TILENGA PROJECT ESIA - APPENDIX N: Terrestrial Vegetation

May 2018

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N1 – Field Survey Report

N2 – Flora Mapping Sources

N2.1 – Vegetation Cover – well pads

N2.3 – Sensitivity Key

N2.4 – Sensitivity maps – well pads

N2.5 – Sensitivity maps - Flowlines

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APPENDIX N1

Tilenga Project

VEGETATION AND FLORA FULL ECOLOGICAL SURVEY REPORT

2018

VEGETATION AND FLORA FULL ECOLOGICAL SURVEY REPORT

TILENGA PROJECT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Report Prepared for AECOM Uganda Limited (Registration Number: 170146)

By

James Kalema

Derick Serunjogi

Kennedy Mukasa

BACKGROUND

In this report we provide a summary of the results of survey work undertaken during both the first and second Vegetation and Flora survey campaigns in the area of Blocks CA-1 and LA-2 North. These surveys were carried out between 28th March and 22nd April 2017, and later between 12 June and 5th July 2017. The areas surveyed were:

- Selected CA-1 well pads in Murchison Falls National Park (JBR, Jobi Riii sites)
- Victoria Nile Pipeline HDD Crossing (North)
- North and South Victoria Nile Ferry Crossing areas
- Bugungu Airstrip extension area
- Selected LA-2 North well pads in community areas (Kasemene-Wahrindi (KW), Kigogole (KGG), Ngiri (NGR), Nsoga (NSO) sites)
- Victoria Nile Pipeline HDD Crossing (South)
- Water Abstraction System (WAS)

The survey locations for these Vegetation and Flora campaigns are shown in the Figures in Appendix N2.1 of the ESIA report.

A reconnaissance visit had earlier been made to the study area between 18 and 23 July 2016 to identify the locations that would later be used for the surveys, based on preliminary habitat mapping. The purpose was to select the survey points that would provide good coverage of the main vegetation types in their full variation so that a complete and representative picture of the flora and fauna baseline across the Project Area might be presented.

The surveys were conducted in both the dry and the wet seasons of the year in order to collect data on the species composition and vegetation communities as they vary between seasons. This variation is more pronounced on the non-woody species. Different species of plants have different phenological and life cycles. The sampling regime was therefore staggered to have a repeat visit made to the study area so that each was visited once in the dry and once in the wet season of the year. This is important given that during the dry season several parts of the project area were either too dry or burnt, making identification of plants in the herb layer nearly impossible. The available climatic data covering the site was used to identify these seasons and the field surveys were scheduled accordingly (often wet during April-May and August-November periods, and drier during the December-March and June-July in Murchison Falls National Park – Uganda Government 1967). However, there were notable changes in weather in the area and rains did not come as expected.

The results of these field surveys presented here provide a basis for description of baseline conditions in the study area for the Environmental and Social Impact Assessment (ESIA).

SCHEDULE AND LIST OF PARTICIPANTS

A total of 25 sites were surveyed in a range of vegetation types. Each of the sites was surveyed once in the dry and once in the wet season. The dry season surveys were carried out from 28th March to 22nd April 2017 and the wet season surveys from 12th June to 5th July 2017. Daily Reports were prepared and provided to TEPU.

The surveys were managed and supervised by AECOM personnel:

- Dr. Brian Cuthbert
- Gail Muirhead

The surveys were conducted by the following team:

Table 1: Flora Survey Team Composition

First, Last Name	Responsibility
James Kalema	Makerere University, Vegetation and Flora: Lead
Derick Serunjogi	Makerere University, Vegetation and Flora: Assistant 1
Kennedy Mukasa	Makerere University, Vegetation and Flora: Assistant 2

METHODS

Literature review

Prior to the actual field surveys, a desk-based approach was employed to review existing sources of data and information about the vegetation and flora of the Project Area.

The known vegetation mapping products for Uganda were reviewed. Of particular importance is the land cover classification information for Uganda by Langdale-Brown *et al.* (1964) and Oneka (1996) who prepared a vegetation map of the Murchison Falls area using vegetation types adapted from Langdale-Brown *et al.* (1964). Information on the flora of the area was sought from such sources as Plumptre *et al.* (2003) who provide a broad overview on biodiversity of the Albertine Rift region, Kalema (2005) who assessed the flora of MFNP, reporting up to 450 species of plants.

Red Lists were obtained from IUCN (2016), Kalema & Beentje (2012) on conservation status of Uganda trees and WCS (2016) on the National Redlist of plants. A number of ecological studies on ESIA and related works in the areas were also reviewed, e.g. Air water Earth (2011a,b), Air Water Earth (2012a, b), AECOM (2014), AECOM (2017), ERM/BIMCO (2014), WCS & eCountability (2016a) on critical habitat analysis.

Field surveys

The approach used in this task was conducting targeted surveys to cover the footprint of the proposed infrastructure and the area within a 500 m buffer around the infrastructure footprint. Prior to these detailed surveys preliminary “avoidance” surveys were undertaken across the entire Project Area,

covering all Project components including well pads and flowlines. The findings for these surveys are shown on the Figures in Appendices N2.4 and N2.5.

Based on the findings of these avoidance surveys the locations for the detailed surveys discussed in this report were determined. The detailed findings from this survey are shown on Figures N2.1 and N2.3.

For the detailed surveys, at a given site, design of 30 x 30 m plots was used to survey for vegetation and flora within the 500 x 500 m buffer. At least five such quadrats were used, one being the actual location of the infrastructure, and four at each of the corners of the 500 x 500 polygon (Fig. A). Description of the vegetation types was done from direct observations of the plant community features of tree cover, shrub cover, herbaceous cover and community height and species composition (Tzoulas & James 2010).

A record was made of species present, and the abundance of each species assessed from its percentage cover. This relative abundance was to be used to define the vegetation type and to provide information on the phytosociological structure of the different vegetation types. A sample data sheet for recording the necessary data can be found at the end of this report. The sheet includes a record of dominant woody and non-woody species; altitude, tree cover, shrub cover, herbaceous cover, bare ground cover.

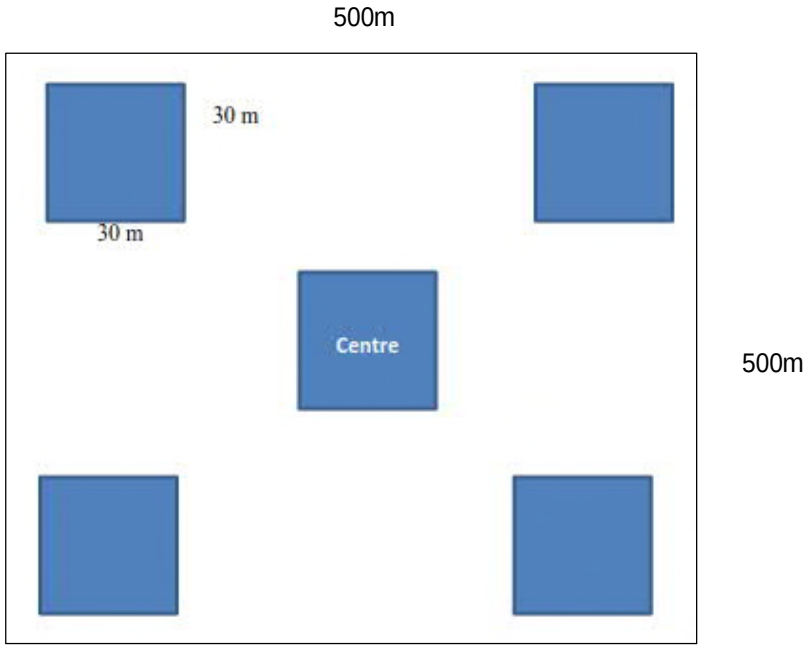

Fig. A Illustration of the design of placement of quadrats within the 500 x 500 m buffer zone

The structural features of the vegetation recorded were:

- total tree cover
- total shrub cover
- bare ground and/or open water cover

- total herb cover
- tree mean height
- shrub mean height
- herbaceous mean height

Vegetation characterization was based on the dominant woody and non-woody floristic composition and landscape features observed in the general area at the site. The top three dominant species for both woody and non-woody species were recorded. Other common species of plants at the site and their percentage cover were also estimated.

Cover is an estimate of a species' or group of plants' quantitative contribution to the vegetation. It is a measure of the vertical projection on to the ground of the extent of the living parts of a species or group of plants (Rodwell 2006). This cover was visually estimated by all the three surveyors from the central point of the plot if the vegetation was open with little obstruction to the surveyors' view, or by walking round some obstacles e.g. in dense Bushland and Thicket communities.

The mean of the three estimates was taken and recorded. General details recorded included surveyor information, date, locality and geographical coordinates, slope and altitude. The general soil type was also recorded depending on the proportions of sand, clay and silt. A map to describe the vegetation communities from basic phytosociological characteristics was prepared from the dominant species within the buffer area.

Plant identification

The Angiosperm Phylogeny Group (APG 2009) system of classification was followed for taxonomic treatment of angiosperms for this study. Species of plant important for this survey that were not easy to identify in the field even with field guides were collected as voucher specimens for subsequent identification and deposition at the Makerere University Herbarium Uganda.

Biodiversity Value and Identification of Critical Habitats

The biodiversity value of sites was assessed though presence of species of conservation concern, e.g. threatened species and ecosystems, IUCN red data listed species, endemic taxa, CITES listed species and nationally threatened ones, culturally important biodiversity features, ecological processes necessary for maintaining critical habitats. Such species, when encountered, were recorded and geo-referenced and their habitats noted. Also of interest and concern was the occurrence of invasive species in or near the project area as these reduce the biodiversity value of a site.

The criteria proposed under the International Finance Corporation (International Finance Corporation 2012) were followed in identification of Critical Habitats in the project area. Guidance Note 54 (GN54), under Performance Standard 6, which defines a Critical Habitat as:

"… areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes…"

GN55 provides the criteria for qualifying a Critical Habitat, thus presence of:

- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species
- Criterion 2: Endemic and/or restricted-range species
- Criterion 3: Migratory and/or congregatory species
- Criterion 4: Highly threatened and/or unique ecosystems
- Criterion 5: Key evolutionary processes

Further criteria are suggested under GN56. These include

- Habitats used during periods of stress (e.g., flood, drought or fire)
- Concentrations of Vulnerable (VU) species in cases where there is uncertainty regarding the listing, and the actual status of the species may be EN or CR
- Areas of primary/old-growth/pristine forests and/or other areas with especially high levels of species diversity
- Landscape and ecological processes (e.g., water catchments, areas critical to erosion control, disturbance regimes (e.g., fire, flood) required for maintaining critical habitat)
- Habitat necessary for the survival of keystone species
- Areas of high scientific value such as those containing concentrations of species new and/or little known to science.

Different sites within the project area were assessed against the criteria above for identification of Critical Habitats.

Photography

A photographic record of the vegetation type and any features of interest was made. Other landscape features such as topography, general soil description and indications of drainage were also recorded. Proximity to important features such as river and streams was noted.

Equipment list:

2x Handheld GPS
Plant presses,
Pairs of secateurs,
Ivy tags,
Measuring tapes,
Old newsprint,
Voucher collecting bags
2x Camera
Field ID books

Limitations owing to weather changes

At the time of the first campaign, several parts of the block were only still recovering from the previous burning regime and/or dry season conditions (Photo 1). This made identification of some of the herbaceous species in the field layer difficult or virtually impossible in instances. The wet season also delayed a bit, so the vegetation was not as luxuriant as was expected even by July 2017.

Photo 1: JBR-01 in April 2017

FINDINGS

1. Bridge Barge North

HABITATS

This site is along the Victoria Nile River just by the jetty used by the current Paraa Ferry, thus making it have much bare ground with gravely sandy soils (Photo A-JK-170624-746). The vegetation is Riverine *Kigelia* woodland with *Harrisonia* thicket. Along the Victoria Nile is *Vossia-Cyperus* marsh. *Kigelia africana*; *Acacia sieberiana*; *Crateva adansonii* are the dominant species in the woody layer while *Sporobolus pyramidalis* and *Setaria sphacelata* dominate the herb layer.

Photos A-JK-170624-746 and A-JK-170624-744 of Victoria Nile Ferry Crossing North site with bare ground (left) and narrow vegetation belt along the Victoria Nile (right)

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

- At least two invasive species of plant occur in the site, viz: *Salvinia molesta* and *Eichhornia crassipes* (Photo Photos A-JK-170704-334 and A-JK-170704-335) at low abundance along the Nile. These are both aquatic species that will remain at the edges of the river unless carried out deliberately or inadvertently to the away from the river. These species have the potential to spread with disturbance. Construction activity of the bridge may cause siltation into the river proliferating the incidence of the two species


Photos A-JK-170704-334 and A-JK-170704-335 of alien invasive *Eichhornia crassipes* (left) and *Salvinia molesta* (right) at Victoria Nile Ferry Crossing North

2. Victoria Nile Ferry Crossing South

HABITATS

This, too, is along the Victoria Nile River just a few tens of meters from the jetty on the south end of the Victoria Nile at the existing Paraa Ferry crossing point. There is less bare ground. The vegetation is *Phragmites-Vossia-Cyperus* swamp fringed by *Acacia-Combretum* bushland *Sesbania sesban* and floating *Salvinia molesta* on the edge of the River. *Sesbania sesban*; *Acacia senegal*; *Kigelia africana* are dominant in the woody layer of the Bushland while *Phragmites mauritianum*; *Vossia cuspidata*; *Cyperus papyrus* are the dominant herbaceous species.

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

- Three invasive species of plant were recorded in the site, viz: *Salvinia molesta* and *Eichhornia crassipes* (Photo A-JK-170419-545) at low abundance and *Mimosa pigra* (Photo A-JK-170419-561) at moderate level of abundance. The first two species are purely aquatic species that will not grow on dry ground but the later may survive in environments that are only hygrophic but not dry. These species have the potential to spread with disturbance. Construction activity of the Victoria Nile Ferry Crossing point may cause siltation into the river proliferating the incidence of the three species.


Photo A-JK-170419-545 *Salvinia molesta* (left) and *Eichhornia crassipes* (right, in flower)

Photo A-JK-170419-561 of invasive *Mimosa pigra*

3. Bugungu Airstrip

HABITAT

This site is located within well wooded vegetation with moderate to tall grass. There is hardly any bare ground owing to a very good cover of the ground by grass (Photo A-JK-170419-524). The vegetation is Woodland dominated by *Albizia*, *Acacia* and *Philenoptera* in the tree layer with *Combretum molle*, *Securidaca longipedunculata* and *Stereospermum kunthianum* in the shrub layer and *Brachiaria*, *Hyperthelia* and *Hyparrhenia* in the herbaceous layer forming a dense cover with moderate height; on sandy soil. *Albizia grandibracteata*, *Acacia sieberiana* and *Philenoptera laxiflora* are dominant in the woody layer of the woodland while *Brachiaria brizantha*, *Hyperthelia dissoluta* and *Hyparrhenia filipendula* are the dominant grass species.

Photo A-JK-170419-524 of Woodland with dense ground grass cover

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

- One invasive species of plant was recorded in the site, viz: *Chromolaena odorata* at very low abundance. This species grows on dry ground but is still in very abundance. It tends to proliferate with disturbance, spreading to cover large areas with creation of gaps. Construction activity during extension of the air strip may cause its spread into areas it does not occur at the present
- The site is well stocked with woody species and hence extension activity is very likely to cause reduction in the woody biomass which takes a long time to be re-assembled even with restoration

4. • Victoria Nile Pipeline HDD Crossing (North)

HABITATS

This site is located by the northern bank of the Victoria Nile on generally flat or gently sloping ground with patches of bare ground (Photos A-JK-170418-471 on sandy soil. The vegetation is mainly Open Bushland of *Acacia* in the tree layer with *Capparis*, *Acacia* and *Vepris* in the shrub layer with the herbaceous layer dominated by *Sansevieria nilotica* on sandy soil. It is variably dominated by *Maytenus undata*, *Harrissonia abyssinica*; *Acacia sieberiana*; *Vepris nobilis* and *Jasminum* sp., *Capparis fascicularis*; *Crateva adansonii*; *Acacia senegal* in the shrub layer. The tree layer is sparse to moderate, mainly composed of *Acacia sieberiana*. The herbaceous layer is dominated by *Sansevieria nilotica* and *Sporobolus pyrimidalis*.


Photos A-JK-170418-471 and A-JK-170623-717 of Bushland-Bushed Grassland mosaic

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

- Whereas no species of conservation concern were recorded at this site, reference should be made to the avoidance maps (Appendix N2.4 and N2.5 prepared to check for any possible features such as the mature large trees of *Acacia sieberiana*, *Balanites aegyptiaca*, *Crateva adansonii*, *Kigelia africana* and the seasonal wetland patches, mainly in wallows.
- Though not recorded from any plot, two invasive species were encountered along the Victoria Nile – *Eichhornia crassipes* and *Salvinia molesta*. Both are aquatic species that may proliferate with disturbance as they propagate vegetatively.
- *Suddia sagittifolia*, which is an aquatic grass species of restricted range (known only from the Nile by the Lake Kyoga area in Uganda as the southern-most limit of its geographical range (Kalema 2005) to South Sudan (Renvoize *et al*. 1984)), was not recorded but is likely to occur along the Victoria Nile around the site. It grows in *Cyperus papyrus* mats at the river margins with *Typha domingensis* and *Vossia cuspidata* and *Phragmites mauritianum* (Photo X2)

Photo X2 *Suddia sagittifolia* recorded from the Victoria Nile margins

5. Victoria Nile Pipeline HDD Crossing (South)

HABITATS

This site is located by the southern shores of the Victoria Nile on generally flat or gently sloping ground with patches of cultivation on sandy soil. There is on-going development of a tourist facility, with new structures being constructed and vegetation being cleared. The vegetation is mainly Riverine forest (Photos A-JK-170420-565, A-JK-170420-568, A-JK-170420-570) dominated by *Maytenus*, *Vepris* and *Kigelia* with *Vepris* in the shrub layer and virtually no herb layer due to heavy shading of trees, on sandy loam soil.

The tree layer is composed of *Kigelia africana*, *Acacia sieberiana*, *Maytenus undata*, *Trichilia emetica* and *Ficus* sp. The shrub layer is dominated by *Vepris nobilis*, *Maytenus undata*, *Ziziphus pubescens*. The herbaceous layer is dominated by *Sansevieria nilotica* and *Sporobolus pyrimidalis*. In places farther away from the river, open grassland patches occur with *Hyperthelia dissoluta* as the dominant grass species.


Photos A-JK-170420-565 (left) and A-JK-170420-568 (right) of Riverine forest at Victoria Nile Pipeline HDD Crossing (South).

Photo A-JK-170420-570 of Riverine forest at Victoria Nile Pipeline HDD Crossing (South)

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

Milicia excelsa was recorded here during avoidance surveys.

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

- Whereas no species of conservation concern were recorded at this site, reference should be made to the avoidance report prepared to check for any possible features such as the mature large trees of *Acacia sieberiana*, *Balanites aegyptiaca*, *Crateva adansonii*, *Kigelia africana* and the seasonal wetland patches, mainly in wallows.
- *Chromolaena odorata* is the one invasive species of plant registered from the site, albeit at very low abundance.
- Though not registered during these surveys, invasive species *Mimosa pigra*, *Eichhornia crassipes* and *Salvinia molesta* are also likely to be within the site

6. JBR-01

HABITATS AND THEIR CONDITION

This site is located on gently to moderately sloping ground on sandy soil. The vegetation is mainly Open Grassland (Photos A-JK-170409-275 and A-JK-170627-793) with *Acacia-Balanites* Open Wooded Grassland along the vale with Acacia *sieberiana* and *Harrisonia abyssinica* in the shrub layer with short grass.

There are also areas of open Bushed grassland patches. The grass layer may be virtually absent during the dry season, having been burnt. The sparse tree layer is dominated by *Acacia sieberiana*, and *Balanites aegyptiaca*. The shrub layer is dominated by *Acacia sieberiana*. The herbaceous layer is variably dominated by *Hyperthelia dissoluta*, *Sporobolus stapfianus, Chamaecrista kirkii* and *Bulbostylis* sp.

Photos A-JK-170409-275 and A-JK-170627-793 of Bushed Grassland and Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, the avoidance data revealed presence of mature large trees of *Acacia sieberiana*, *Balanites aegyptiaca*, *Crateva adansonii*, and the seasonally flooded wetland patches, as wallows that need to be avoided where possible.

7. JBR-010

HABITATS AND THEIR CONDITION

This site is located on flat ground (Photos A-JK-170417-438 and A-JK-170625-749) on sandy soil. The vegetation is mainly a Bushland-Bushed grassland mosaic dominated by *Acacia sieberiana* trees (Photos A-JK-170417-438 and A-JK-170625-749). In places, the vegetation becomes Dense *Acacia* bushland with *Vepris* and *Capparis* in the shrub layer with a sparse herbaceous layer. *Harrisonia abyssinica*, *Cadaba farinosa*, *Combretum aculeatum*, *Maytenus undata* and *Capparis fascicularis* are the commonest and dominant species in thicket and Bushed Grassland communities. The grass is short grass (under c.0.5 m).


Photos A-JK-170417-438 (left) and A-JK-170625-749 (right) with Bushland and Bushed Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia sieberiana*. In addition,

there are seasonally flooded grassland (wetland) areas with habitat-specific plant species such as *Echinochloa colona* that may be ecologically damaged.

8. JBR-02

HABITATS AND THEIR CONDITION

This site is located on moderately sloping ground with slope angle of 8-16° on sandy soil. The vegetation is composed of Open Grassland with Thicket and occasional trees of *Balanites aegyptiaca*. There is also open *Acacia* Wooded Grassland along the vale. In some places there is Bushed Grassland with *Harrisonia abyssinica* and *Acacia sieberiana* and occasional tree cover of *Balanites aegyptiaca* and *Acacia sieberiana* with virtually no grass layer in the dry season due to burning. The grass is short (under c.0.5 m) due to grazing. (Photos A-JK-170410-307 and A-JK-170623-735)

Photos A-JK-170410-307 and A-JK-170623-735 of Grassland with Thicket and Bushed Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. The avoidance features recorded from this site, particularly mature trees of *Balanites aegyptiaca* and *Acacia sieberiana* would be reduced in abundance if not circumvented.

9. JBR-03

HABITATS AND THEIR CONDITION

This site is located on well drained sandy soils sloping ground angle mostly 16-32° on sandy soil. The vegetation is mainly Open Grassland dominated by *Hyperthelia dissoluta*; *Bulbostylis* sp., *Chamaecrista kirkii* and *Sporobolus stafianus* with very sparse tree cover of *Crateva* and very short

grass during drought periods and also due to burning. In the surrounding vales is Acacia Wooded Grassland.


Photo A-JK-170411-325 (left) and A-JK-170628-805 (right) of Open Grassland at JBR-03 in dry season (left) and in wetter season (right)

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. Notable avoidance features that were recorded from this site that would be directly affected include mature individual trees of *Acacia sieberiana*, *Balanites aegyptiaca*, *Crateva adansonii*. There are also azonal micro-habitats such as wallows with habitat-specific (wetland) flora such as *Ipomoea aquatica*, occurring in only very restricted places within the site.

10. JBR-04

HABITATS AND THEIR CONDITION

This site is located on gently sloping terrain (slope mostly 8-16°) on sandy soil. The vegetation is mainly Open grassland with very sparse tree cover of *Acacia* with short grass due to burning and drought (Photos A-JK-170412-338 and A-JK-170629-820). In the surrounding vale is Seasonally Flooded Open *Acacia* Wooded Grassland with sparse bushes of *Harrisonia abyssinica* and short grass during the dry season. The herb layer is dominated by *Hyperthelia dissoluta*, *Ctenium newtonii* and *Eragrostis* sp. fringed by *Acacia sieberiana* Open Wooded Grassland.

In places, the vegetation becomes Shrubland dominated by *Acacia* and *Harrisonia* with patches of bare gravelly ground fringed by *Acacia* Wooded Grassland with short grass on clayey sands with gravel.


Photos A-JK-170412-338 and A-JK-170629-820

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia sieberiana* and *Balanites aegyptiaca*. In addition, there are seasonally flooded wetland areas (Wetland with seasonal water presence) with habitat-specific flora such as *Nymphaea lotus*, *Caldesia resinosa, Cyperus iria*, *Sphenoclea zeylanica* (Photo A-JK-161124-089) and riable soils with marginal plant species (Photo A-JK-170629-823). These are azonal habitats enhancing alpha and beta diversity.


Photo A-JK-161124-089 of seasonal wetland with habitat-specific flora (left) and A-JK-170629-823 with friable soils

11. JBR-05

HABITATS AND THEIR CONDITION

This site is located on flat ground, slope 0-8° on sandy soil. The vegetation is Open *Hyperthelia*, *Ctenium*, *Eragrostis* and *Bulbostylis* grassland with sparse *Crateva adansonii*, *Borassus aethiopum*, and *Acacia sieberiana* tree cover and short grass on sandy soil (Photo A-JK-170413-351 and A-JK-170630-843). In small patches are *Crateva* or *Borassus* Open Wooded areas.

Photo A-JK-170413-351 and A-JK-170630-843 of Open Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, a few mature individual trees, especially of *Crateva adansonii*, *Borasssus aethiopum* and *Acacia sieberiana* recorded during the avoidance survey may be felled down or damaged.

12. JBR-06

HABITATS AND THEIR CONDITION

This site is located on ground that is flat or gently sloping (4-8°) to moderate slope (16-32°) on sandy soil. The vegetation is Open Grassland dominated by *Hyperthelia dissoluta* and *Digitaria longiflora* with very sparse *Borassus aethiopum* and *Crateva adansonii* tree cover and very short grass on sandy soil (Photos A-JK-170413-375 and A-JK-170701-868). Open grassland dominated by bare eroded gullies fringed by *Acacia and Balanites* trees in vale and very sparse grass cover on gritty sandy soil. In the surrounding vale is sparse *Borassus* cover with *Hyperthelia* and *Sporobolus pyramidalis*.


Photos A-JK-170413-375 and A-JK-170701-868 of Open Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site. These are seasonal wetland with *Urochloa*, *Ludwigia* and *Cyperus* spp. (wetland areas with habitat-specific flora) and mature trees, particularly of *Crateva adansonii*, *Borassus aethiopum* and *Acacia sieberiana* as pointed out in the avoidance report.

13. JBR-07

HABITATS AND THEIR CONDITION

This site is located on sloping ground (slope 8-32°) on sandy soil. The vegetation is mostly Open Grassland with sparse *Borassus* tree and shrub and occasionally *Balanites aegyptiaca* and *Crateva adansonii* cover and very short grass due to drought and over grazing (Photos A-JK-170414-382 and A-JK-170703-892). The herb layer is dominated by *Hyperthelia dissoluta*, *Eragrostis* sp. and *Ctenium newtonii*.


Photos A-JK-170414-382 and A-JK-170703-892 of Open Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Borassus aethiopum* as pointed in the avoidance report. Besides, there are seasonally flooded grassland (wetland) areas with habitat-specific flora i.e. *Urochloa* sp., *Ludwigia* sp. and *Cyperus* spp.

14. JBR-08

HABITATS AND THEIR CONDITION

This site is located on gently to moderately sloping ground (slope ranging 8-32°) on sandy soil. The vegetation is mainly *Hyperthelia* Open Grassland with sparse *Borassus* and *Balanites* tree cover and occasional presence of mature *Acacia sieberiana* trees (Photos A-JK-170415-396 and A-JK-170704-915).

The shrub layer is dominated by *Borassus aethiopum* with short grass due to grazing. The herb layer is dominated by *Hyperthelia dissoluta*, *Ctenium newtonii* and *Eragrostis* sp.


Photos A-JK-170415-396 and A-JK-170704-915 of Open Grassland with *Borassus* and *Balanites*

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site. However, there are two invasive plant species, viz: *Salvinia molesta* and *Eichhornia crassipes* in a wetland (Photos A-JK-161129-193, A-JK-161129-195, A-JK-161129-196 that could proliferate with disturbance.


Photos A-JK-161129-193 (top left), A-JK-161129-195 (bottom) and A-JK-161129-196 (top right) of invasive *Salvinia molesta* and *Eichhornia crassipes*

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Borassus aethiopum*, *Crateva adadnsonii, Balanites aegyptiaca* and *Acacia sieberiana*. In addition, there is seasonally flooded *Urochloa* seasonal wetland with habitat-specific flora in a wallow at the site(Photo A-JK-161129-186).

Photo A-JK-161129-186 of seasonal wetland

15. JBR-09

HABITATS AND THEIR CONDITION

This site is located on flat ground (slope 4-8°) on sandy soil. The vegetation is *Borassus-Acacia-Balanites-Hyperthelia* Wooded Grassland with *Borassus* in the shrub layer and very short grass due to over grazing and burning at the well site (Photos A-JK-170416-412 and A-JK-170626-760). This is surrounded by Open *Borassus-Acacia* woodland with *Borassus-Crateva* shrub layer and short grass due to burning and over grazing. In places, the vegetation becomes Open *Acacia* woodland with occasional *Borassus* trees and *Borassus* in the shrub layer and very short grass. In the adjacent gulley is Open Riverine Woodland dominated by *Acacia* and *Borassus* in the tree layer with *Sporobolus* and *Setaria* in the herb layer with moderate grass height.

Photos A-JK-170416-412 and A-JK-170626-760 of *Borassus-Acacia* Wooded Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia sieberiana* (Photos A-JK-161130-211 and A-JK-161130-212), *Borassus aethiopum* and *Balanites aegyptiaca*.

Photos A-JK-161130-211 and A-JK-161130-212 of large mature *Acacia* tree

16. KGG-03

HABITATS AND THEIR CONDITION

The well site is located on very gently sloping ground (slope 4-8°) on sandy soil. The whole environment is modified with cultivation, leaving only very few isolated mature trees. The vegetation at the well site itself is Bushed Grassland dominated by *Acacia hockii* and *Harrisonia abyssinica* with *Cyperus* sp., *Setaria sphacelata* and *Brachiaria brizantha* in the herb layer and partly cultivated with *Zea mays* (maize) and *Gossypium* (cotton) (Photos A-JK-170613-589 and A-JK-170613-590).

The surrounding area is mostly cultivated with *Manihot* gardens with relics of small trees and relics of *Lannea-Harrisonia-Ziziphus* thicket. There is occasional occurrence of *Musa* garden surrounded by Grevillea trees with weeds of cultivation such as *Digitaria ciliaris*, *Bidens pilosa*, *Commelina africana* and *Brachiaria scalaris* and Brachiaria *brizantha* in the herb layer. There are also Post-cultivation areas of *Manihot esculenta* and bushed grassland with *Albizia grandibracteata*, *Acacia hockii* and *Harrisonia abyssinica* with *Panicum maximum* in the herbaceous layer (Photos A-JK-170421-584 and A-JK-170421-585).


Photos A-JK-170613-589 and A-JK-170613-590 of Bushed Grassland with cultivation (above) and A-JK-170421-584 and A-JK-170421-585 (below) of Bushed Grassland relics in cultivation (below)

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

Dalbergia melanoxylon, a Globally Threatened species (VU - IUCN 2017) was recorded at the site at very low abundance.

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. There are only very few mature trees recorded during the avoidance surveys such as the planted or spared *Mangifera indica*. The invasive *Chromolaena odorata* was recorded at very low abundance.

17. KW-01

HABITATS AND THEIR CONDITION

This site is located on flat ground (slope 0-4°) which is poorly drained. The vegetation is Seasonally Flooded Bushed Grassland with Thicket dominated by *Euphorbia candelabrum*, *Azima tetracantha* (Photo A-JK-170110-608 and A-JK-170110-595). The grass layer is intermediate height of *Sporobolus pyramidalis* with an additional layer of short grass with *Sporobolus festivus*. There are shallow depressions that collect water seasonally. In places, the vegetation is Seasonally Flooded Open Grassland dominated by *Sporobolus pyramidalis*, *Setaria sphacelata*, *Panicum* sp. and *Sporobolus consimilis* with very sparse thicket dominated by *Azima tetracantha*, *Euphorbia candelabrum, Acacia sieberiana* and *Balanites aegyptiaca*.

There are small patches of Bushland dominated by *Opuntia* and *Azima tetracantha* with very little tree cover and very small pockets of *Sporobolus pyramidalis* grassland. Trees here are dominated by *Acacia sieberiana*, *Euphorbia candelabrum* with short grass owing to over grazing.

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. But, there are notable avoidance features recorded within the site that may be affected by the planned developments. Mature large trees, particularly of *Acacia sieberiana* and *Balanites aegyptiaca* may be cut down or damaged. There are also Seasonally Flooded Open Grassland (wetland) areas (Photo A-JK-170110-608) with habitat-specific species of plants such as *Cyperus articulatus* (Photo A-JK-170110-595). Exotic and invasive *Opuntia* sp. (Photos A-JK-170407-250 and A-JK-170621-702) was recorded at very high abundance and at very low abundance.


Photo A-JK-170110-608 and A-JK-170110-595 of Seasonally Flooded Grassland with habitat-specific flora


Photos A-JK-170407-250 and A-JK-170621-702 of *Opuntia* sp.

18. KW-02

HABITATS AND THEIR CONDITION

This site is located on flat ground (slope 0-4°) on sandy soil. The vegetation is Modified Grassland with Thicket dominated by *Azima tetracantha* and *Euphorbia candelabrum* with short grass and sparse tree cover (Photo A-JK-170622-704). The area is mostly settled in Bushed Grassland dominated by *Hyperthelia dissoluta* with thicket dominated by *Euphorbia* and *Azima*. The tree layer is

dominated by *Crateva* and *Azadirachta*. There are also planted Woodlot patches of *Cassia siamea* with very scattered *Azima* thicket and very sparse grass layer with large patches of bare ground.

Photo A-JK-170622-704 of Modified Bushed Grassland with Thicket

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

Milicia excelsa, assessed as Globally LR/NT by IUCN (2017) was recorded at seven locations within the site. It is also a 'Reserved Species' attracting national attention and concern in Uganda and also listed as NT by WCS (2016).

Invasive *Cassia siamea* was recorded in some areas in fairly high abundance and in other areas at very low abundance.

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia sieberiana*, *Albizia coriaria*, *Azadirachta indica*, *Balanites aegyptiaca*, *Crateva adansonii*, *Kigelia africana*, *Lannea schweinfurthii*, *Mangifera indica*, *Milicia excelsa* and *Tamarindus indica*. In addition, there are seasonally flooded grassland (wetland) areas with habitat-specific flora.

19. NGR-02

HABITATS AND THEIR CONDITION

This site is located on flat ground (slope 4-8°) on sandy soil. The vegetation is Bushed Grassland with Thicket dominated by *Acacia*, *Ziziphus*, *Stereospermum* and very short herbaceous level owing to heavy grazing (Photo A-JK-170615-612). Within the buffer zone is also Bushed Grassland with thicket dominated by *Acacia hockii*, *A. brevispica*, A. *sieberiana* and very occasional small trees.

There is also Seasonally Flooded Grassland with shallow depressions of impeded drainage dominated by *Setaria sphacelata* and *Cynodon dactylon* and fringed by dense *Acacia* Bushland (Photo A-JK-170401-167). In the lower lying areas is Bushland dominated by *Acacia brevispica*,

Jasminum sp., *Ziziphus pubescens* and *Capparis* spp. forming a dense impenetrable cover with sparse bare patches (Photo A-JK-170401-166).


Photo A-JK-170615-612 of Bushed Grassland with Thicket (left) and A-JK-170401-167 of Seasonally Flooded Grassland fringed by Bushland (right)

Photo A-JK-170401-166 of Bushland with bare patches

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia senegal*, *A. sieberiana*, *Balanites aegyptiaca*, *Crateva adansonii*, Lannea schweinfurthii, Sclerocarya birrera, Tamarindus indica and *Ziziphus pubescens*, with a high woody biomass.

20. NGR-03A

HABITATS AND THEIR CONDITION

This site is located on flat ground on sandy soil. The vegetation is Bushed Grassland with Thicket dominated by *Euphorbia*, *Crateva*, and *Ziziphus* with very short grass and sparse tree cover (Photos A-JK-170402-173 and A-JK-170616-623). There is also Grassland with Thicket dominated by *Euphorbia* and *Cadaba* and very sparse tree cover.

Photos A-JK-170402-173 and A-JK-170616-623 of Bushed Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia sieberiana*, *Balanites aegyptiaca*, *Crateva adansonii*, *Euphorbia candelabrum*, *Lannea schweinfurthii*, and *Tamarindus indica*. The abundance of these could be reduced if not carefully avoided.

21. NGR-05A

HABITATS AND THEIR CONDITION

This site is located on gently sloping flat (slope 4-8°) on sandy soil. The vegetation is mainly Bushed Grassland with patches of Thicket dominated by *Euphorbia candelabrum*, *Acacia brevispica* and *Acalypha fruticosa* with very sparse trees dominated by *Lannea schweinfurthii* and very low grass layer due to over grazing and burning (Photo A-JK-170403-187 - A-JK-170403-188). There is also *Hyperthelia* Grassland with Thicket dominated by *Cadaba farinosa*, *Euphorbia candelabrum* and *Ziziphus pubescens* and very sparse tree cover of *Acacia sieberiana* and *Euphorbia candelabrum*.

In places there is Wooded Grassland dominated by *Acacia sieberiana*, *Tamarindus indica*, *Ziziphus pubescens* and *Euphorbia candelabrum* with thicket of *Cadaba farinosa* and *Ziziphus pubescens*.


Photos A-JK-170403-188 and A-JK-170617-634 of Bushed Grassland

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Acacia sieberiana*, *A. senegal*, *Albizia coriaria*, *Balanites aegyptiaca*, *Crateva adansonii*, *Euphorbia candelabrum*, *Lannea schweinfurthii*, *Sclerocarya birrea*, *Tamarindis indica* and *Ziziphus pubescens*.

22. NGR-06

HABITATS AND THEIR CONDITION

This site is located on flat ground with a slope of 0-4° on sandy soil. The vegetation is Bushed Grassland with Thicket dominated by *Capparis fascicularis*, *Cadaba farinosa*, *Acacia brevispica* and *Euphorbia candelabrum* with very short grass of *Hyperthelia dissoluta*, *Digitaria longiflora* in the herbaceous layer (Photos A-JK-170404-201 and A-JK-170618-648). There is also Grassland with sparse thicket dominated by *Cadaba farinosa* and sparse tree cover dominated by *Euphorbia candelabrum* and *Lannea schweinfurthii*.


Photos A-JK-170404-201 and A-JK-170618-648 of Bushed Grassland with Thicket

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species recorded at the site. There is however, *Cassia siamea*, an invasive tree species planted for firewood and building.

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

No species of conservation concern were recorded at this site. However, there are notable avoidance features recorded within the site as mature large trees, particularly of *Albizia coriaria*, *Balanites aegyptiaca*, *Crateva adansonii*, *Euphorbia candelabrum*, *Lannea schweinfurthii* and *Sclerocarya birrea*.

23. NSO-04

HABITATS AND THEIR CONDITION

This site is located on gently sloping ground with a slope angle of 8-16° on sandy soil. The vegetation is Bushed Grassland with Scattered Thicket of *Euphorbia candelabrum*, *Ziziphus pubescens* and very sparse tree cover of *Crateva adansonii* and *Acacia sieberiana* with very short grass (Photos A-JK-170406-224 and A-JK-170620-675). Some of the areas are Modified Bushed Grassland with patches of woodlots and sparse tree cover dominated by *Euphorbia candelabrum*, *Lannea schweinfurthii*.

There is also Wooded Grassland dominated by *Balanites aegyptiaca* and *Lannea schweinfurthii* with very short grass in settled areas. In the adjacent low-lying area is Seasonally Flooded Woodland with *Albizia coriaria*, *Ficus sycomorus* and *Sclerocarya birrea*. There is also Open Bushland with scattered Thicket dominated by *Acacia hockii*, *Euphorbia candelabrum* and *Ziziphus pubescens* and a sparse tree cover. There are also patches of planted *Cassia siamea* woodlots.


Photos A-JK-170406-224 and A-JK-170620-675 of Bushed Grassland with Thicket

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

Dalbergia melanoxylon (Photos A-JK-170120-925, A-JK-170120-930), a Globally Threatened species, was recorded at areas shown in the table below within the site. This is assessed as Globally LR/NT (IUCN 2017) and as nationally NT in Uganda by WCS (2016). *Thevetia peruviana* is an exotic recorded at very low abundance. Invasive *Cassia siamea* was also recorded from the site.


Photos A-JK-170120-925 (left) and A-JK-170120-930 (right) of Globally Threatened *Dalbergia melanoxylon* in the centre of each photo

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

Dalbergia melanoxylon, a globally threarened species, may be damaged or even depleted from the site as it often occurs in low abundance. There are also mature large trees, particularly of *Acacia sieberiana, Albizia coriaria, Balanites aegyptiaca, Crateva adansonii, Kigelia Africana, Lannea schweinfurthii* and *Trichilia emetica*.

24. Water Abstraction System (WAS)

HABITATS AND THEIR CONDITION

This site is located on the shores of Lake Albert on a flat (slope 0-4°) floodplain on sandy soil (Photo A-JK-170329-087). The vegetation is Seasonally Flooded Grassland with very short grass dominated by *Paspalidium geminatum*, *Cynodon dactylon* and in places with and *Sporobolus pyramidalis* and bare sandy patches. There is also Permanent wetland dominated by *Aeschynomene elaphroxylon*, *Typha latifolia*, *Phragmites mauritianum* with *Eichhornia crassipes* (Photos A-JK-170329-094 and A-JK-170329-096).

Photo A-JK-170329-087 of Floodplain on sandy soil

Photos A-JK-170329-094 and A-JK-170329-096 (below) of Permanent Wetland with *Aeschynomene elaphroxylon*

PRESENCE OF SPECIES OF CONSERVATION CONCERN (E.G. RED LIST SPECIES AND/OR CRITICAL HABITAT CRITERIA)

No threatened, rare or range-restricted species was recorded at the site. A couple of invasive species of plant were recorded: *Eichhornia crassipes* at low abundance and *Mimosa pigra* at very low abundance.

IMPLICATIONS FOR DIRECT/INDIRECT IMPACTS

The invasive *Eichhornia crassipes* (Photo A-JK-161218-531) may get introduced into the lake deliberately or inadvertently, rapidly increasing its abundance. Alteration of the physical conditions may compromise the survival of habitat-specific species such as *Cyperus articulatus*, *Leersia hexandra*, *Oryza*.

Photo A-JK-161218-531 of *Eichhornia crassipes* (left) and A-JK-161218-5 of 06 *Oryza* sp. (right)

SUMMARY

Table **2**: Summary of the site floral conditions

SITE	Habitat condition	Sensitive microhabitats	Species richness	Range-restricted species (endemism)	Threatened species	Invasive species
Victoria Nile Ferry Crossing (North)	Natural	i) River banks that may get silted ii) River edges with invasive species that may proliferate	63	None	None	i) Salvinia molesta ii) Eichhornia crassipes
Victoria Nile Ferry Crossing (South)	Natural	i) River banks that may get silted ii) River edges with invasive species that may proliferate	41	None	None	i) Salvinia molesta ii) Eichhornia crassipes iii) Mimosa pigra
Bugungu Airstrip	Natural	i) High woody biomass in entire area ii) Areas with invasive Chromolaena odorata	95	None	None	Chromolaena odorata
Victoria Nile Pipeline HDD Crossing (North)	Natural	i) Woody biomass of large trees	111	None	None	i) Eichhornia crassipes at river edge ii) Salvinia molesta
Victoria Nile Pipeline HDD Crossing (South)	Natural	i) Woody biomass of large trees	83	None	Milicia excelsa	Chromolaena odorata
JBR-01	Natural	Seasonally Flooded Grassland areas in the vicinity	126	None	None	None
JBR-02	Natural	Where mature trees grow	140	None	None	None
JBR-03	Natural	i) Wallows with habitat-specific	98	None	None	None

SITE	Habitat condition	Sensitive microhabitats	Species richness	Range-restricted species (endemism)	Threatened species	Invasive species
		flora ii) Mature trees in vale				
JBR-04	Natural	i) Mature trees in vale ii) Seasonally flooded wetland areas with habitat-specific flora	128	None	None	None
JBR-05	Natural	Small grooves of trees	68	None	None	None
JBR-06	Natural	i) Vale with sparse mature trees ii) Seasonal wetland areas with habitat-specific flora	94	None	None	None
JBR-07	Natural	i) Seasonally flooded areas with habitat-specific flora ii) Areas with mature Borassus trees	96	None	None	None
JBR-08	Natural	i) Areas with invasive species ii) Seasonally flooded areas with habitat-specific flora	122	None	None	i) Salvinia molesta ii) Eichhornia crassipes
JBR-09	Natural	Areas with high woody biomass	132	None	None	None
JBR-10	Natural	i) High woody biomass in dense Bushland ii) Wallows with habitat-specific flora	124	None	None	None
(KGG-03)	Modified	None	159	None	Dalbergia melanoxylon,	Chromolaena odorata

SITE	Habitat condition	Sensitive microhabitats	Species richness	Range-restricted species (endemism)	Threatened species	Invasive species
					(Globally VU - IUCN 2017)	
KW-01	Transitional	Seasonally flooded shallow depressions with habitat-specific flora	94	None	None	Opuntia sp.
KW-02	Transitional	Cassia siamea in woodlots	96	None	Milicia excelsa (Globally LR/NT by -IUCN (2017) and nationally NT (WCS 2016)	Cassia siamea
NGR-02	Transitional	High woody biomass around in bushland areas ii) Seasonal wetlands	106	None	None	None
NGR-03A	Transitional	Areas with mature trees	90	None	None	None
NGR-05A	Transitional	Areas with mature trees	88	None	None	None
NGR-06	Transitional	Areas with mature trees	80	None	None	Cassia siamea
NSO-04	Transitional	Seasonally flooded Open woodland with large mature trees	132	None	Dalbergia melanoxylon, (Globally VU - IUCN 2017)	Cassia siamea
WAS	Transitional	Permanent wetland with mature trees of Aeschynomene	60	None	None	Eichhornia crassipes, Mimosa pigra

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VEGETATION

Record No.		Locality (West/North/South)	
Survey Site No.		Northing	
Date		Easting	
Time		Altitude (m)	
Surveyor(s)		Slope	
Temperature		Soil type and drainage	
Weather:		Wind Direction	
		Wind Speed	
Site and Vegetation Description:		Tree cover (%)	
		Shrub cover (%)	
		Herbaceous cover (%)	
		Bare ground cover %	
		Tree canopy mean height (m)	
		Shrub mean height (m)	
		Herbaceous mean height (m)	
		Dominant woody spp.: i) ii) iii)	
		Dominant herb. spp.: i) ii) iii)	
Photo Refs.			

SPECIES	**Cover (%)**	**DOMIN scale**	**SPECIES**	**Cover (%)**	**DOMIN scale**

SPECIES	Cover (%)	DOMIN scale	SPECIES	Cover (%)	DOMIN scale

Continue on additional sheet as necessary.

DOMINANT COVER/ABUNDANCE SCALE

1	<4% (few individuals)
2	<4% (several individuals)
3	<4% (many individuals)
4	4–10%
5	11–25%
6	26–33%
7	34–50%
8	51–75%
9	76–90%
10	91–100%

Due to overlapping, the whole can add up to >100%; especially in woodlands and papyrus which are multi-layered

For Trees Record:

- Age and Structure Assessment
- DBH measurement
- Signs of natural regeneration

For Aquatics and Emergent Species, Record:

- Water depth, flow, turbidity
- Open water, instead of Bare ground

In Woodland and Papyrus Record height and cover for:

- Canopy
- Understorey
- Field Layer

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APPENDIX N2

Tilenga Project

VEGETATION AND SENSITIVITY MAPPING

2018

APPENDIX N2

Sources for Vegetation and Sensitivity Mapping

This appendix includes two sets of maps, comprising Vegetation Mapping (Appendices N2.1 to N2.2) and Sensitivity Mapping (Appendices N2.3 to N2.5), respectively.

Vegetation Mapping (Appendices N2.1 – N2.2)

A number of mapping exercises have been undertaken within MFNP and surrounding areas in relation to this project. The mapping shown here is the collated and interpreted mapping presented in WCS 2016[1]. This data has been used to inform the species association studies[2] and also habitat quality assessment[3]. The mapping is based on the following studies:

- AECOM[4] data from the Phase I biodiversity surveys carried out for EA1
- AECOM data collected to inform this ESIA, particularly focused on the Project footprint area (see Appendix N1 for field survey report)
- WCS data collected from MFPA in partnership with UWA and NEMA funded by the Norwegian Government under the Oil for Development fund
- WCS data during the Phase 2 biodiversity study funded by TUOP
- WCS collected for this study funded by TEPU
- Data received from the National Biodiversity Data Bank (NBDB) at Makerere University

The data was combined by WCS and used to finalise mapping and to define the landcover classification hierarchy as described in WCS 2016.

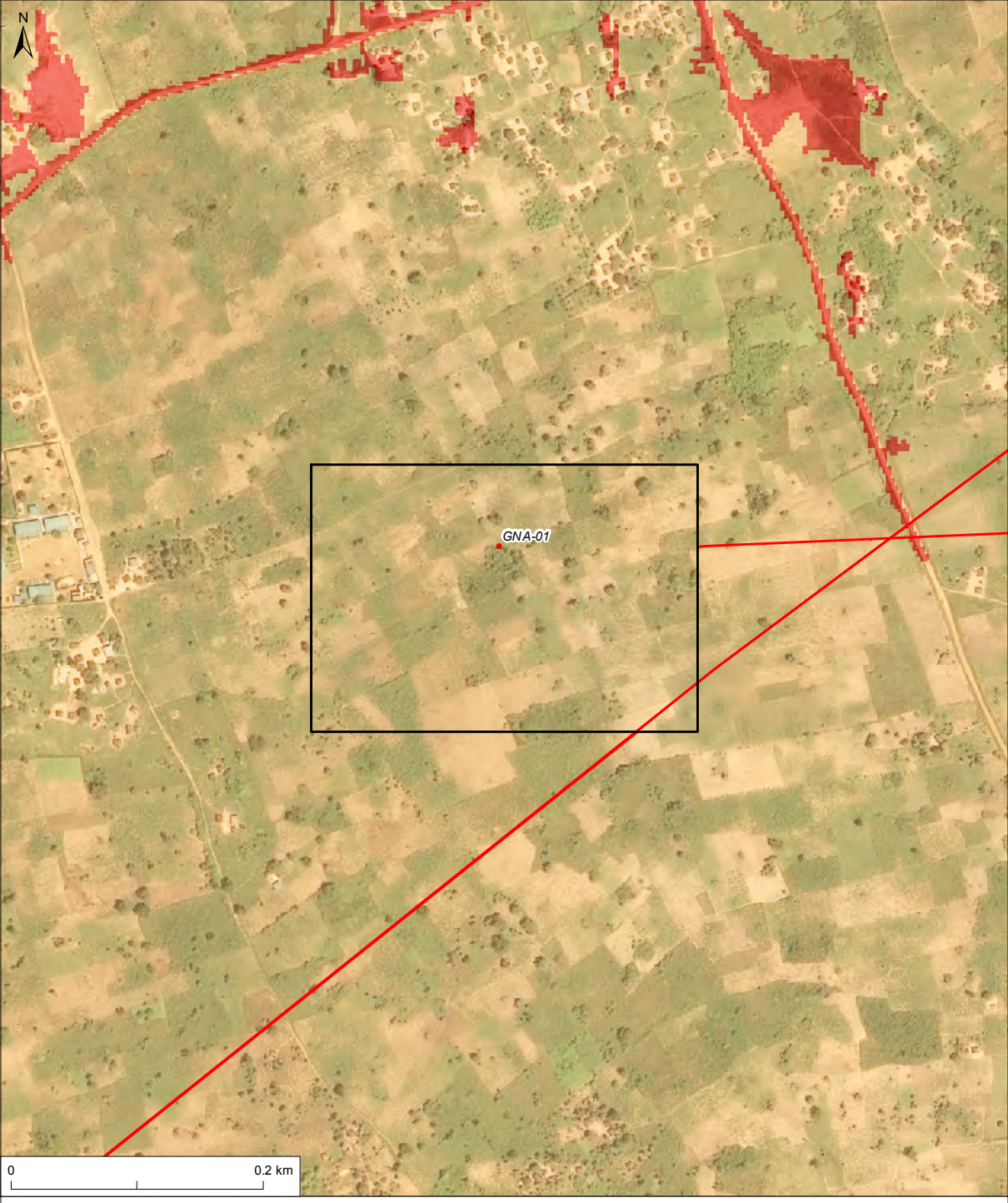
Sensitivity Mapping (Appendices N2.3 – N2.5)

The sensitivity mapping is based on extensive 'avoidance' surveys undertaken by AECOM and TEPU. The objective of the surveys was to visit each area where Project infrastructure would be placed and to record and map the presence of any features, within an appropriate buffer, which should be taken into account with regard to the FEED process, which would result in placement of infrastructure within the Project Area. The avoidance surveys were therefore the first stage in the avoidance hierarchy.

Initial field surveys were undertaken between November 2016 and February 2017, focussing mainly on the well-pad sites and Project components such as the CPF, WAS and river crossing points. Subsequently surveys were undertaken to include flowlines, access tracks and other features such as borrow pits as the locations of these features were developed and finalised. Changes to well-pad positions and other infrastructure were also covered. This second phase of surveys was undertaken by AECOM between August 2017 and February 2018.

In addition, AECOM's avoidance data was supplemented by avoidance surveys undertaken by TEPU during 2017. All of these data were merged to prepare the maps included in this appendix to the ESIA.

[1] WCS & eCountability (2016), Phase 2 Biodiversity Study: Volume 4, Land-Cover Mapping for the Albertine Rift Oil Development Basin, Exploration Areas EA-1-3 (Final Draft, February 2016)
[2] WCS (2017a), Critical Habitat Species Habitat associations and preferences. (Final Report September 2017)
[3] WCS (2017b) Critical Habitat Assessment: Habitat Quality and Condition (September 2017)
[4] AECOM Ltd (2015), Environmental Baseline Study for Exploration Block EA-1 in Uganda



VEGETATION COVER - GNA-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

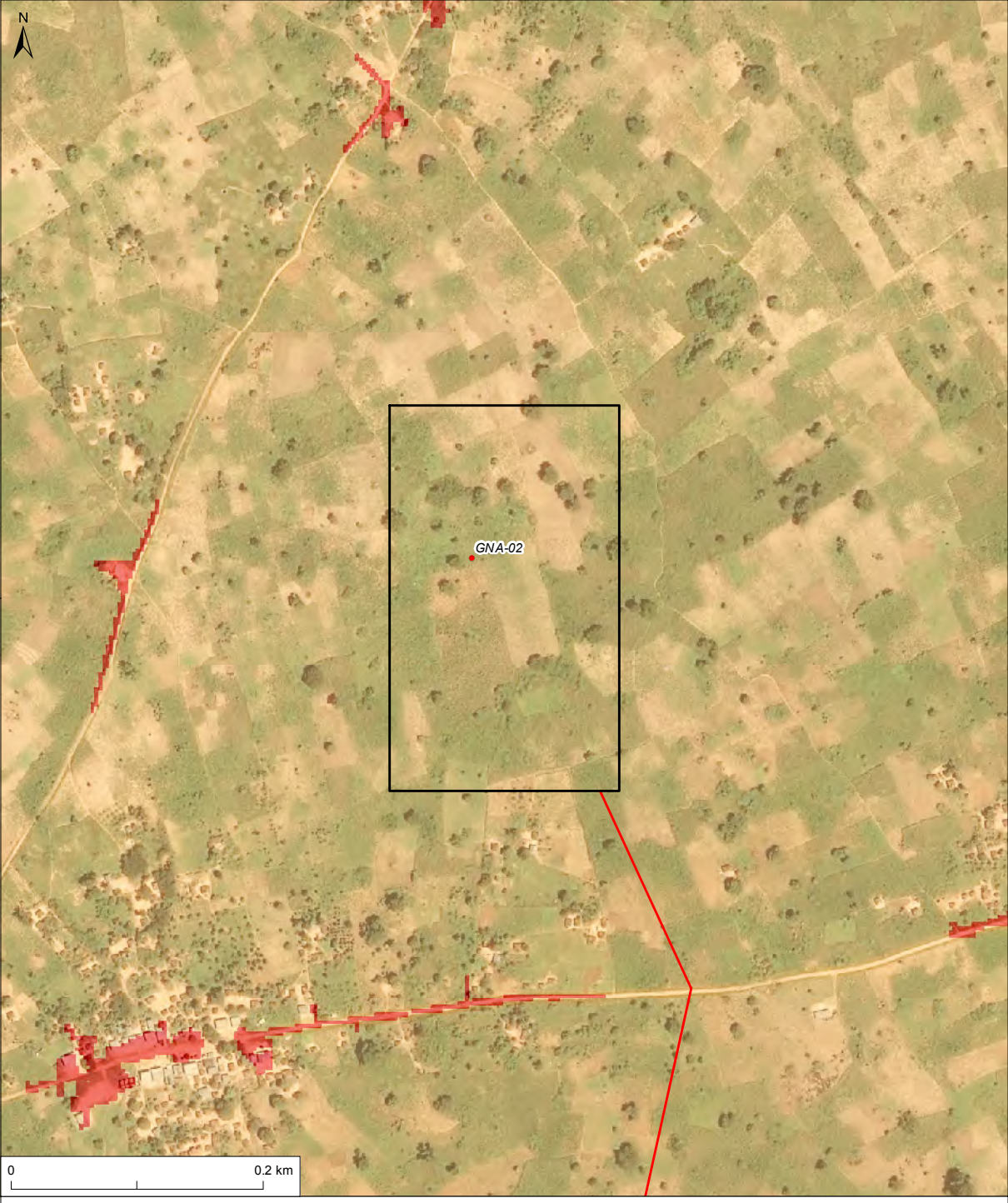
Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - GNA-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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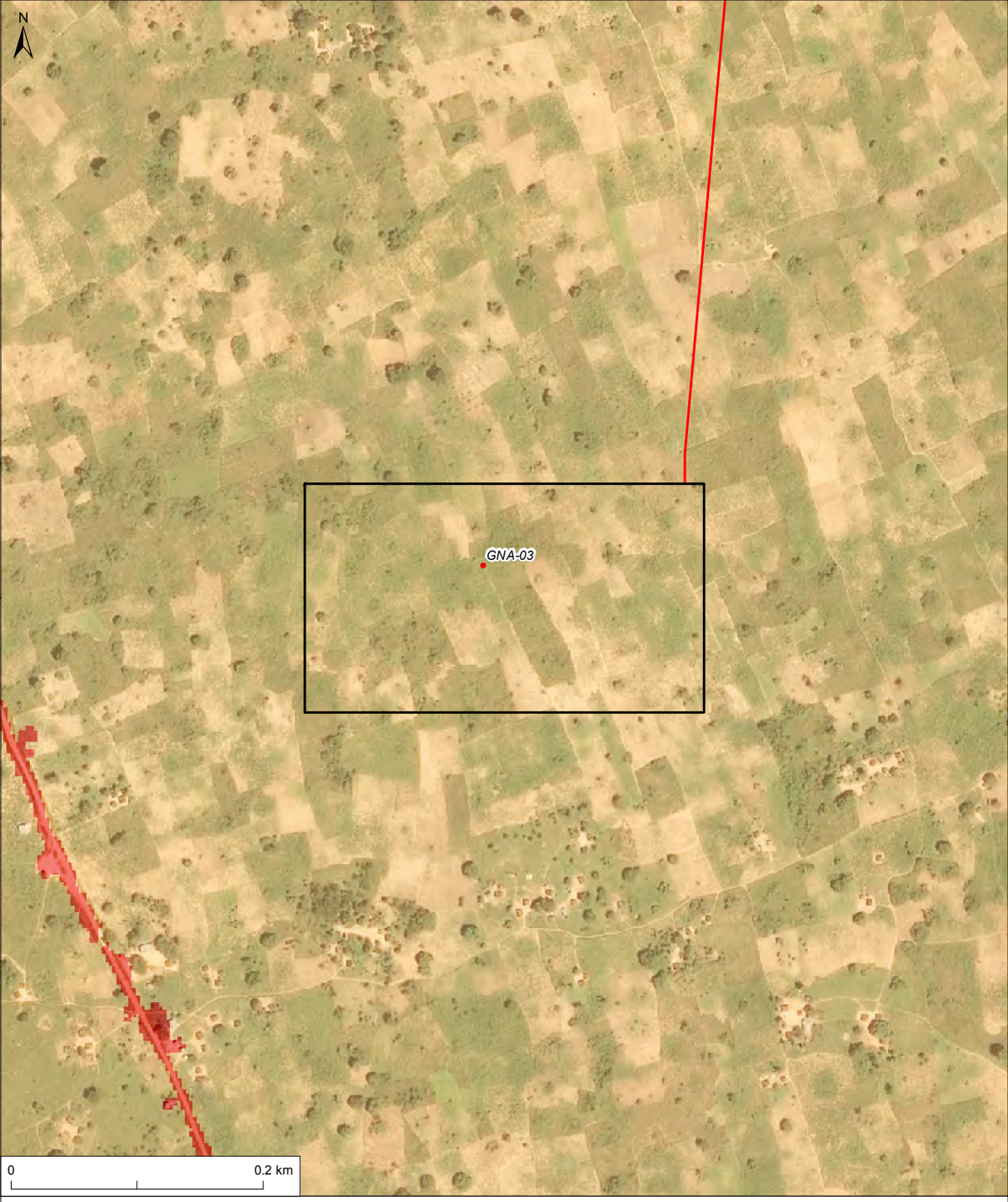


VEGETATION COVER - GNA-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

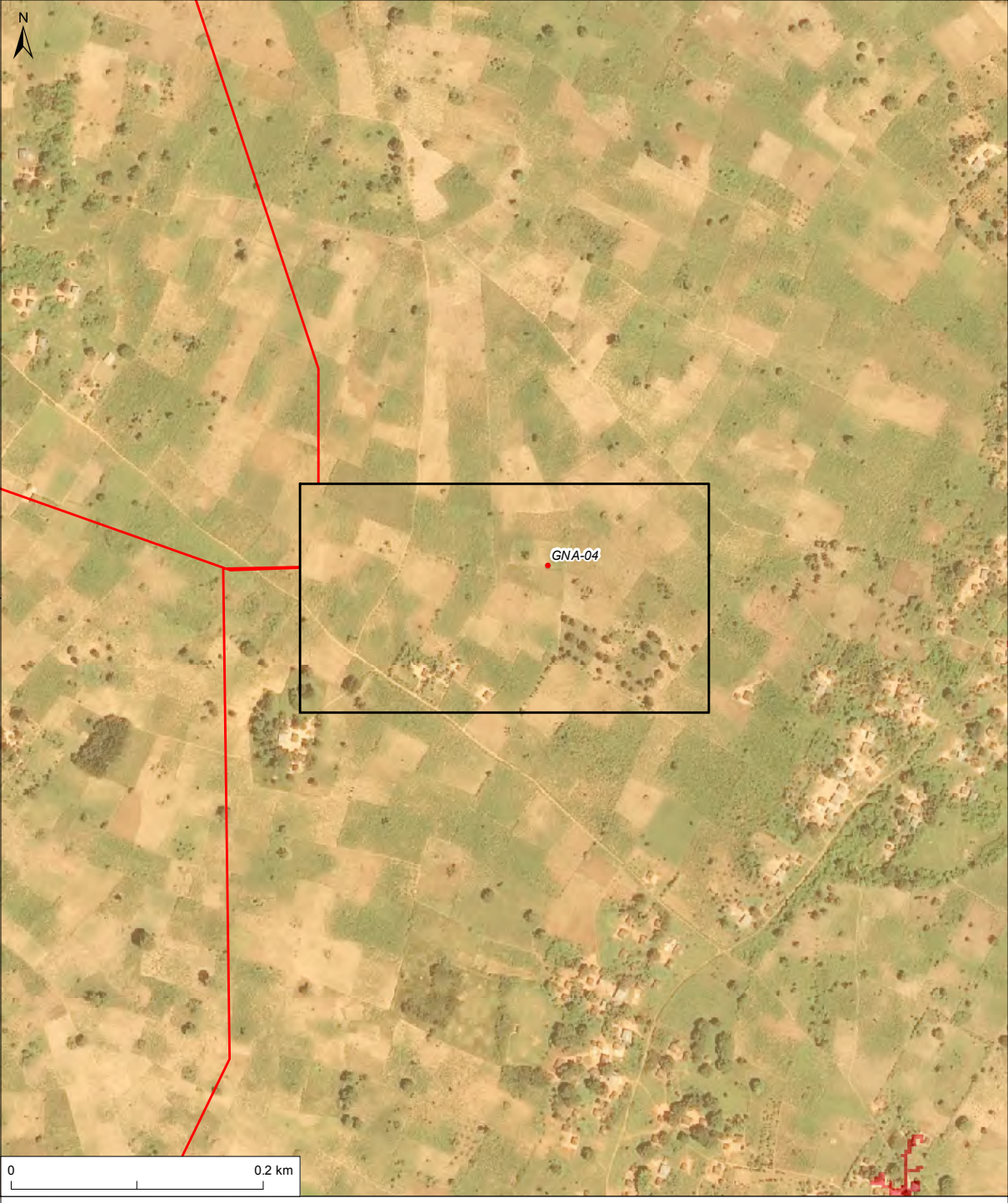
Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - GNA-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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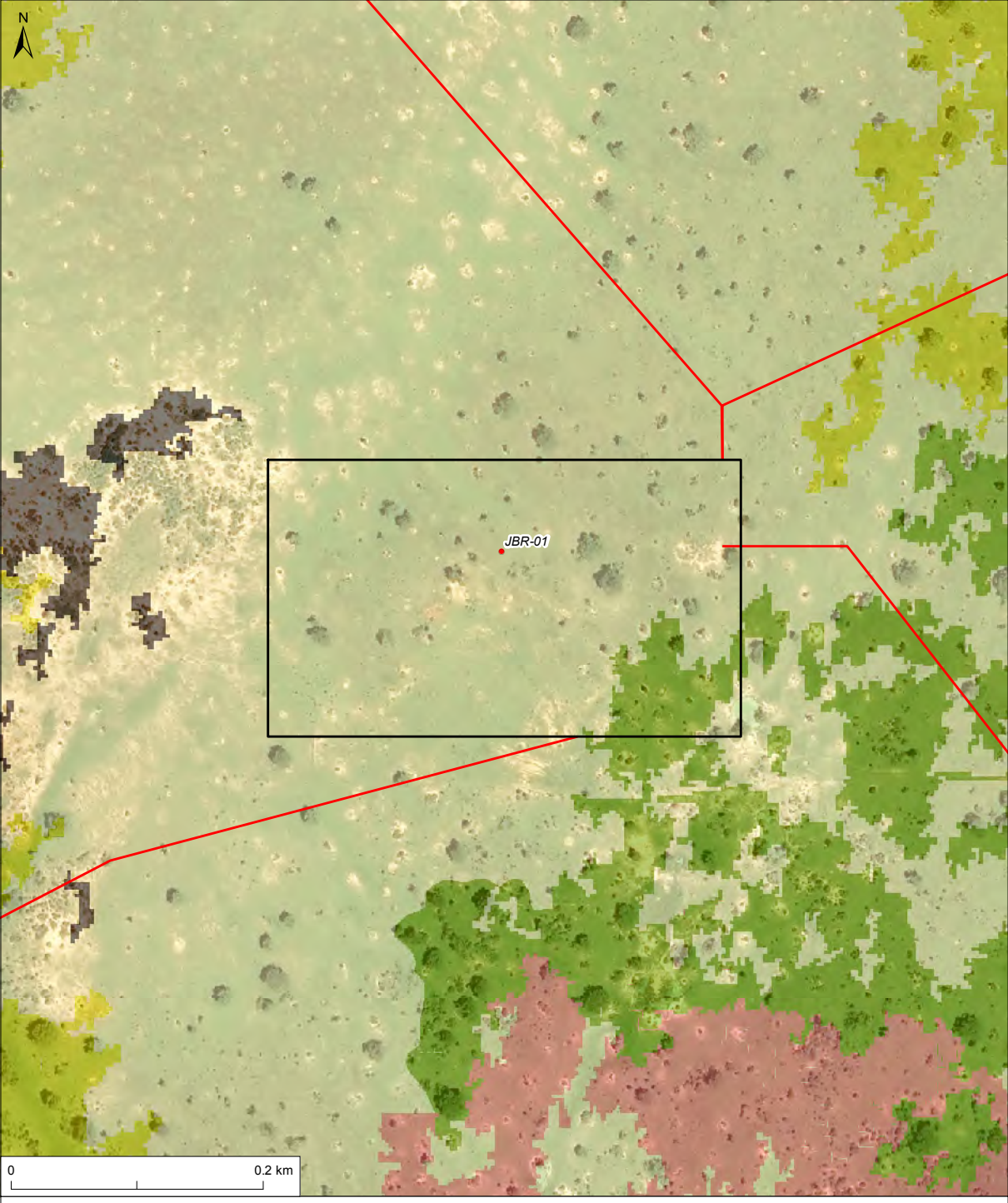

VEGETATION COVER - JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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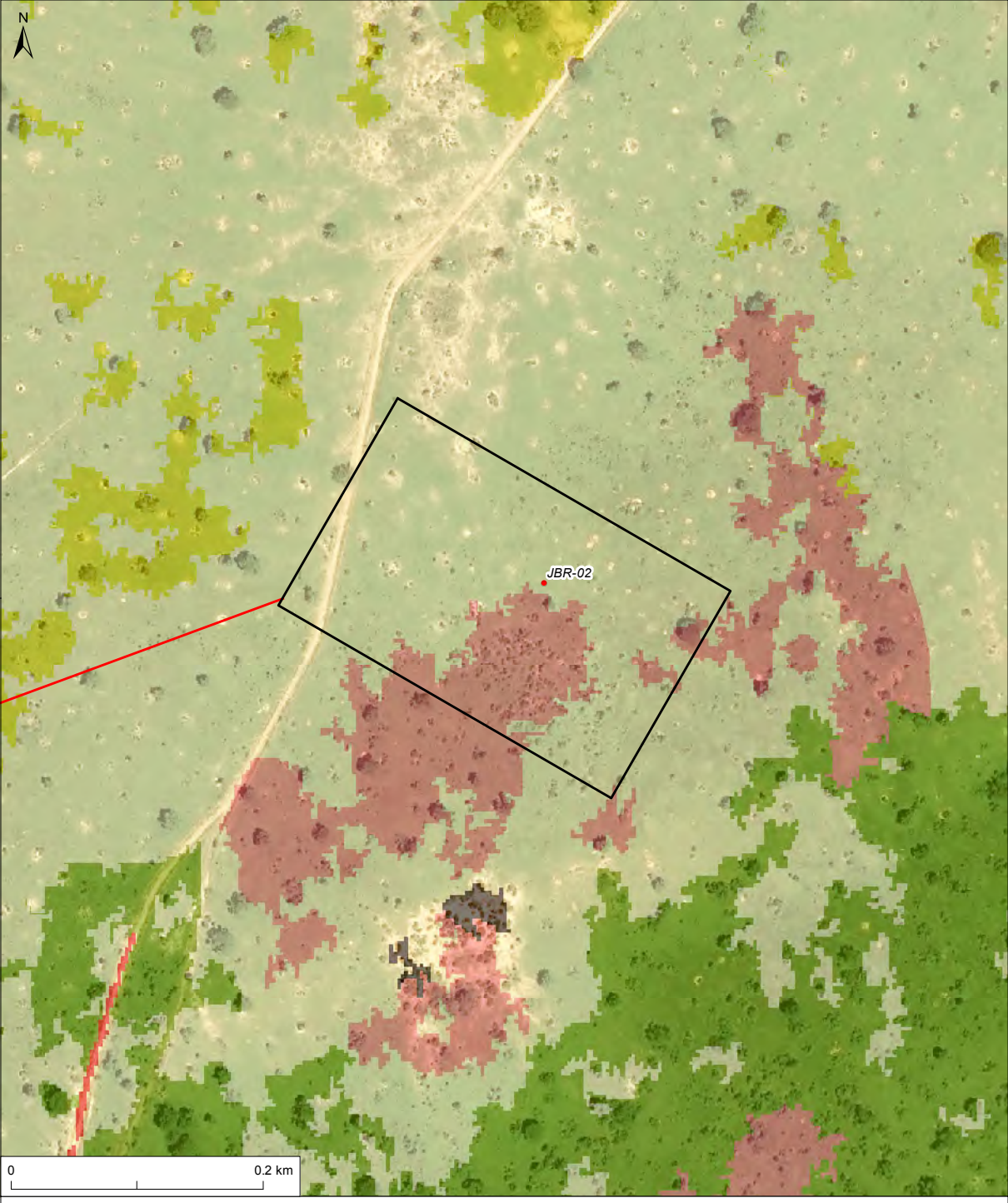

VEGETATION COVER - JBR-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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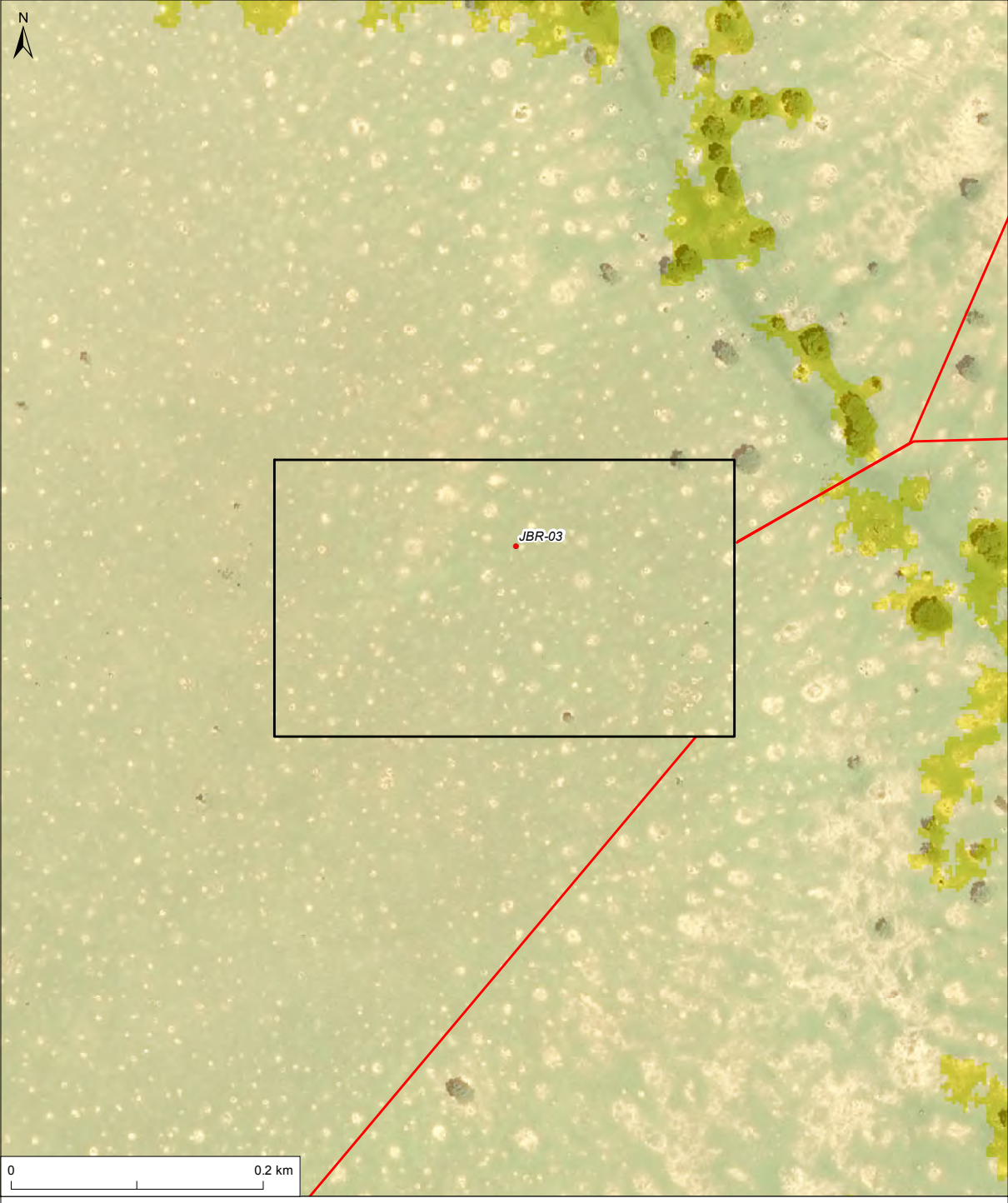

VEGETATION COVER - JBR-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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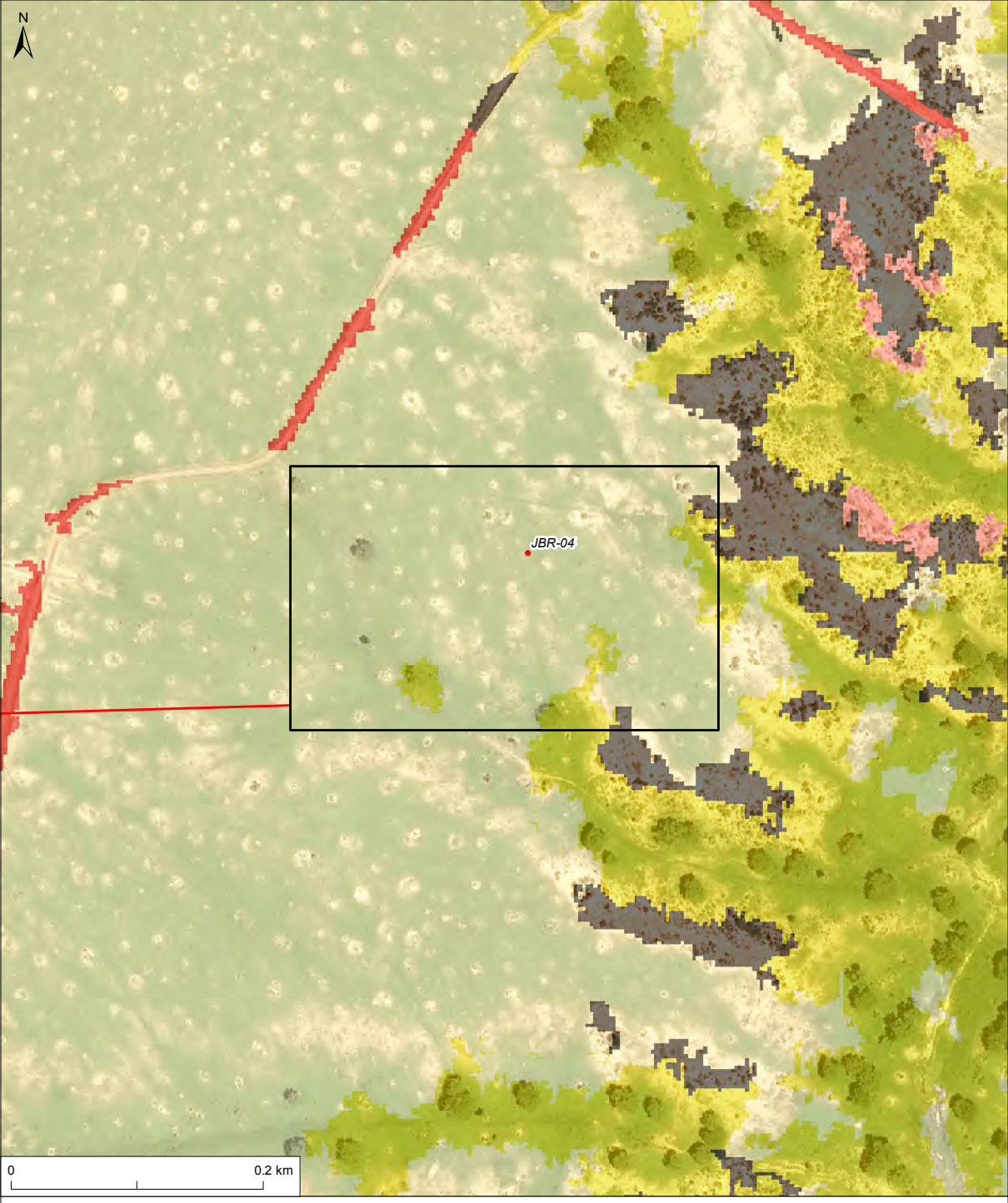

VEGETATION COVER - JBR-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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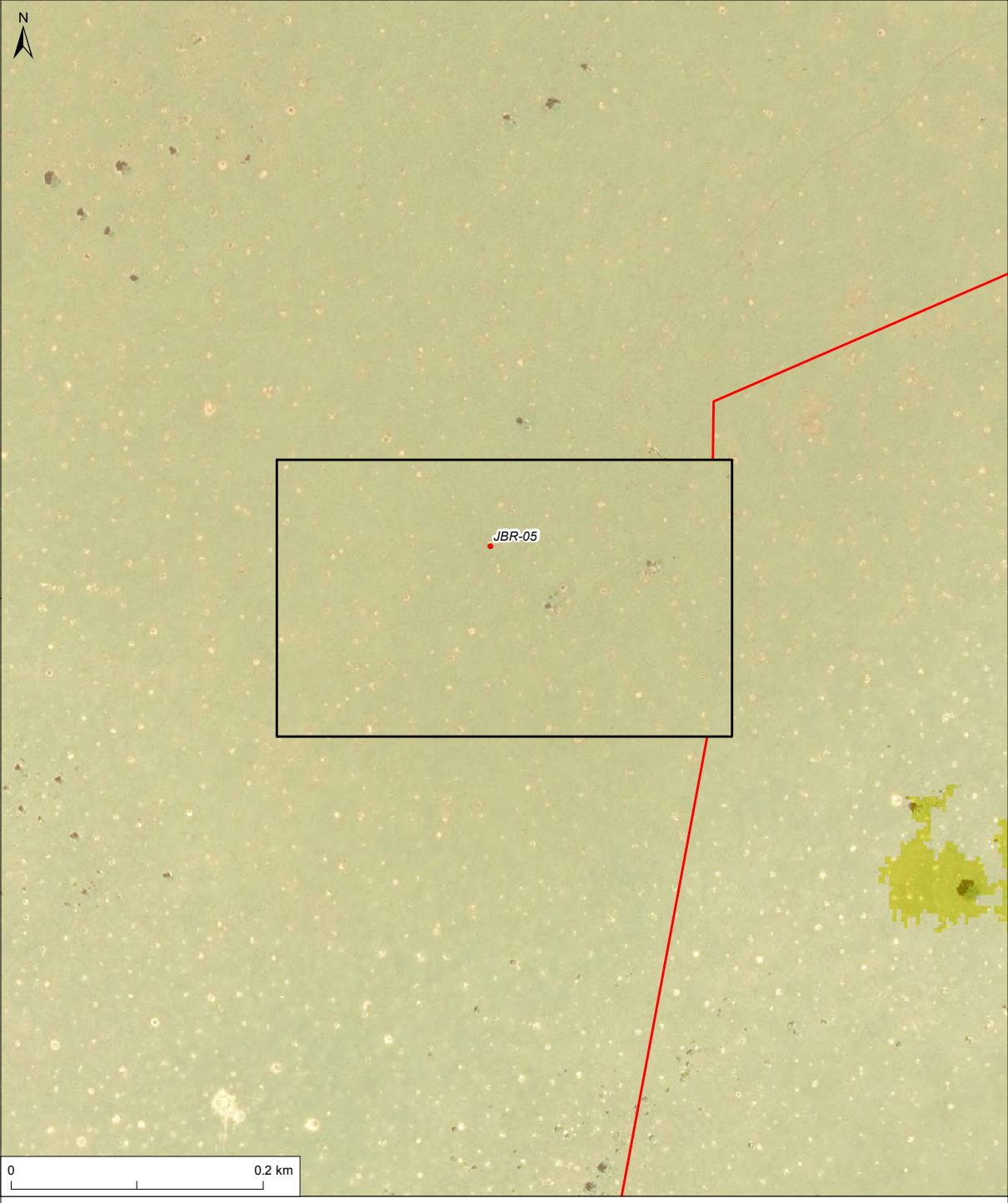

VEGETATION COVER - JBR-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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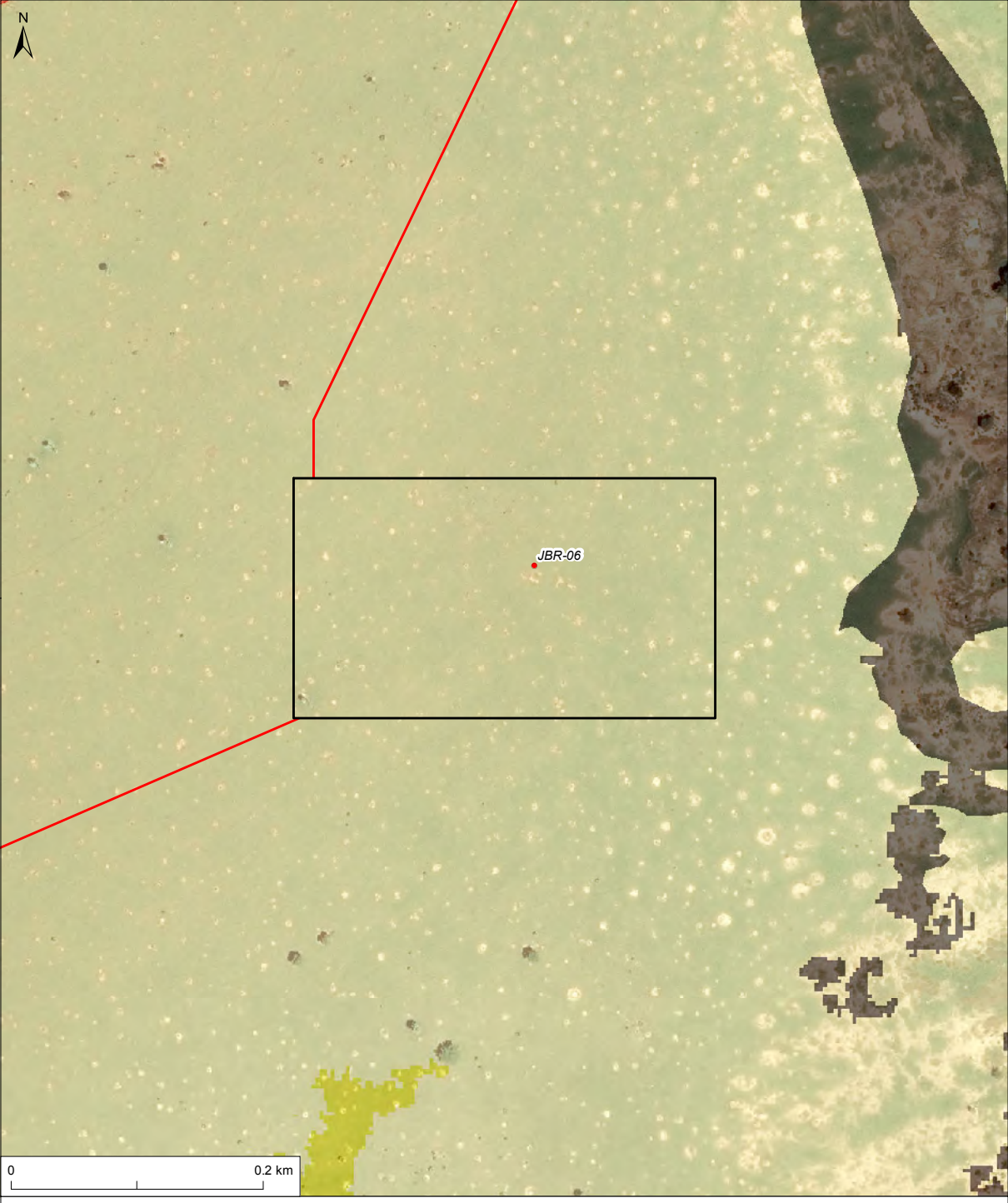

VEGETATION COVER - JBR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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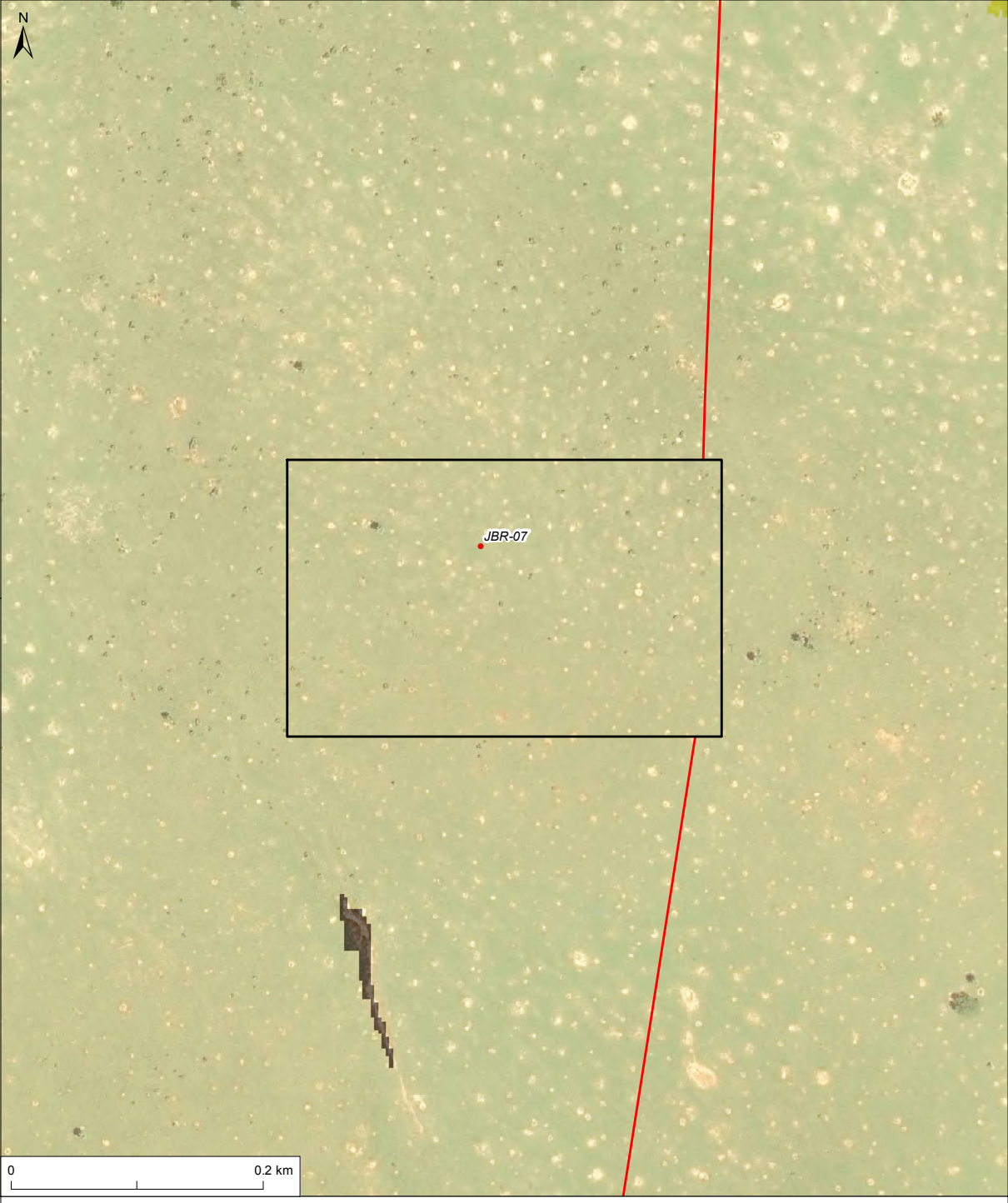

VEGETATION COVER - JBR-07

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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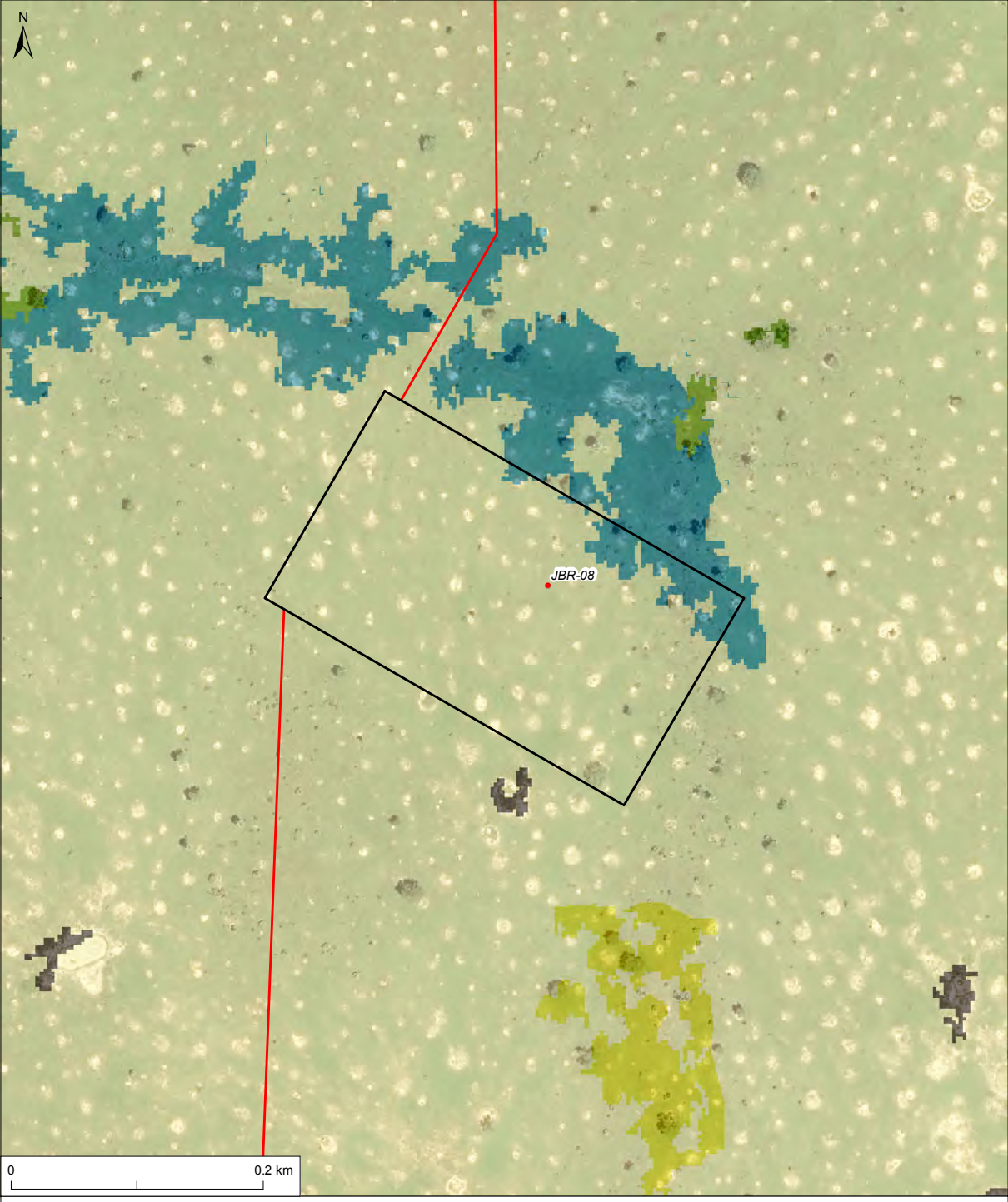

VEGETATION COVER - JBR-08

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

VEGETATION COVER - JBR-09

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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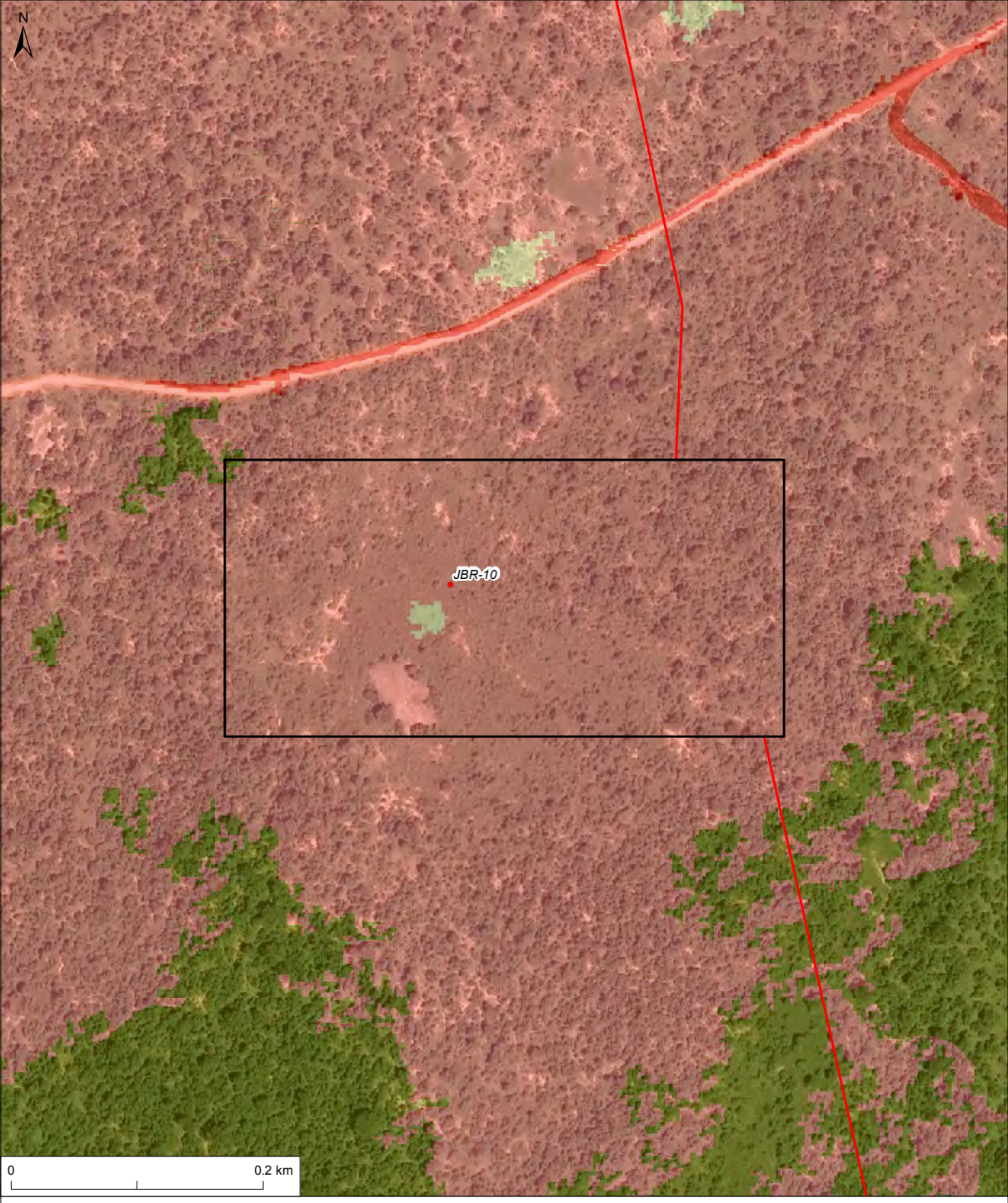

VEGETATION COVER - JBR-10

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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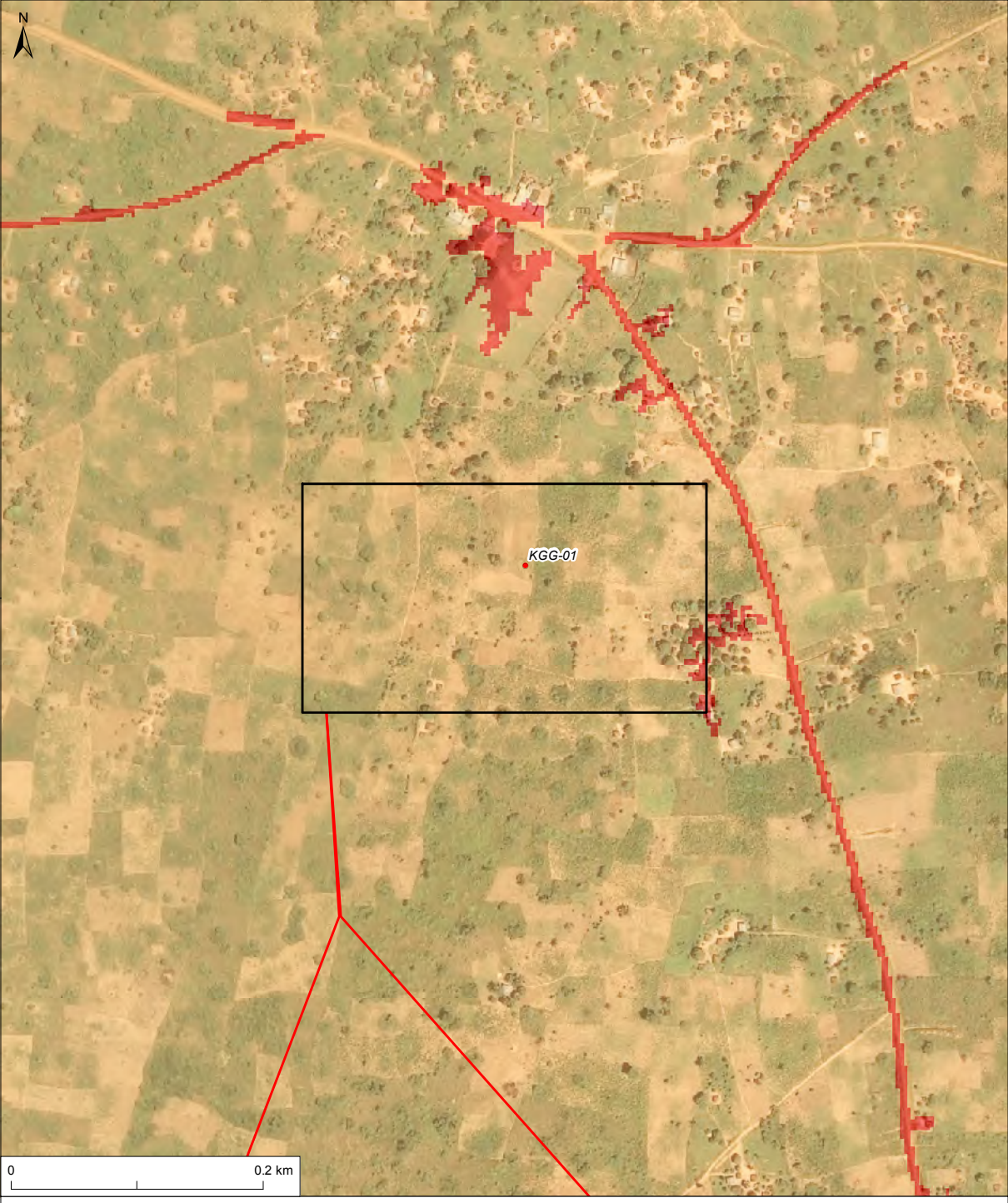


VEGETATION COVER - KGG-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

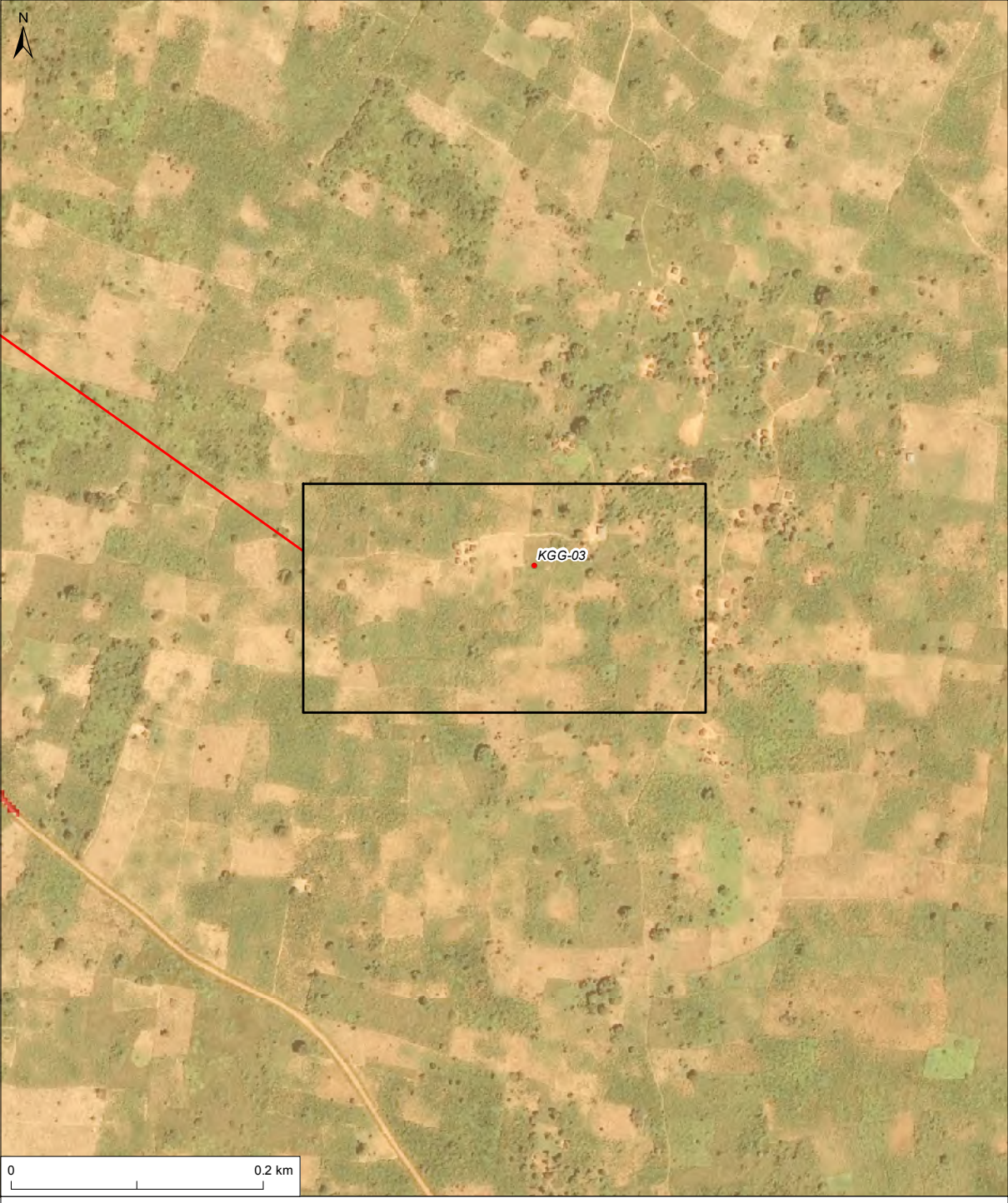
Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - KGG-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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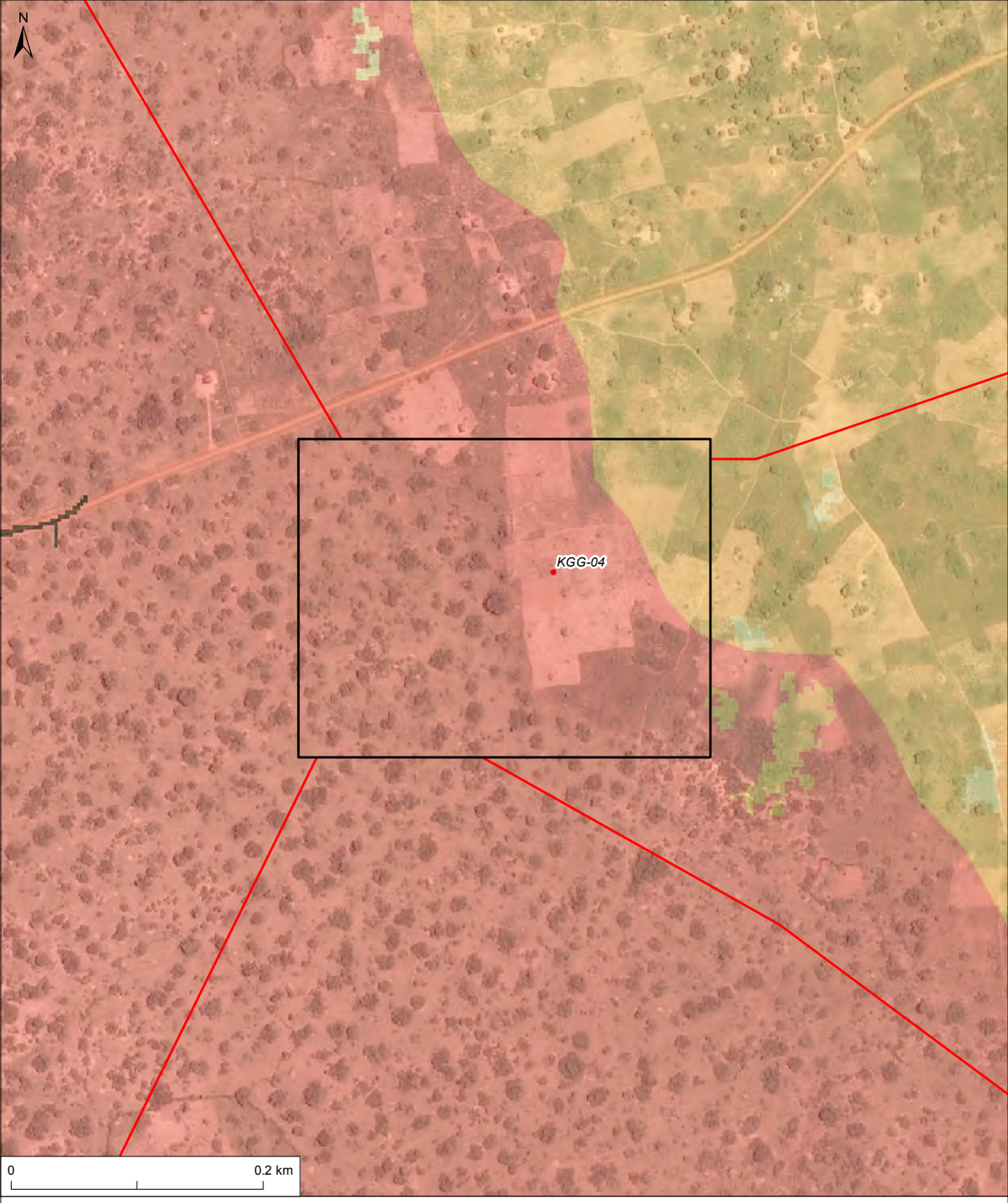

VEGETATION COVER - KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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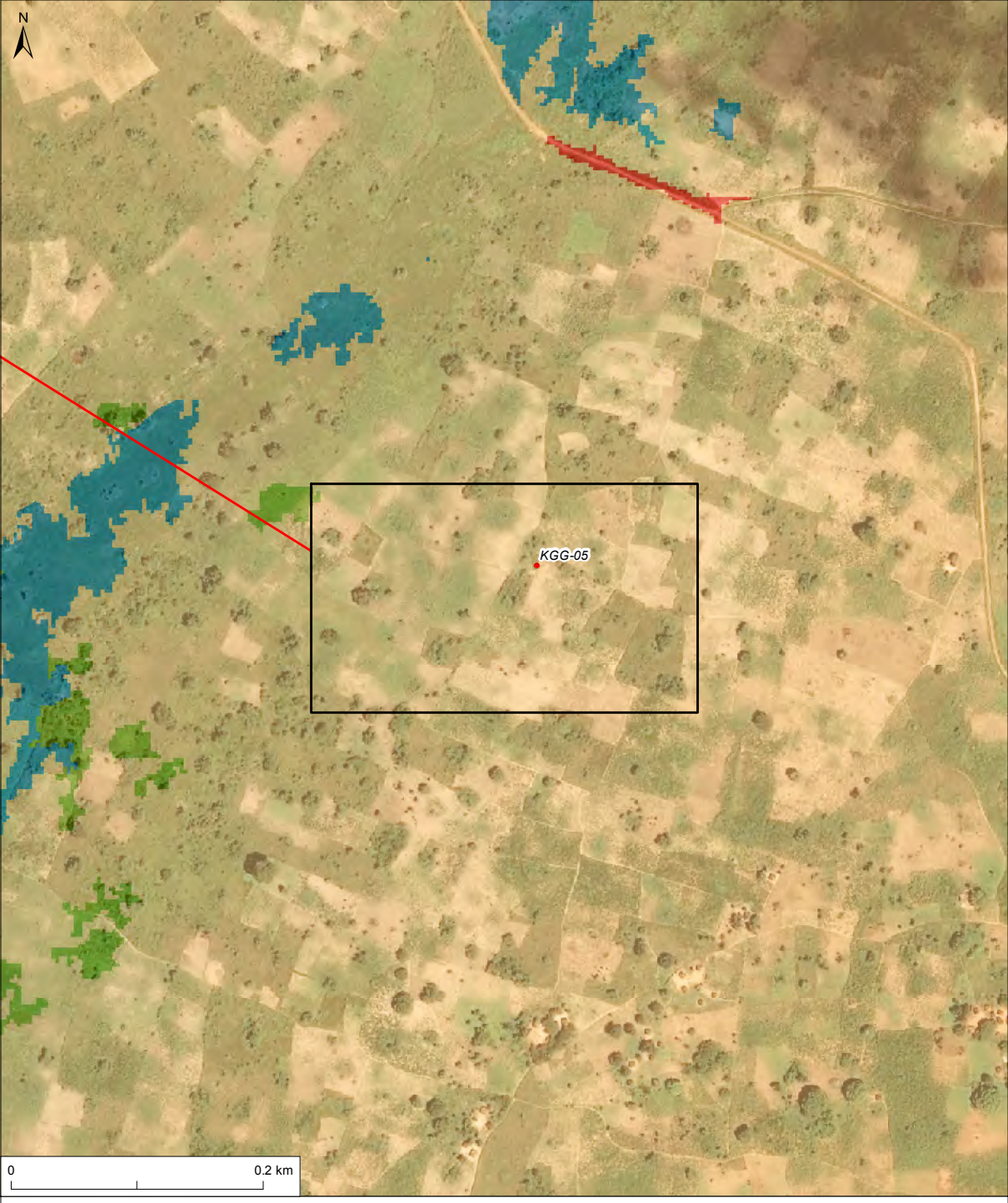

VEGETATION COVER - KGG-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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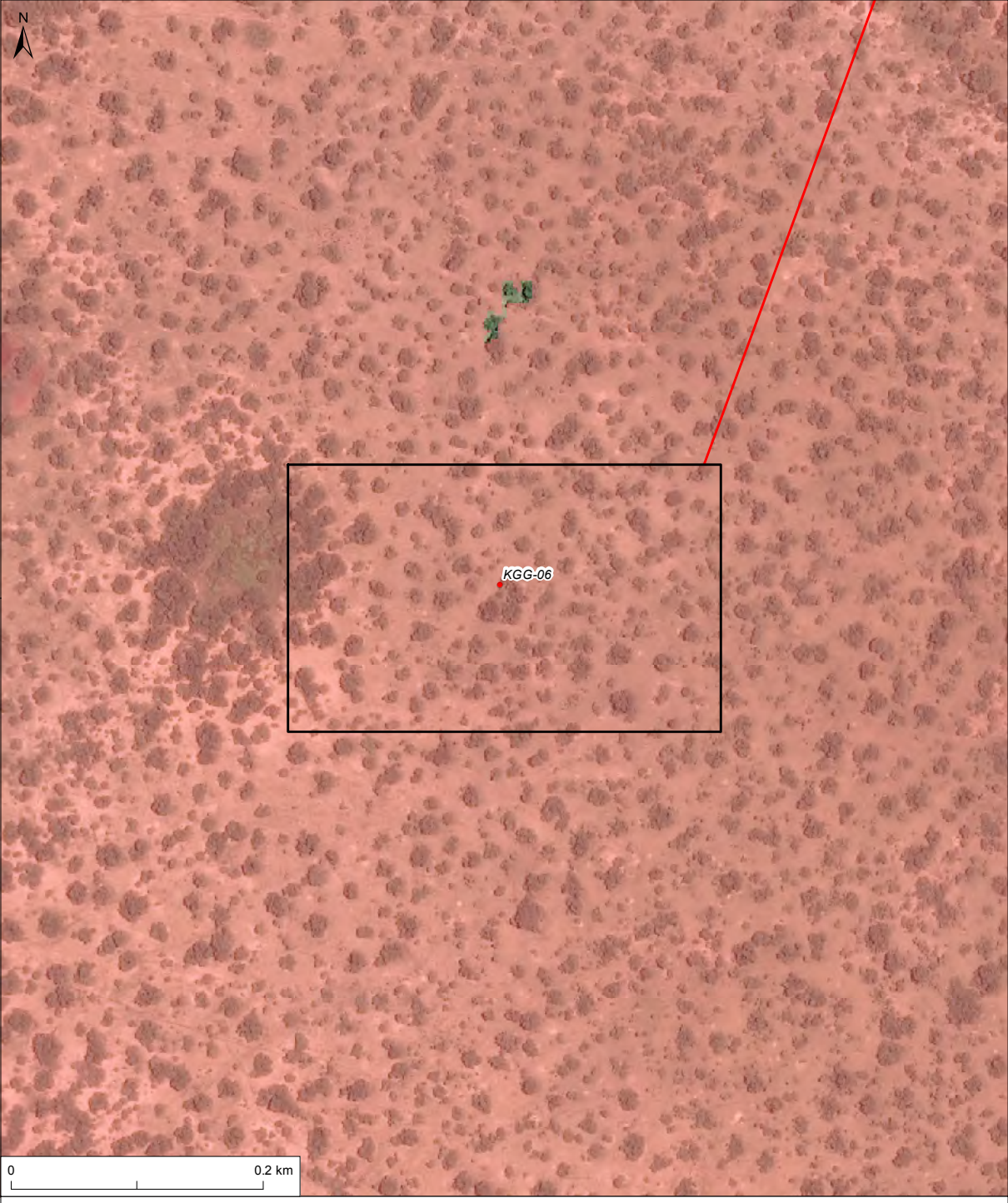


VEGETATION COVER - KGG-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

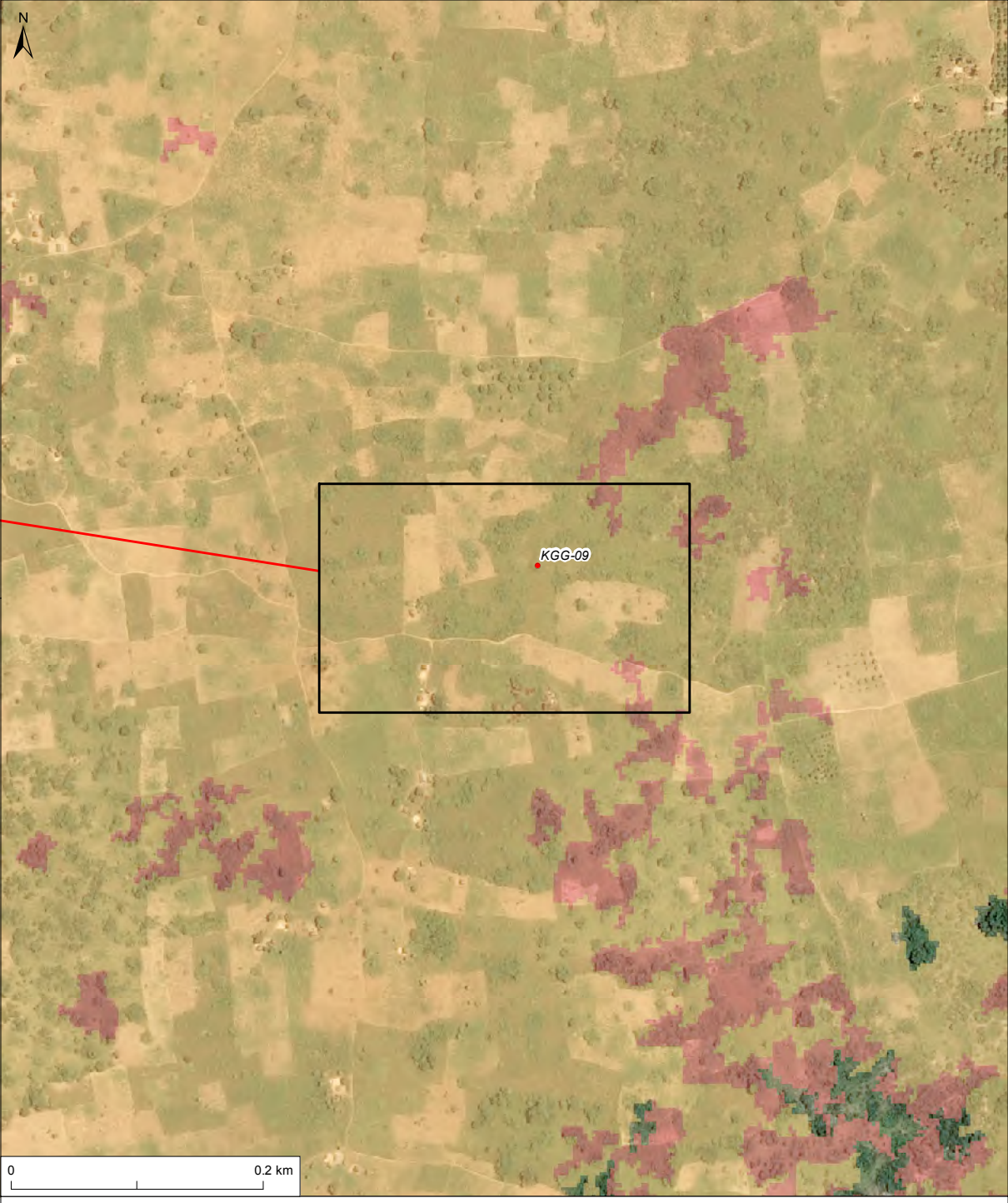
Land Cover Class (WCS 2017)

- Bushlands SH2 (L-B T)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - KGG-09

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bushlands SH2 (L-B T)
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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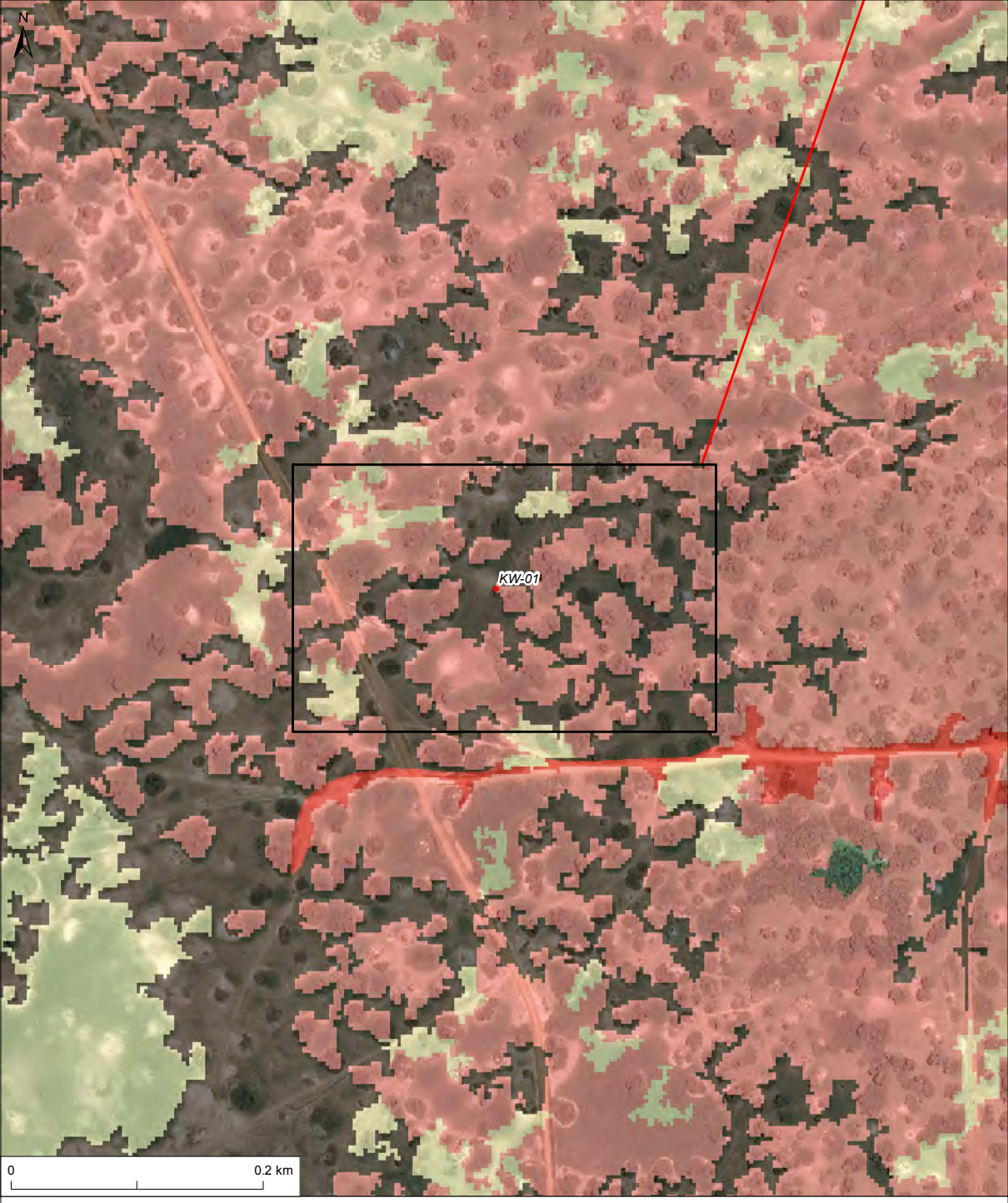

VEGETATION COVER - KW-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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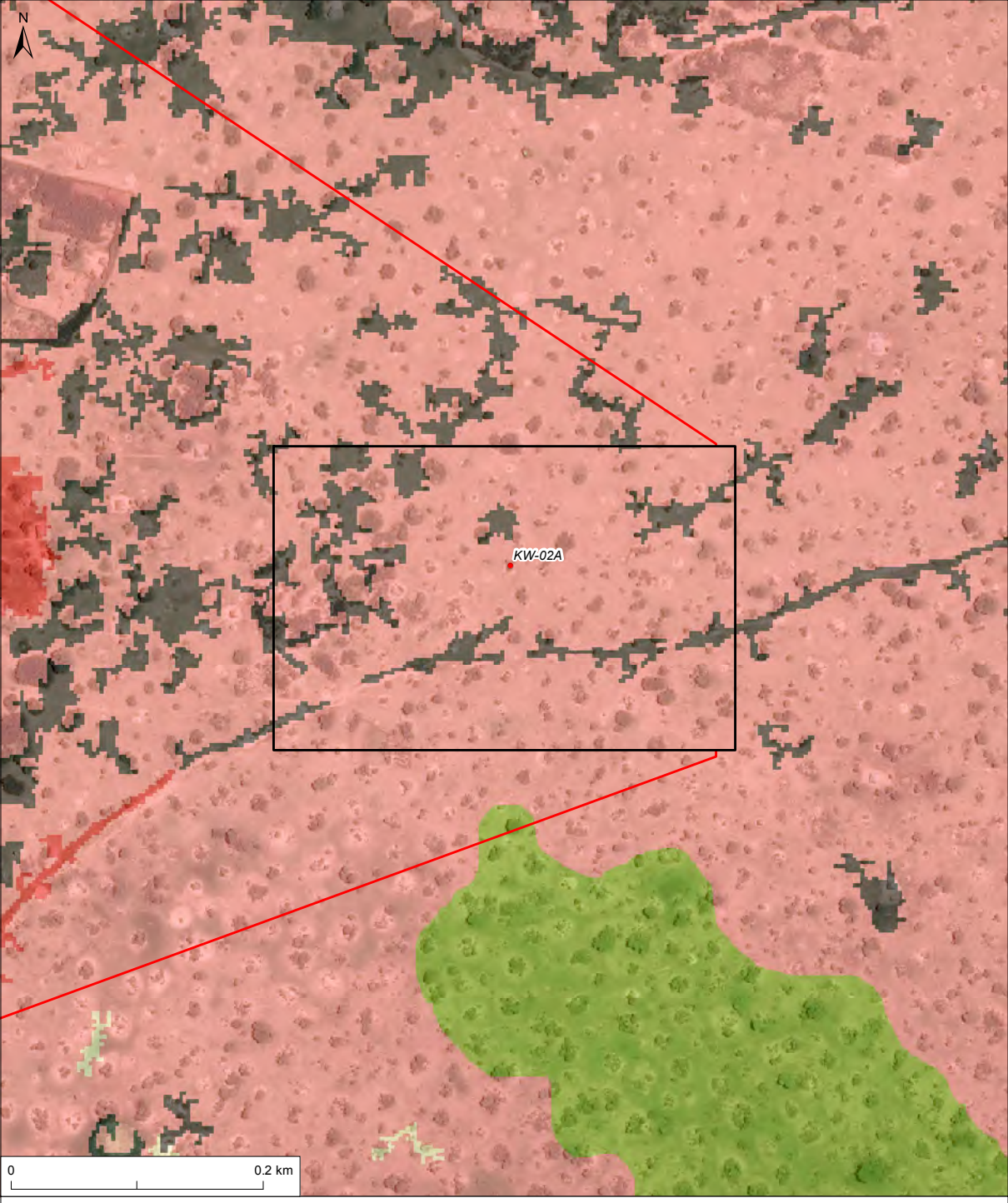


VEGETATION COVER - KW-02A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

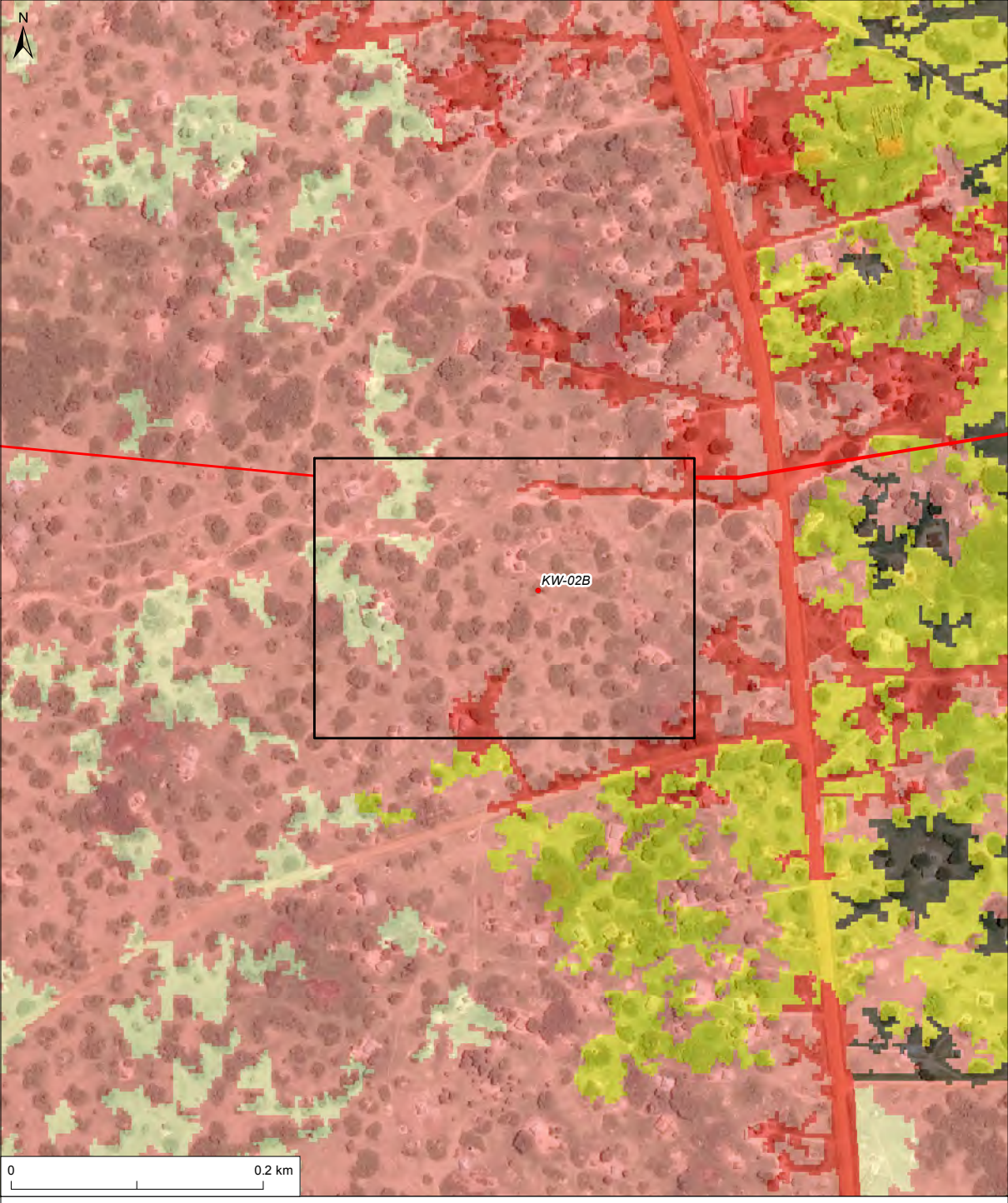
Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - KW-02B

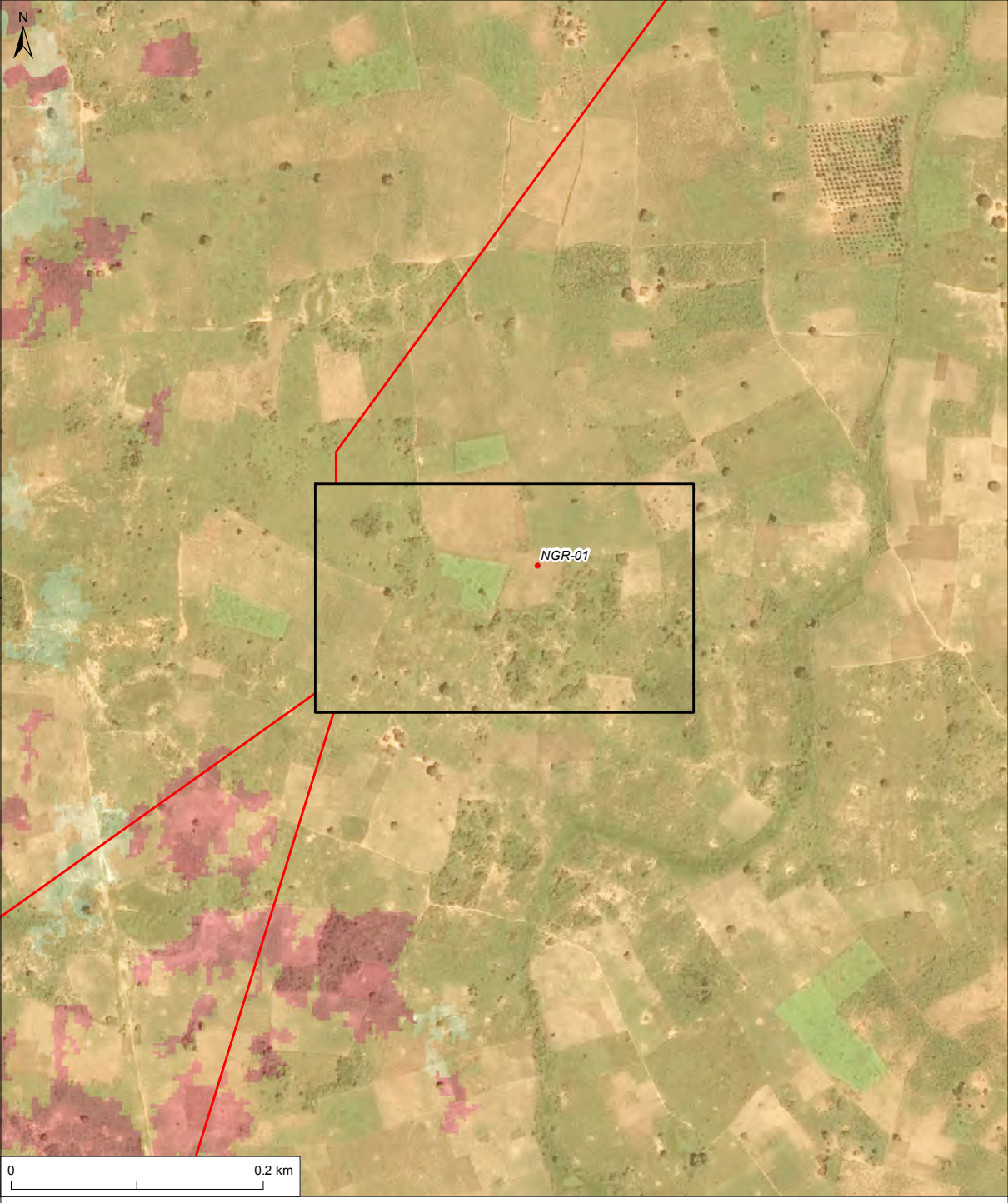
- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



VEGETATION COVER - NGR-01

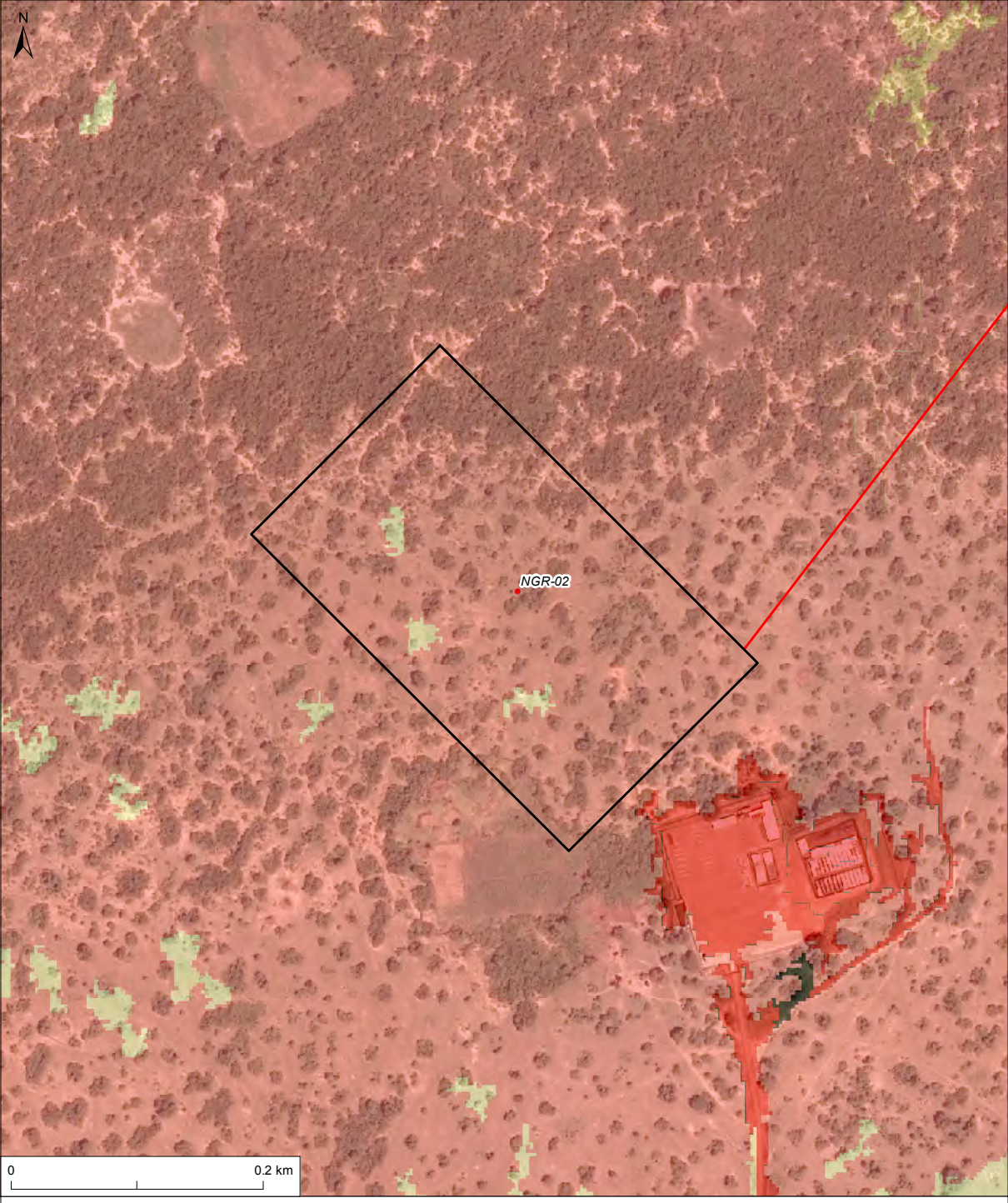
- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



VEGETATION COVER - NGR-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

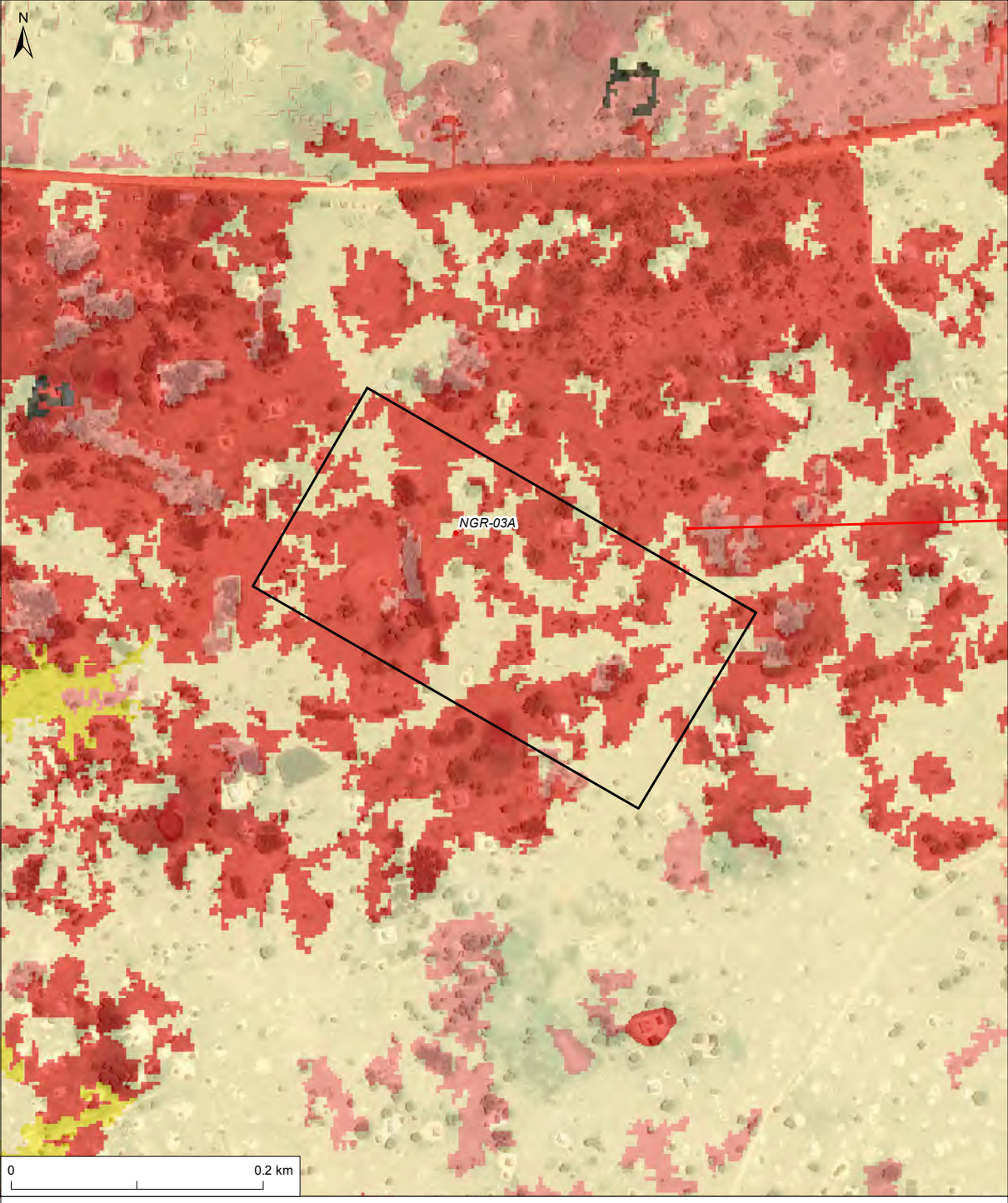
Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - NGR-03A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

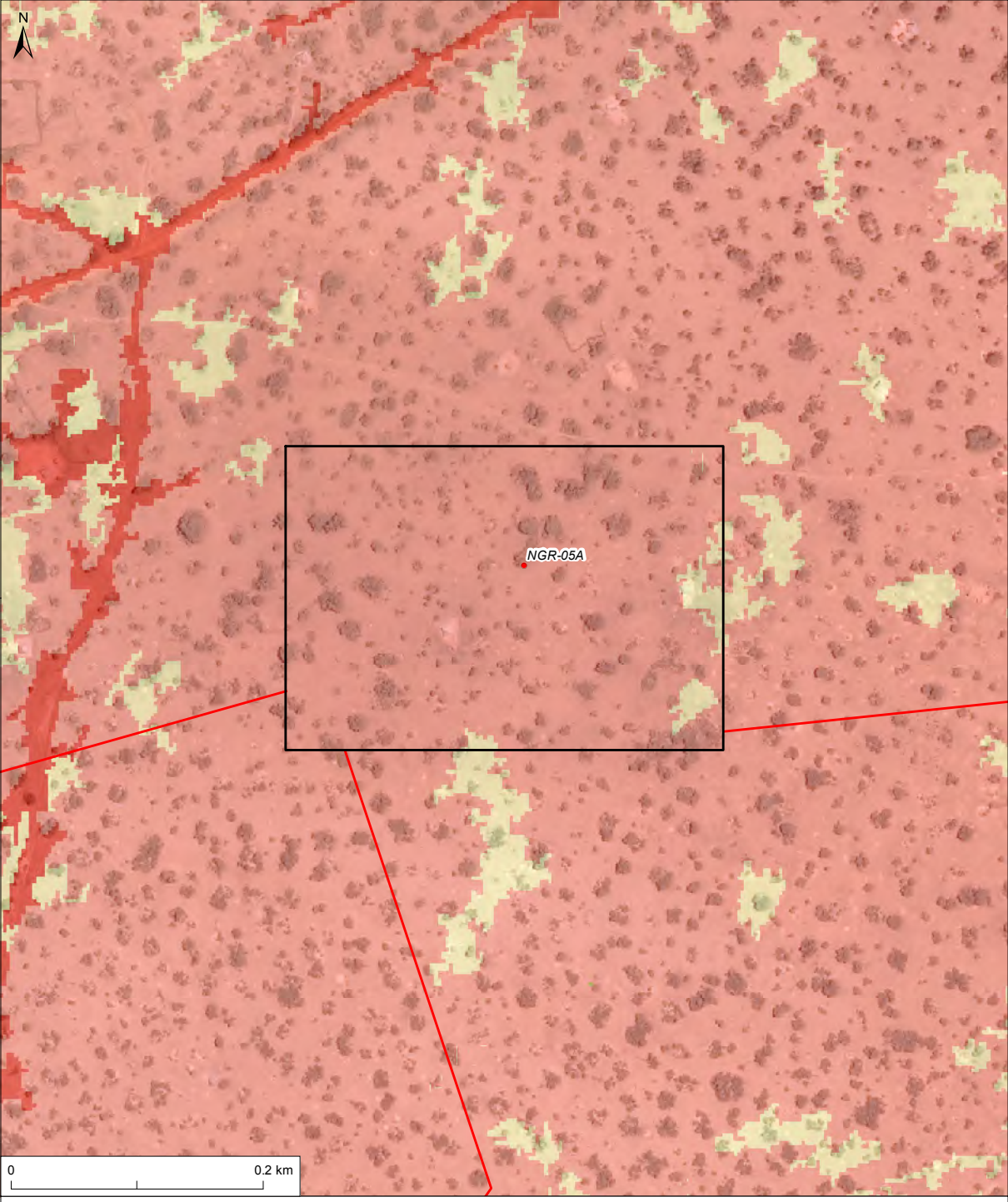
Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - NGR-05A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

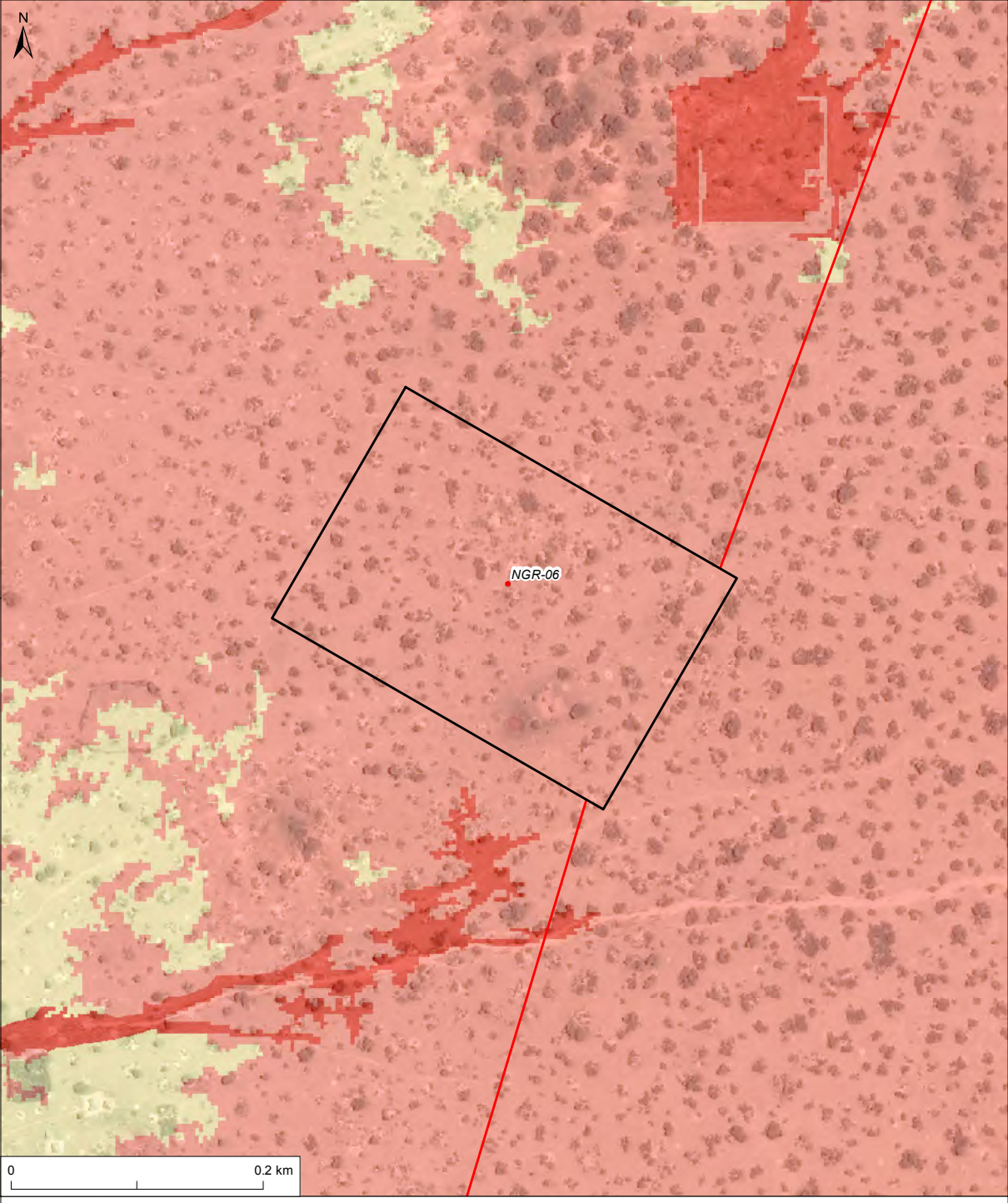
Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - NGR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

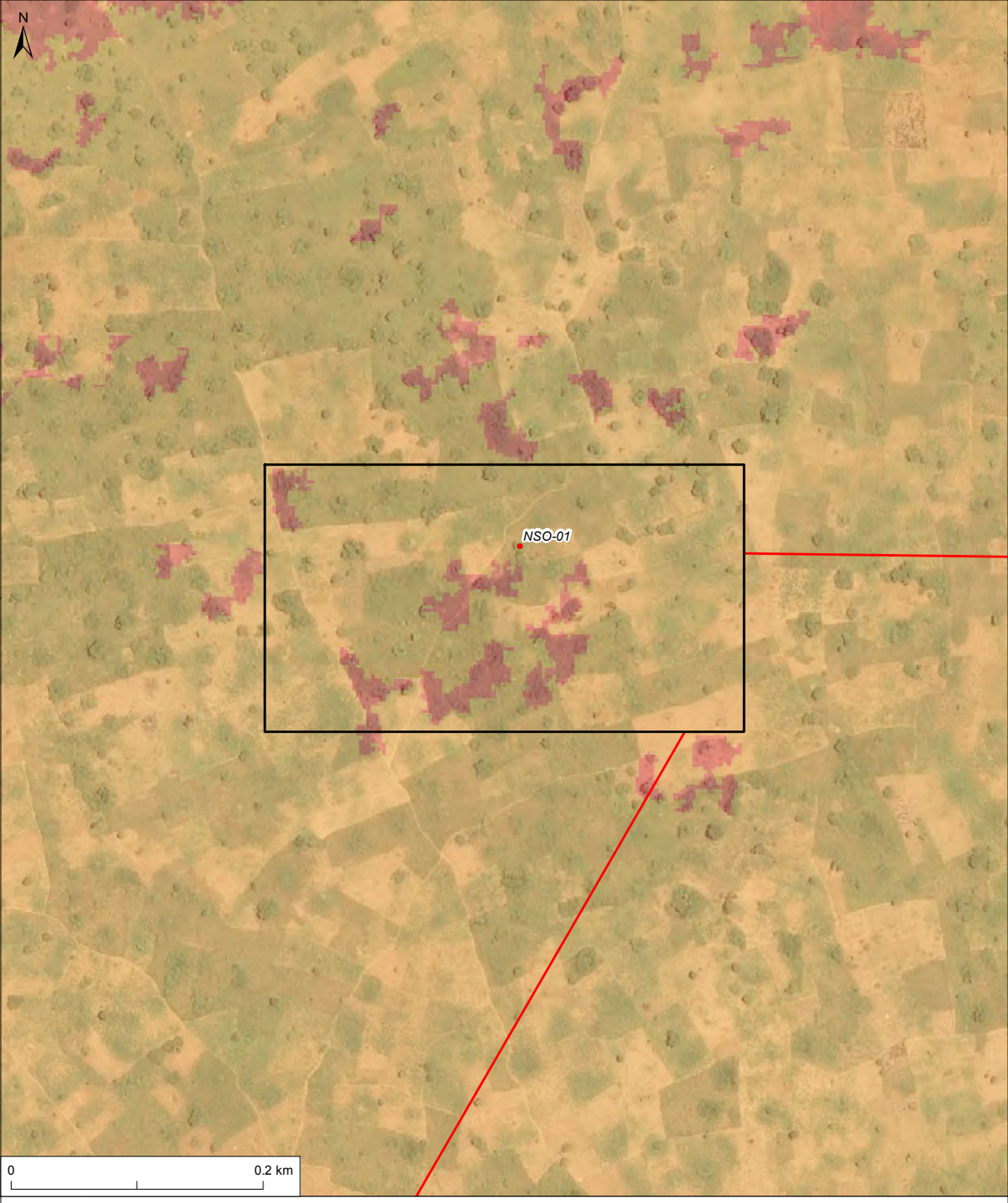
Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - NSO-01

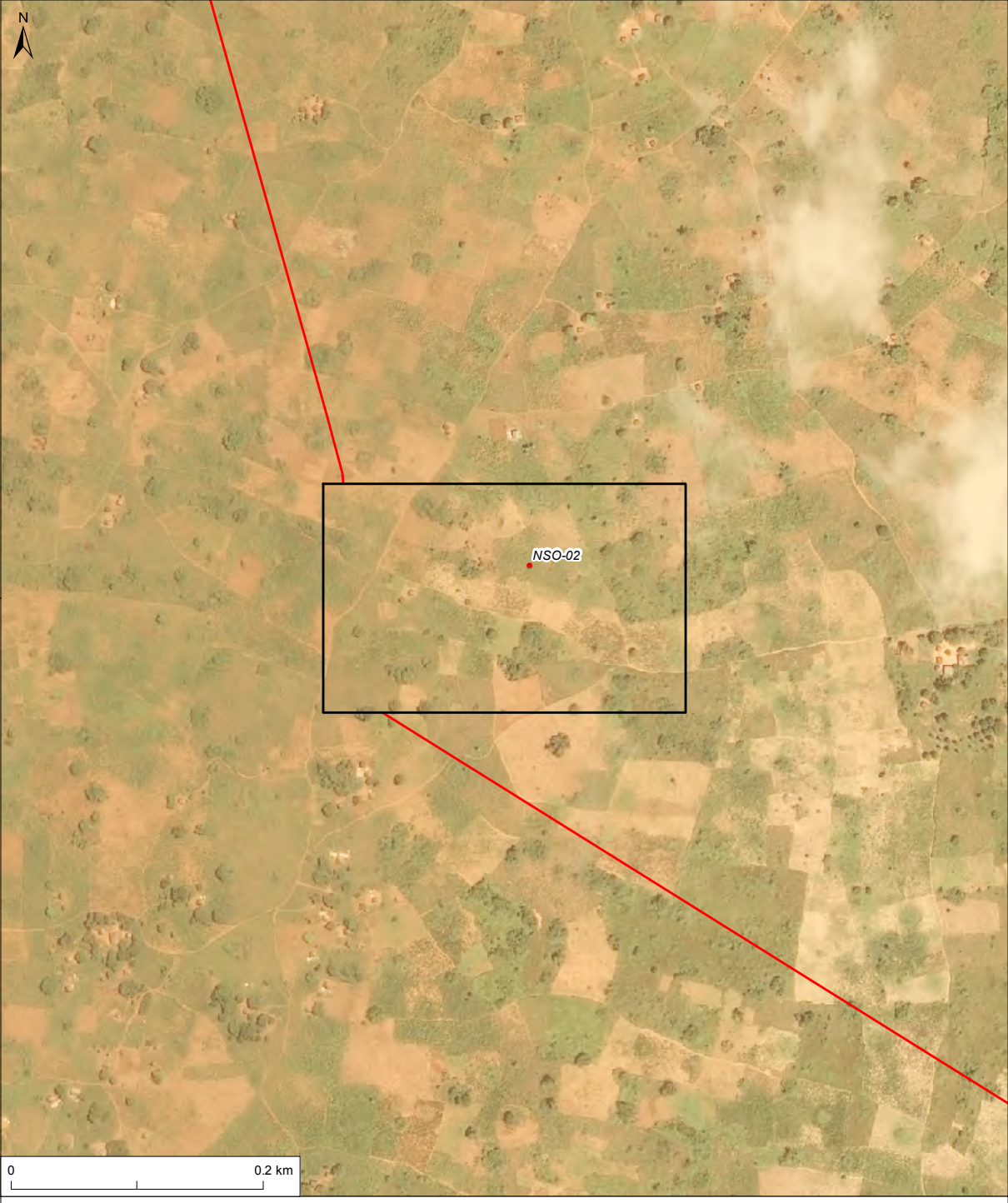
- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bushlands SH2 (L-B T)
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



VEGETATION COVER - NSO-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

VEGETATION COVER - NSO-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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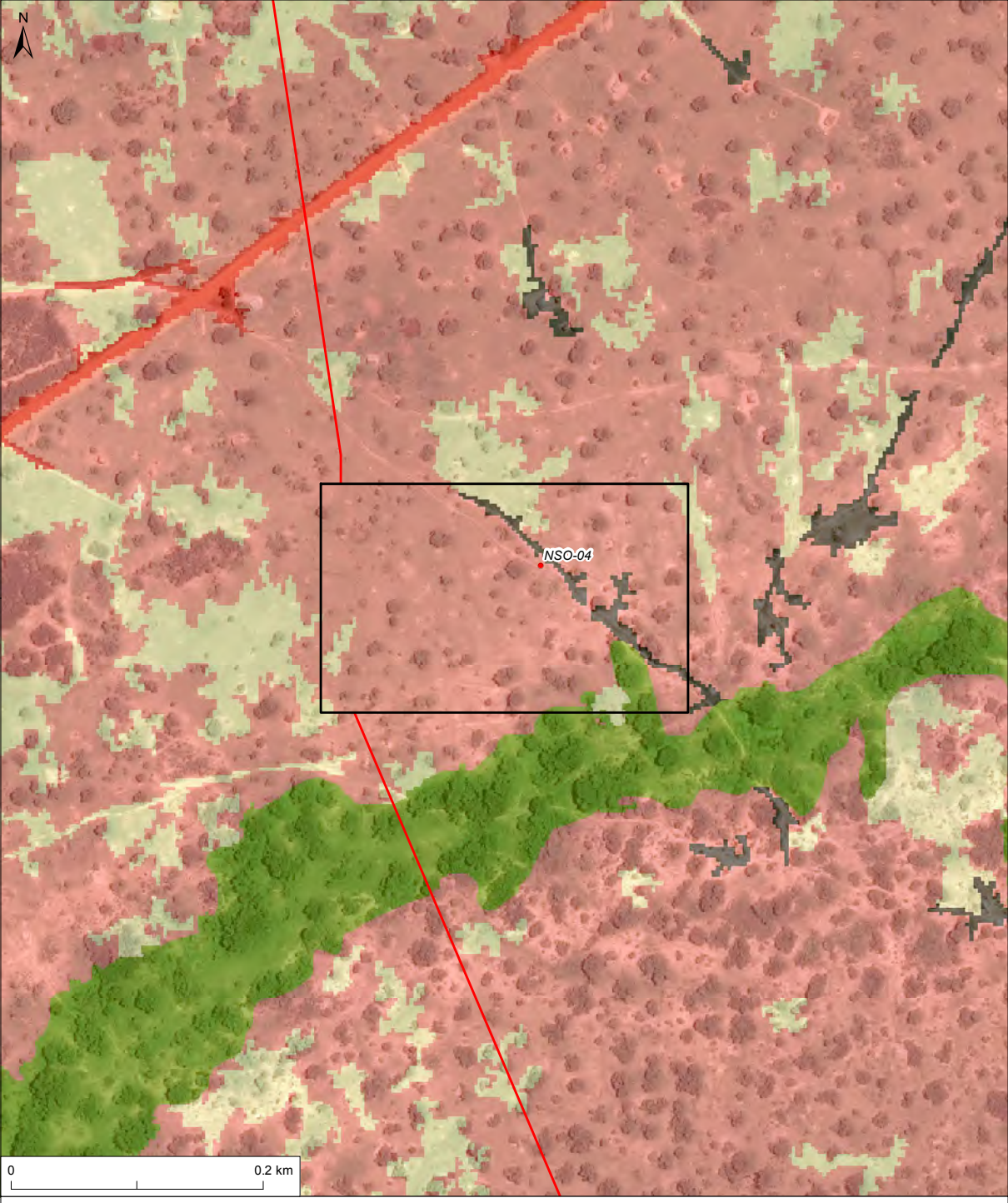

VEGETATION COVER - NSO-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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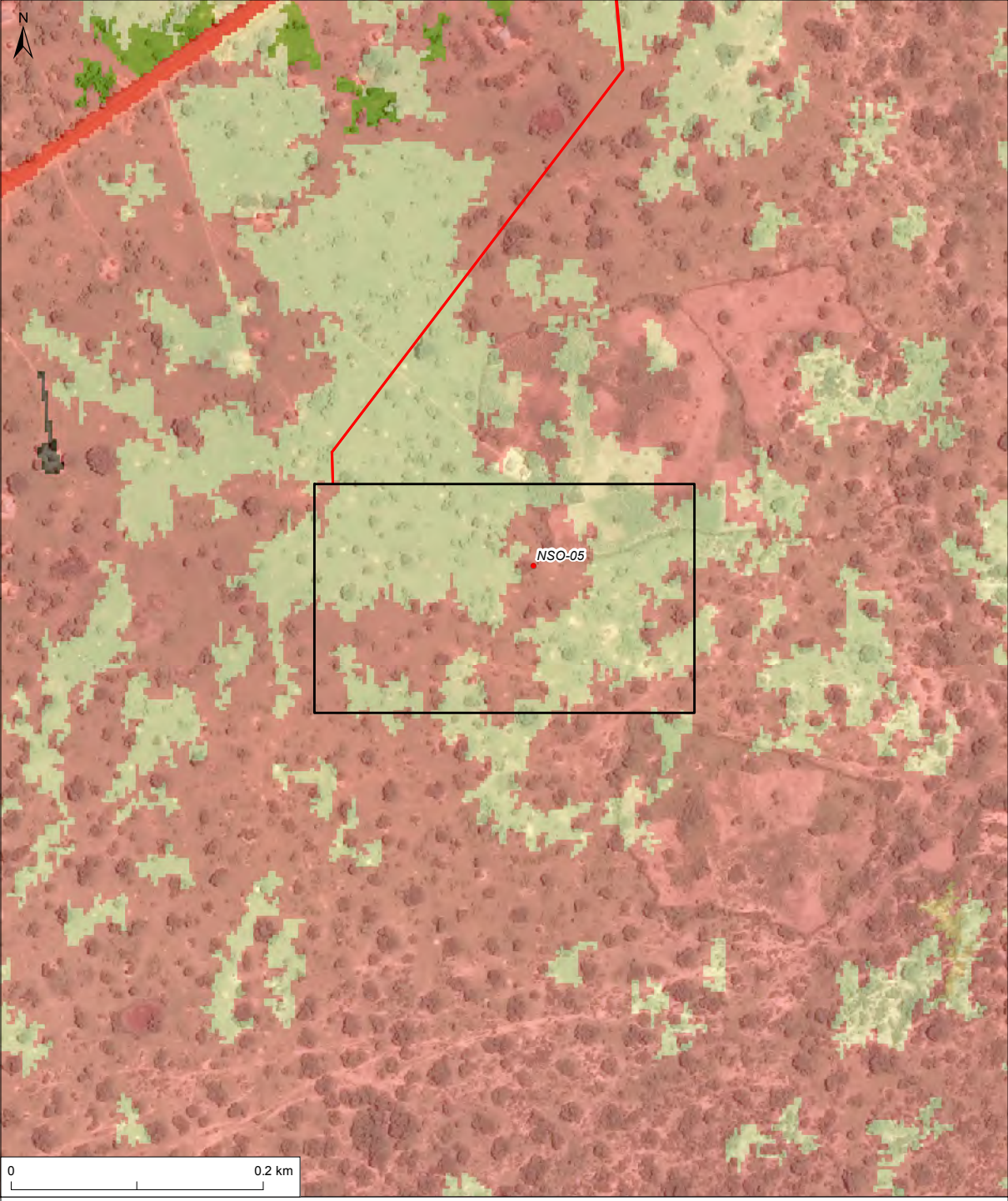

VEGETATION COVER - NSO-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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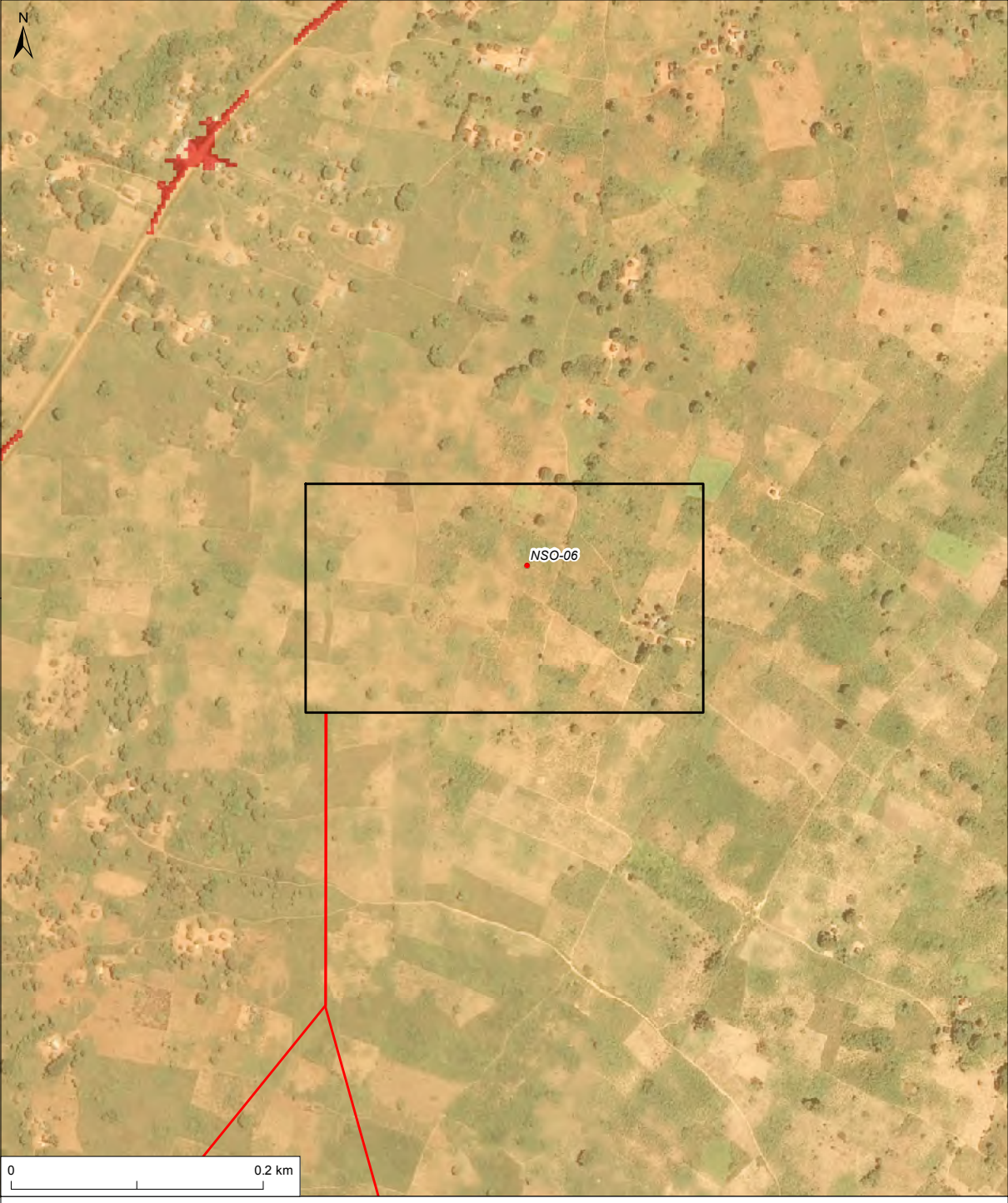


VEGETATION COVER - NSO-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

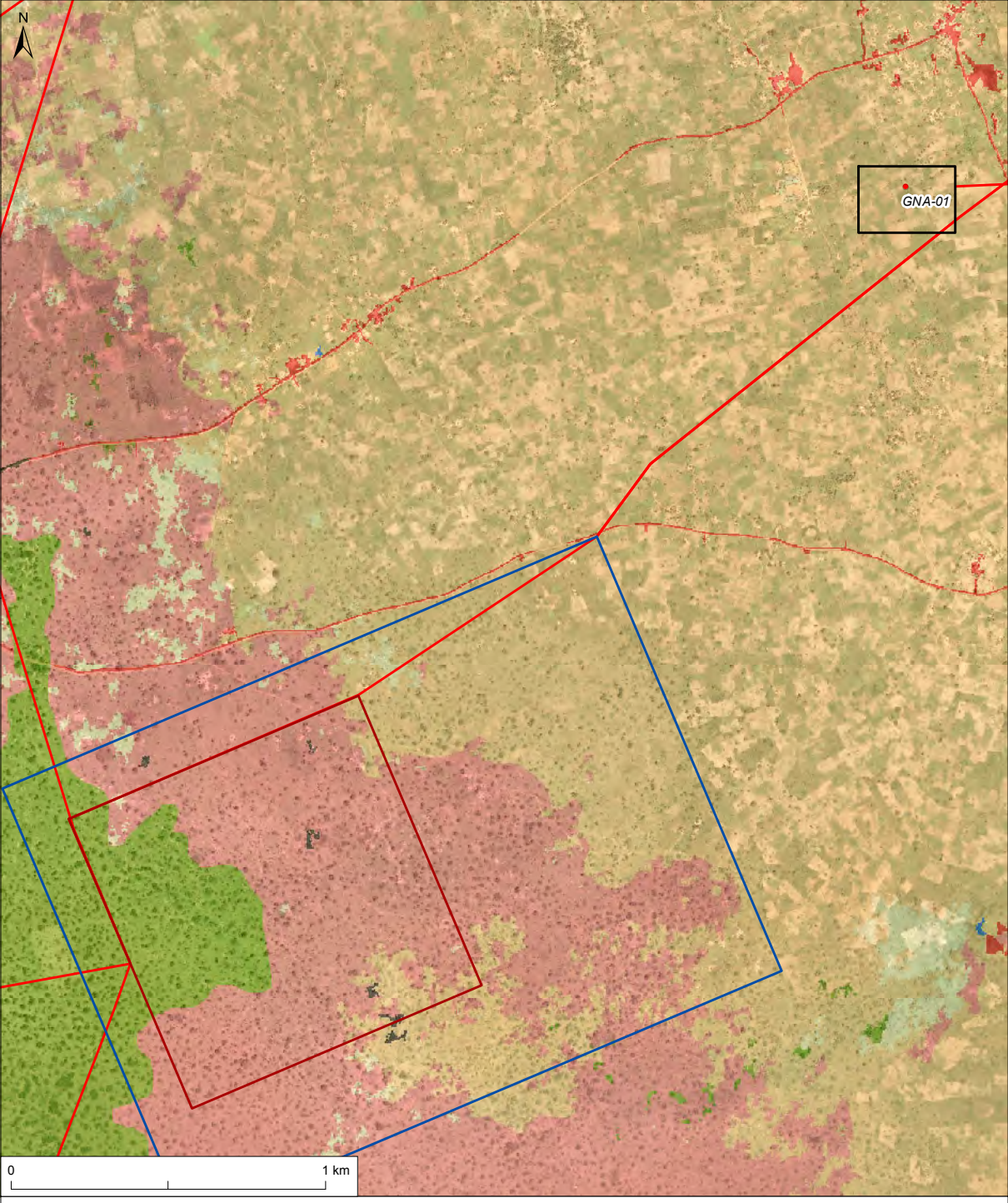
Land Cover Class (WCS 2017)

- Built-up Areas BU
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



VEGETATION COVER - GNA-01 to CPF

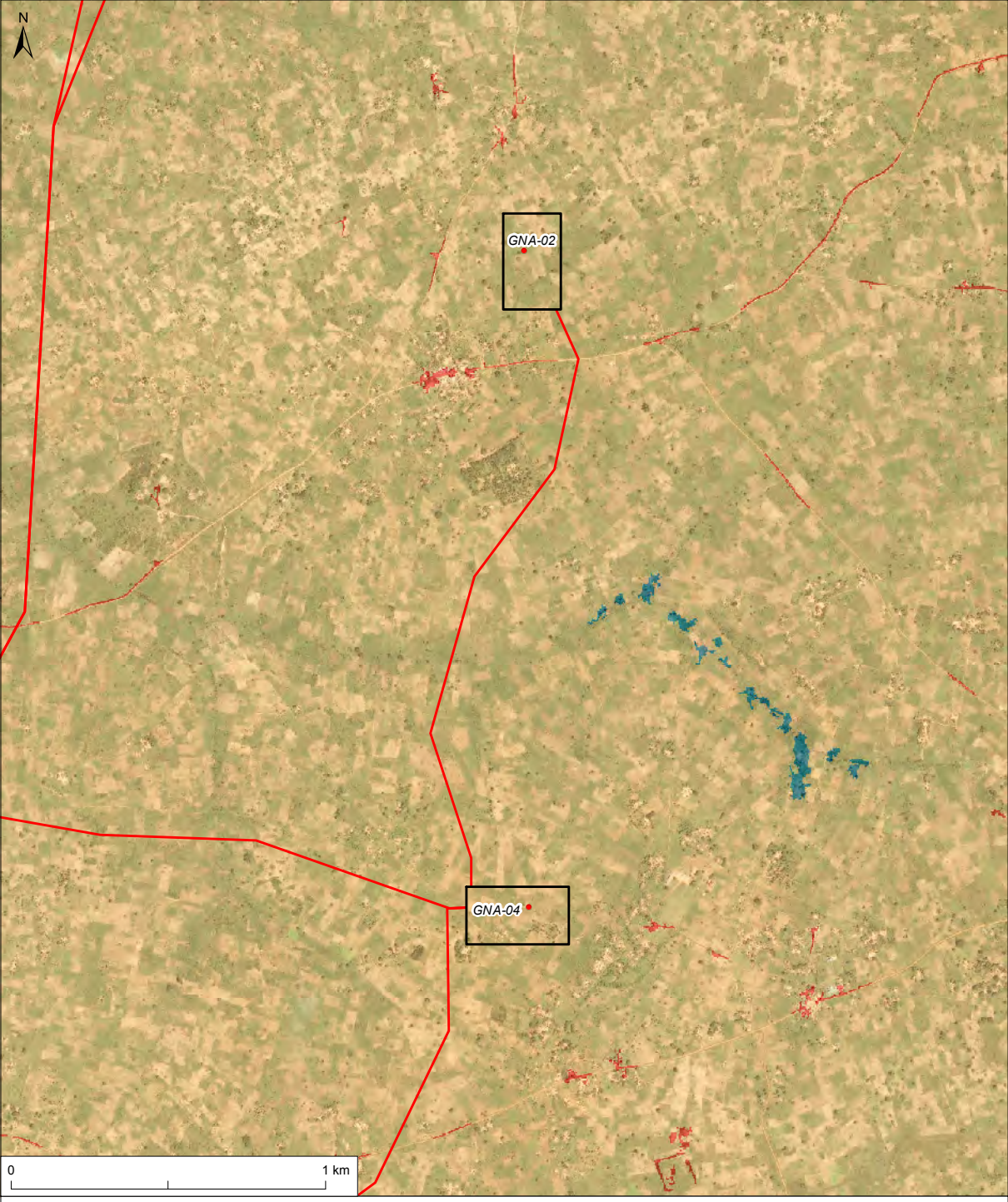
- Wellpad location
- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



VEGETATION COVER - GNA-02 to GNA-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Dry Grassland GR2
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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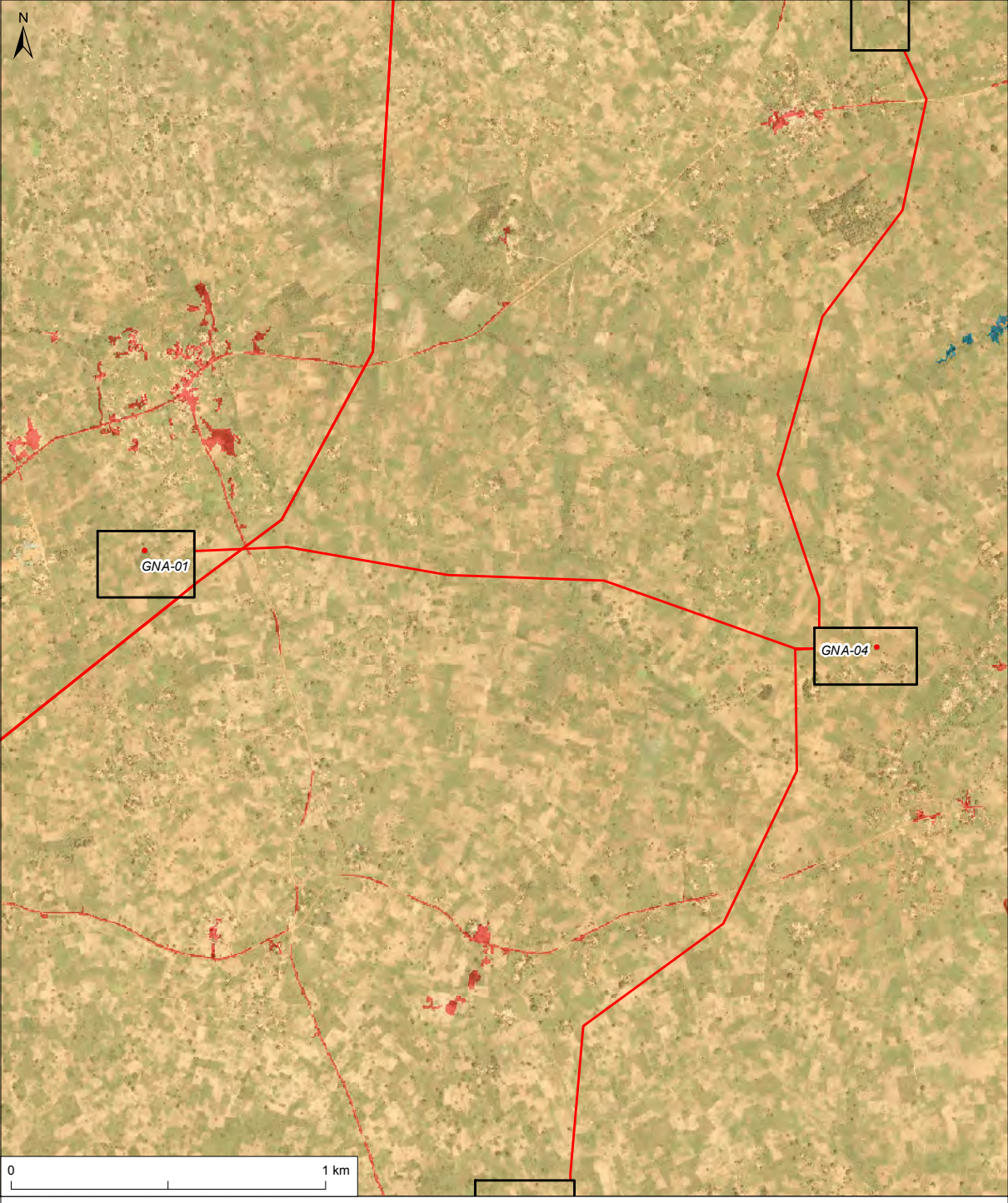

VEGETATION COVER - GNA-04 to GNA-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Dry Grassland GR2
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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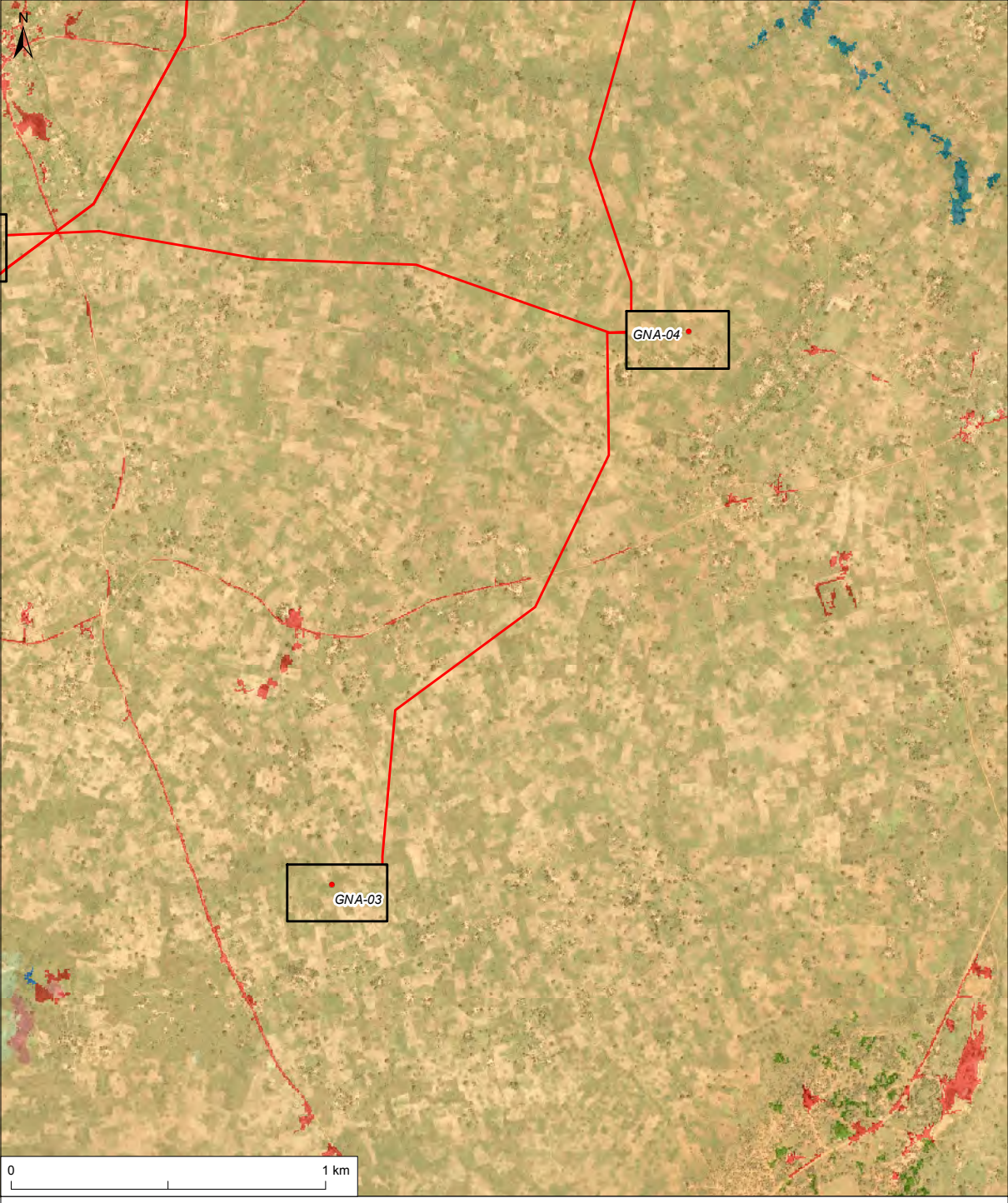

VEGETATION COVER - GNA-04 to GNA-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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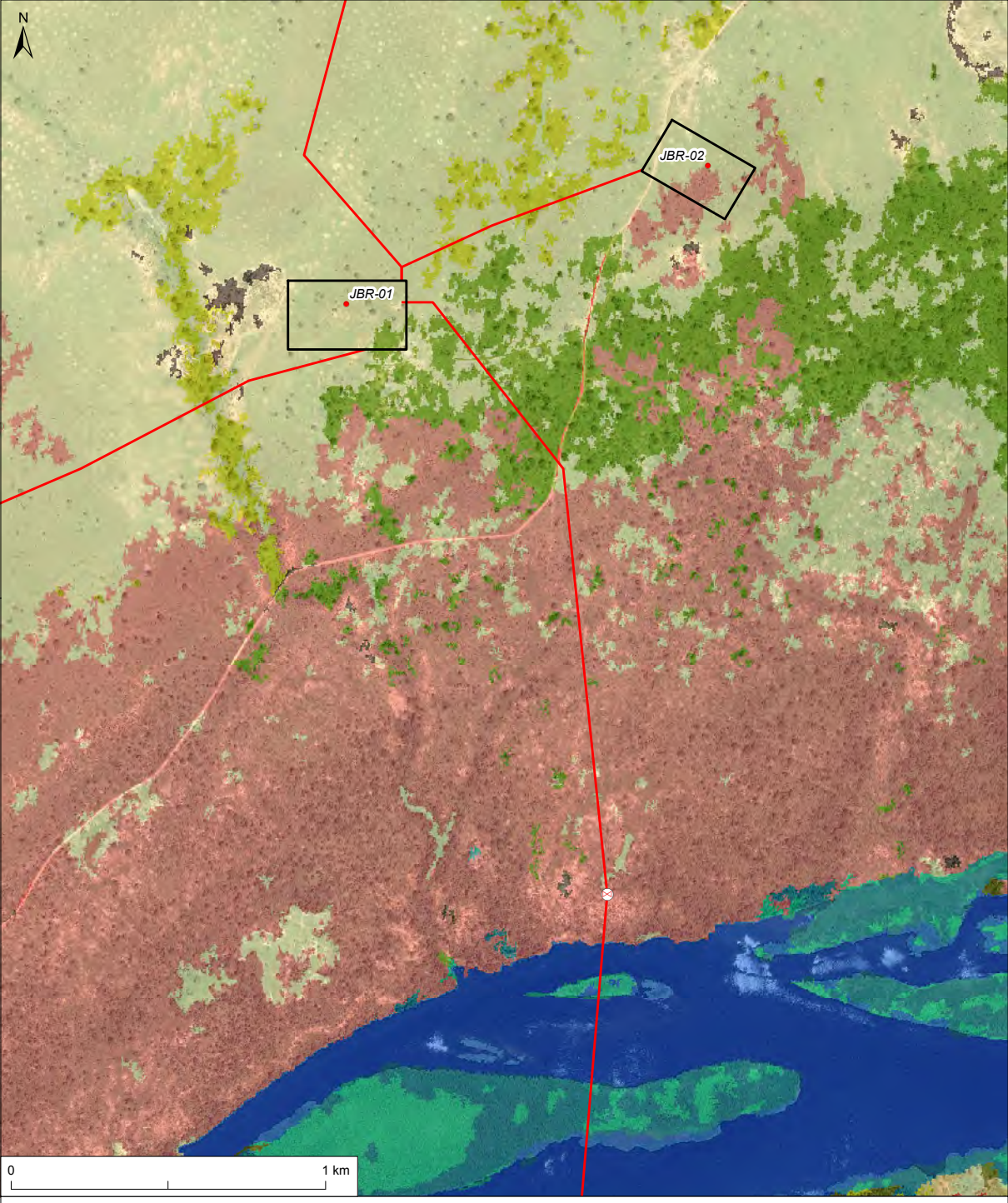

VEGETATION COVER - JBR-01 to NIV (Option 1)

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 1
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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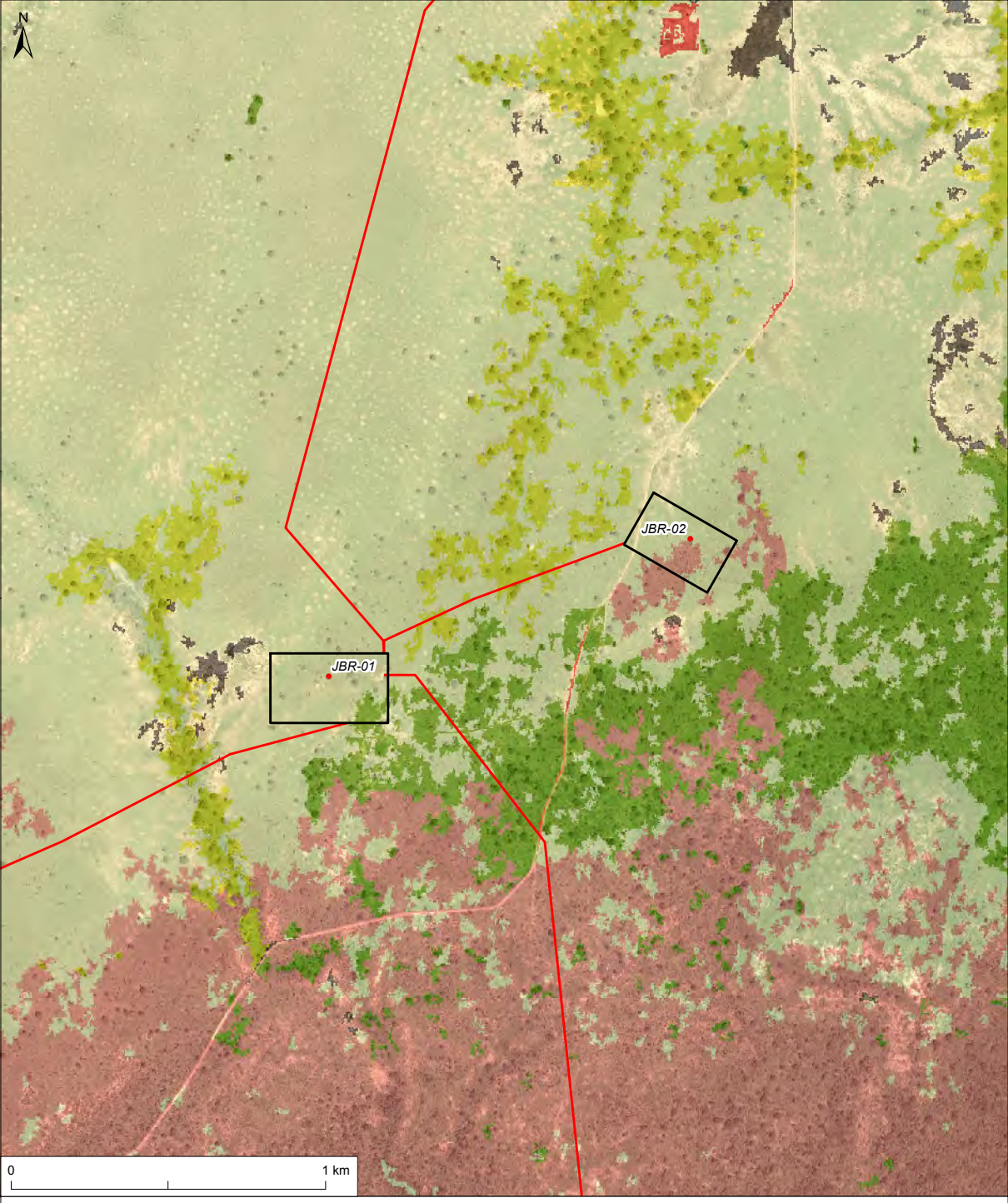

VEGETATION COVER - JBR-02 to JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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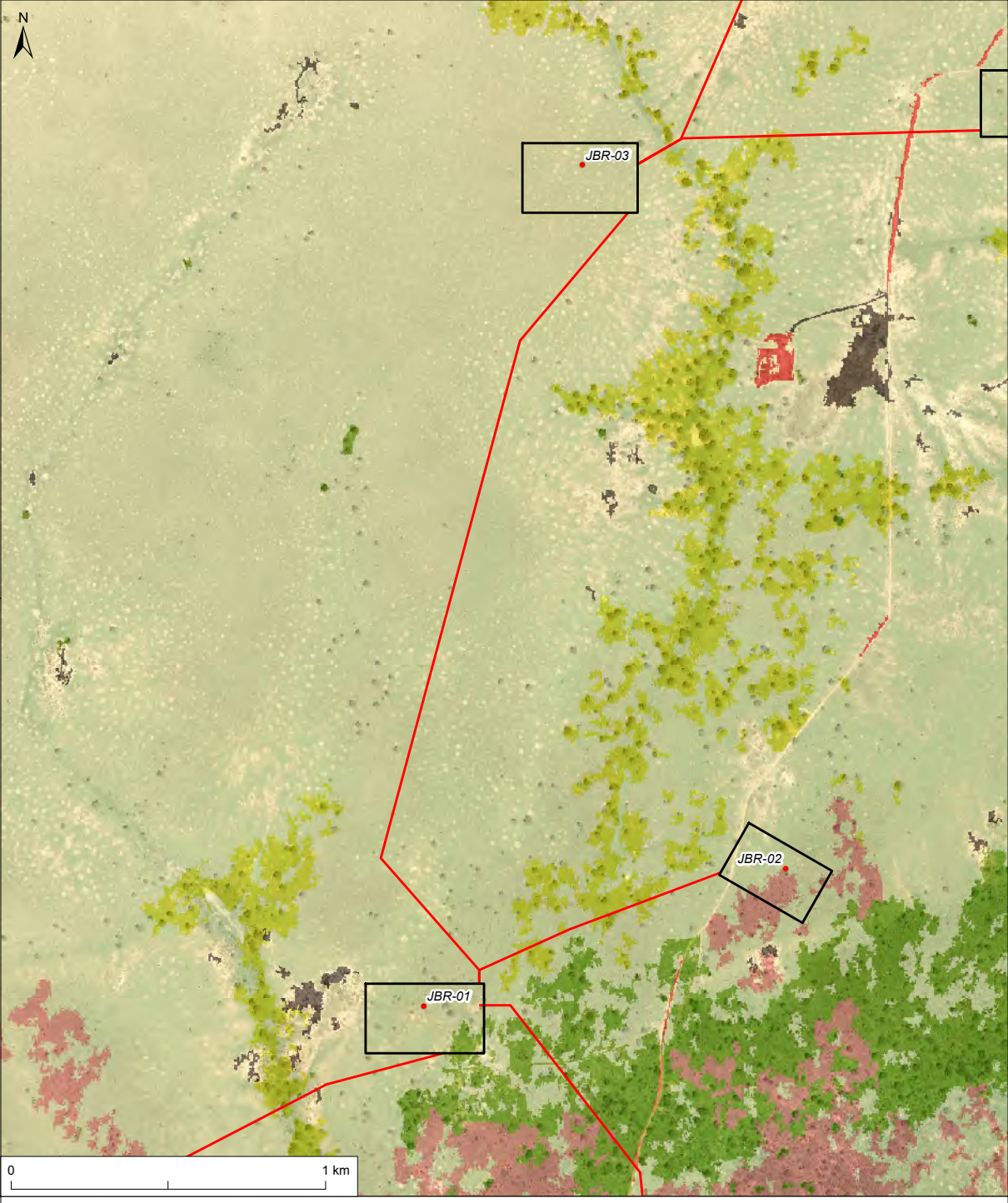

VEGETATION COVER - JBR-03 to JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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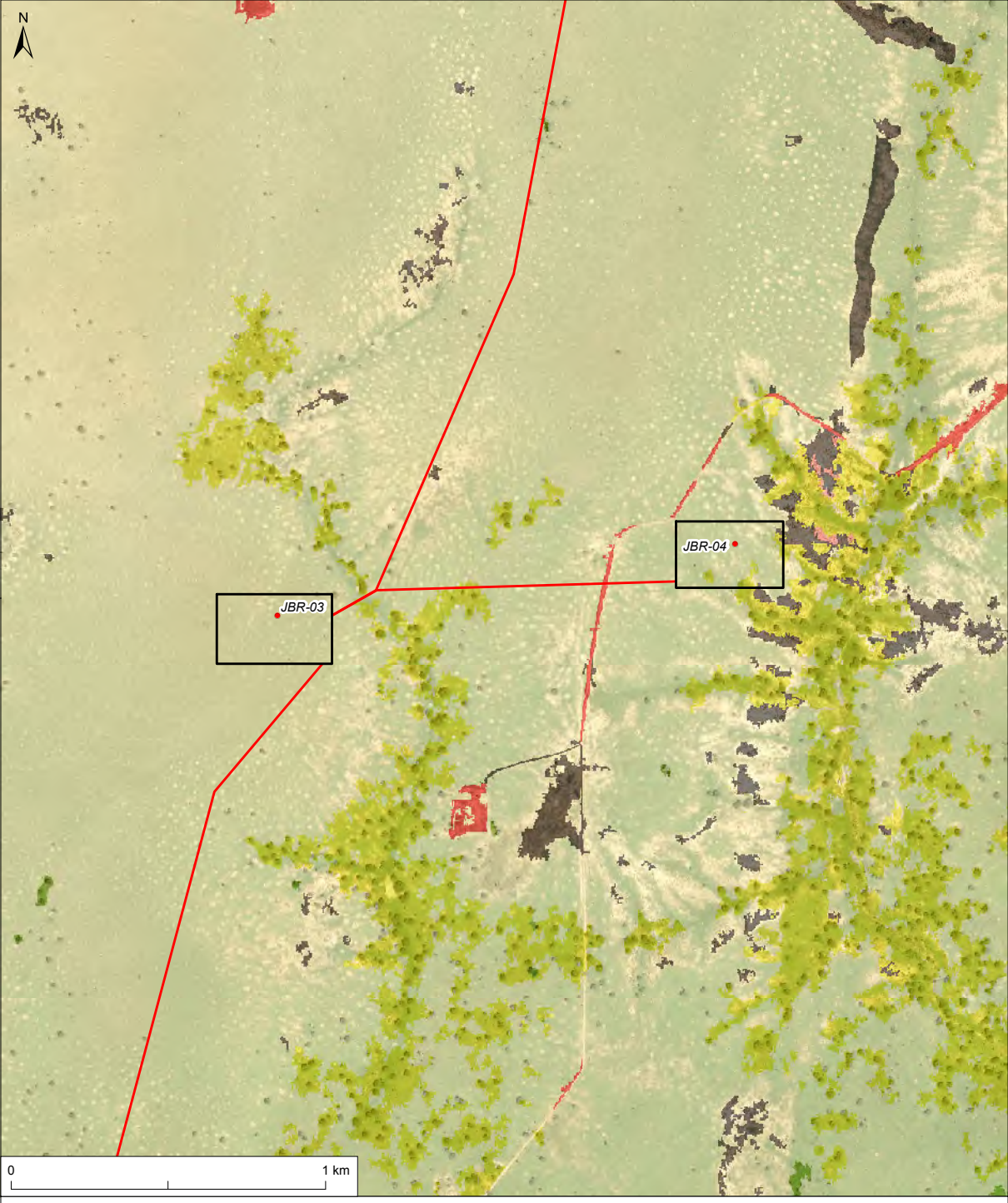

VEGETATION COVER - JBR-04 to JBR-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

VEGETATION COVER - JBR-05 to JBR-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

VEGETATION COVER - JBR-06 to JBR-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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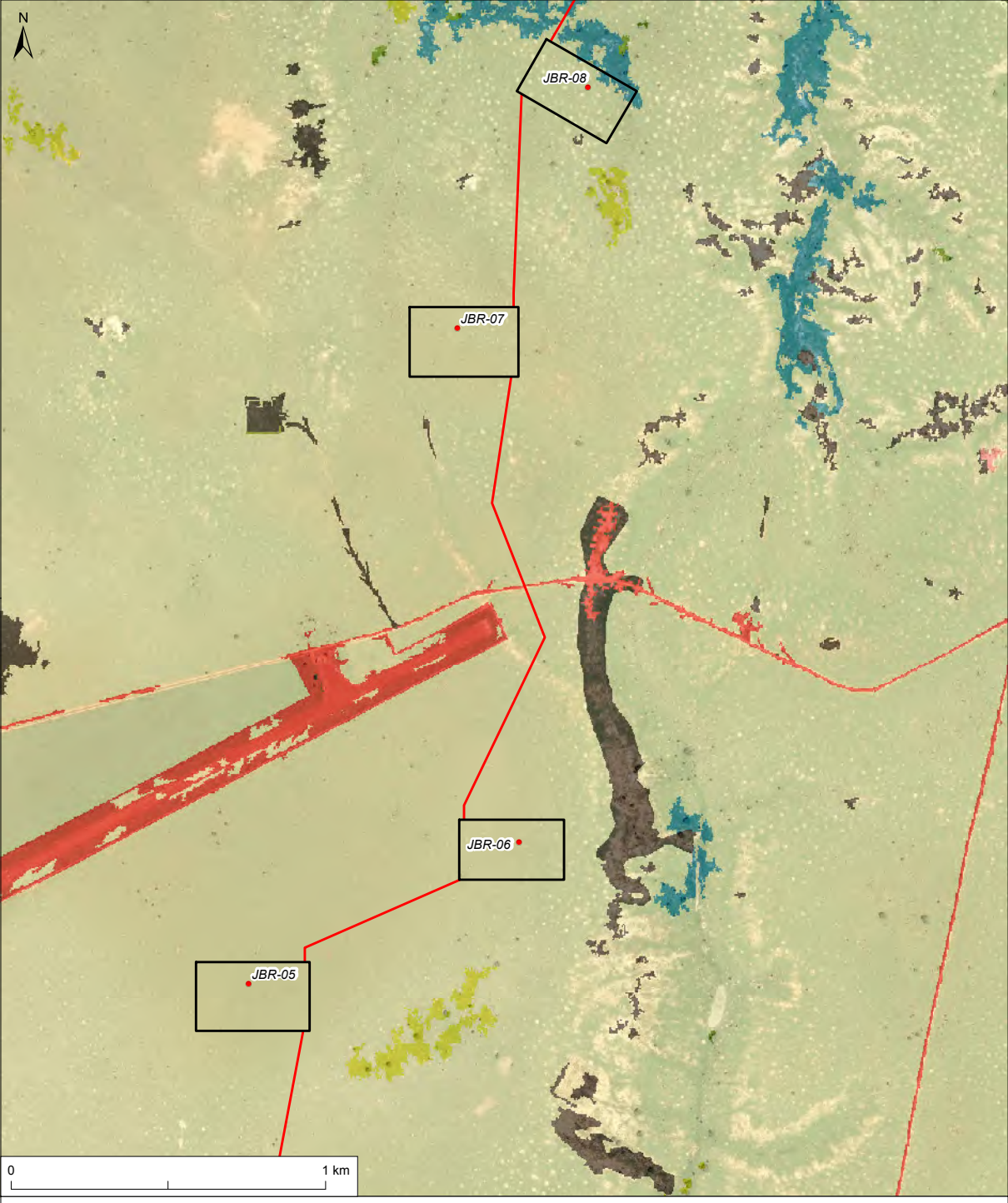

VEGETATION COVER - JBR-07 to JBR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

VEGETATION COVER - JBR-08 to JBR-07

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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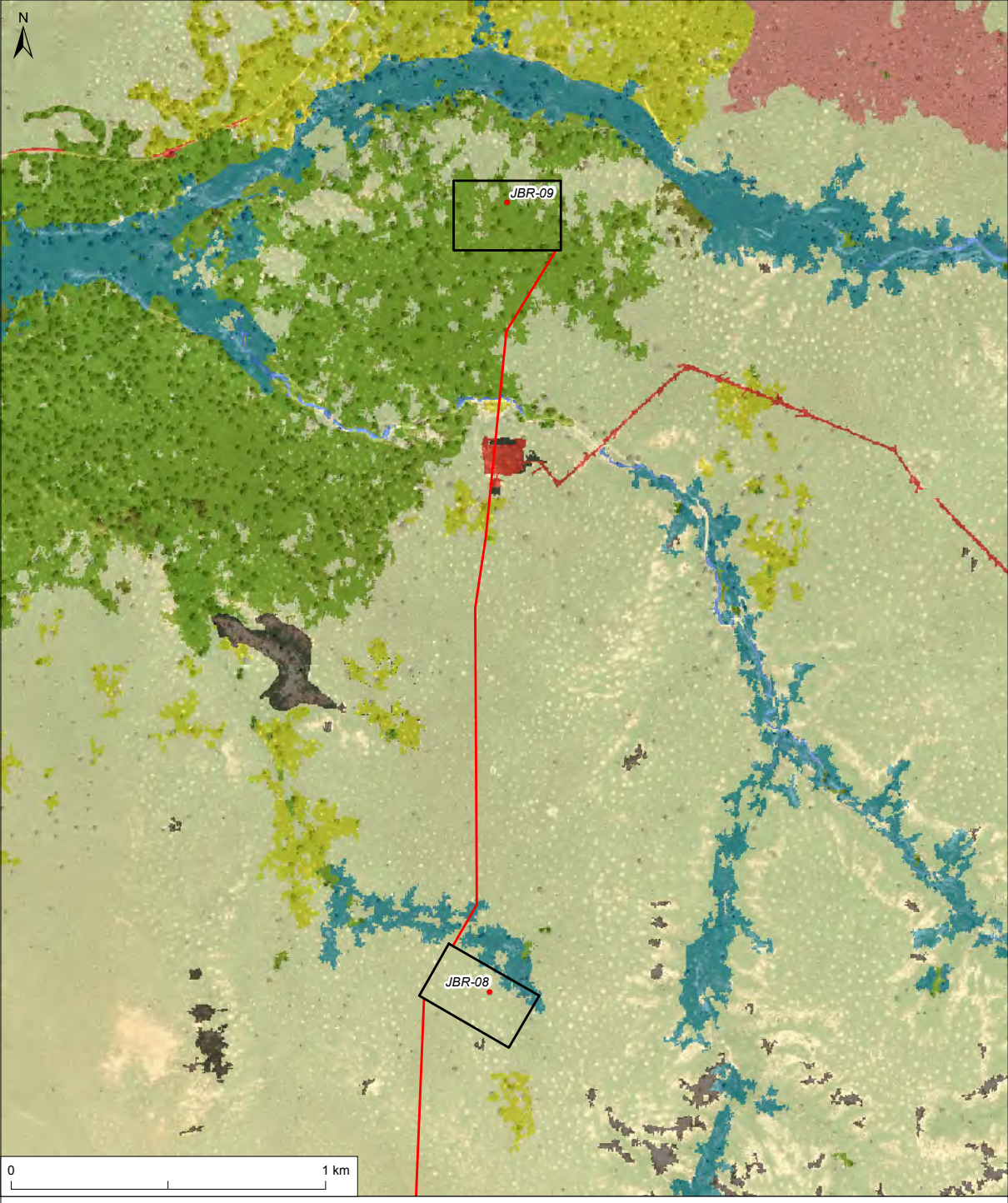

VEGETATION COVER - JBR-09 to JBR-08

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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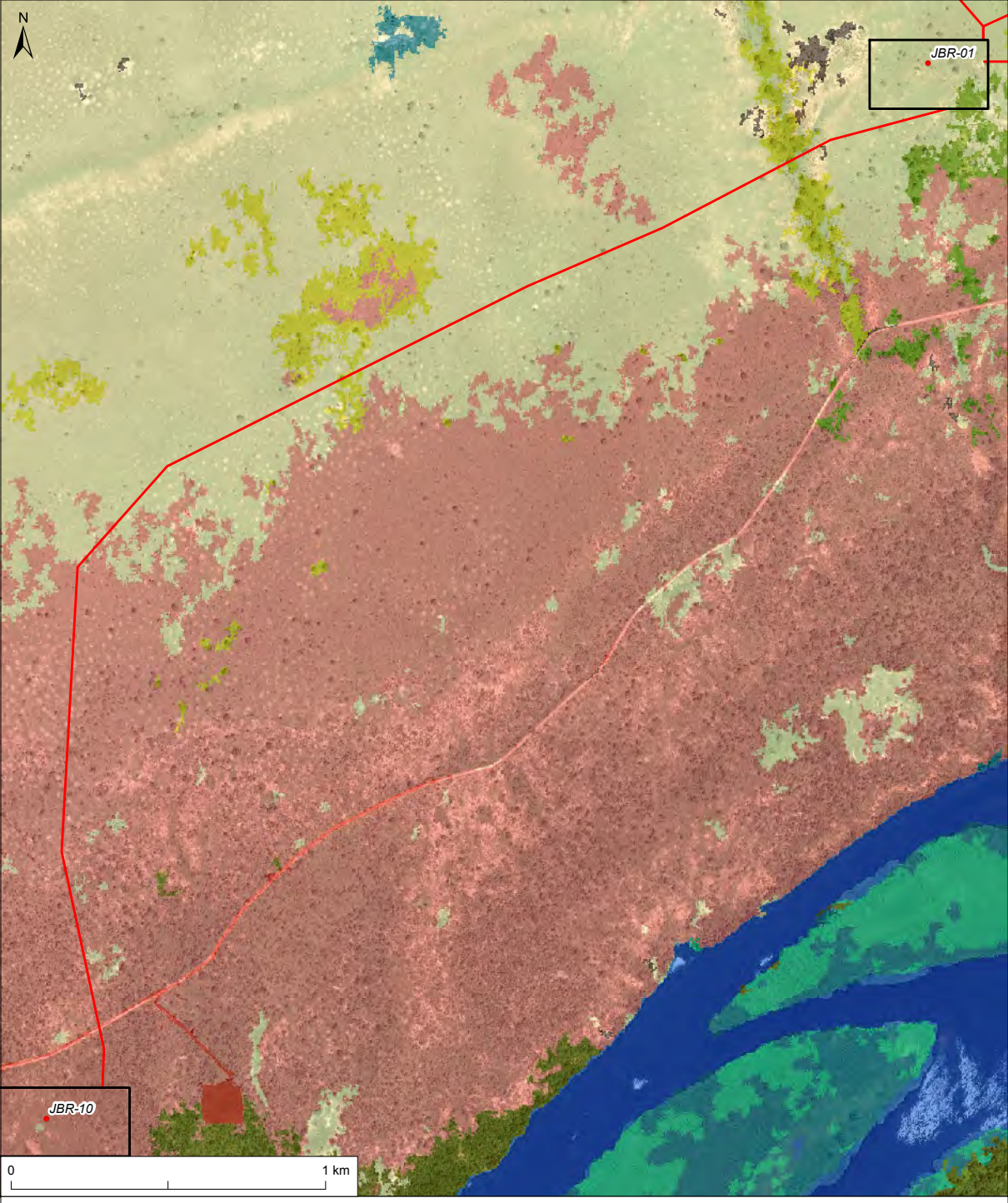

VEGETATION COVER - JBR-10 to JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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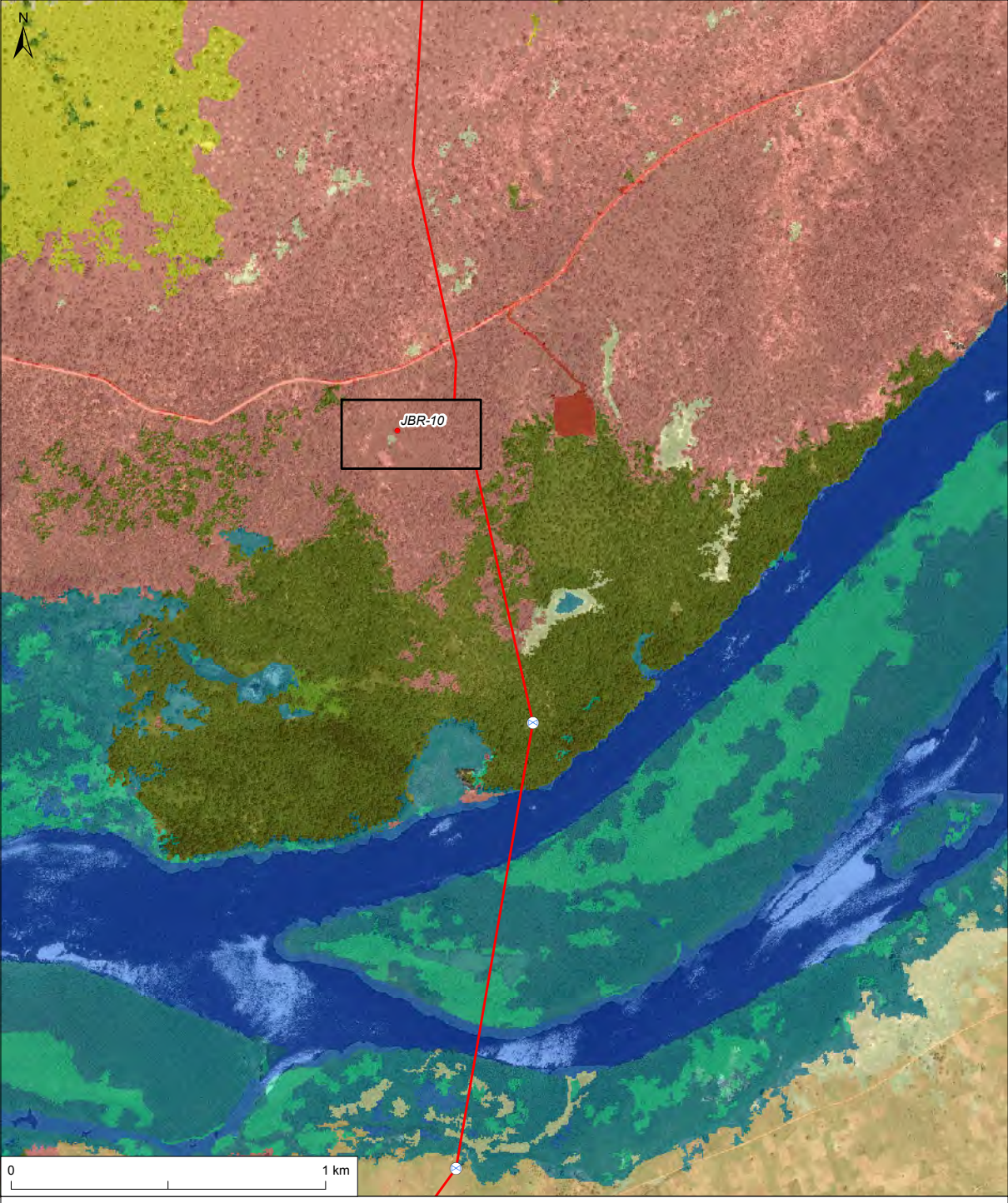

VEGETATION COVER - JBR-10 to NIV (Option 2)

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 2
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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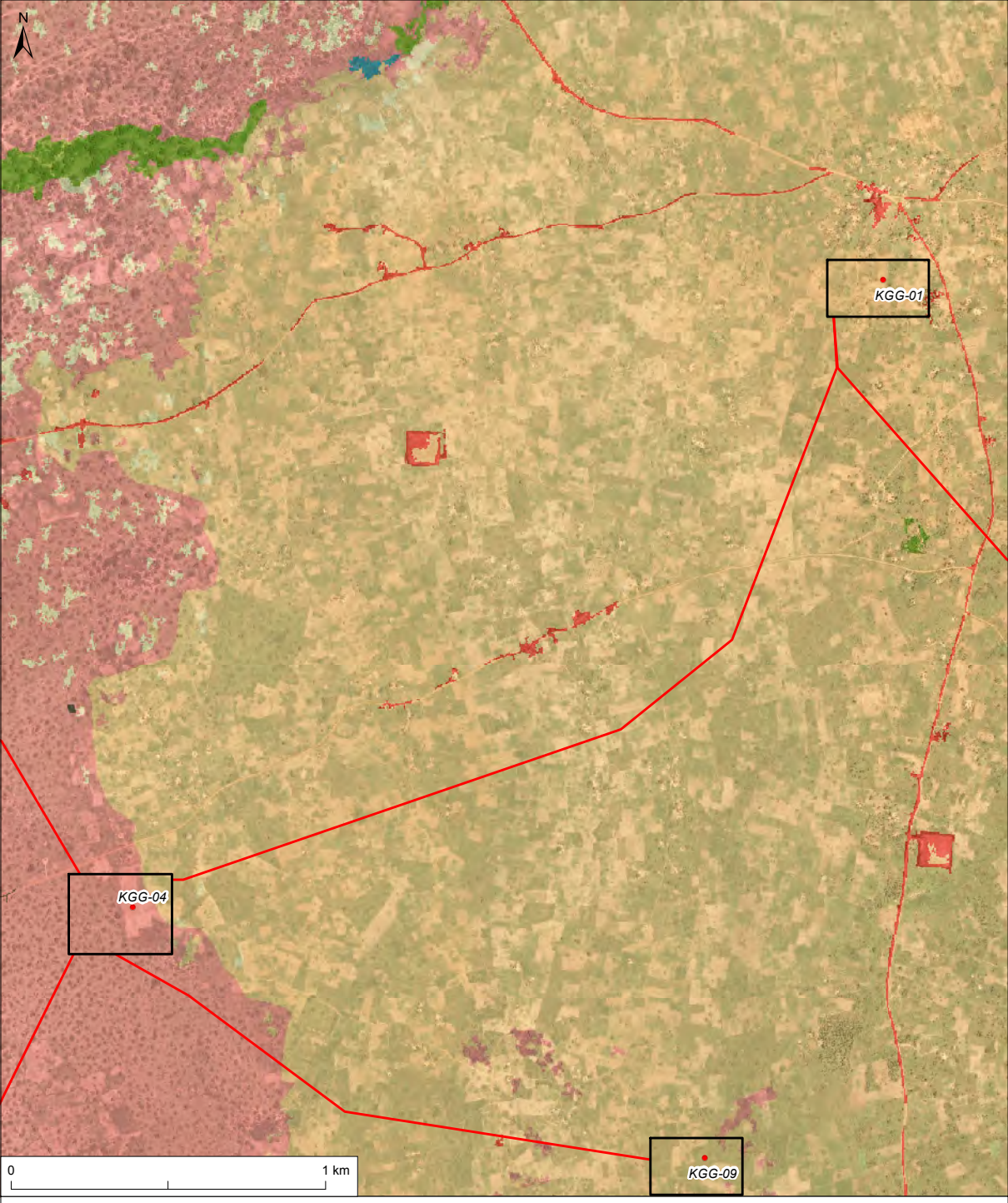

VEGETATION COVER - KGG-01 to KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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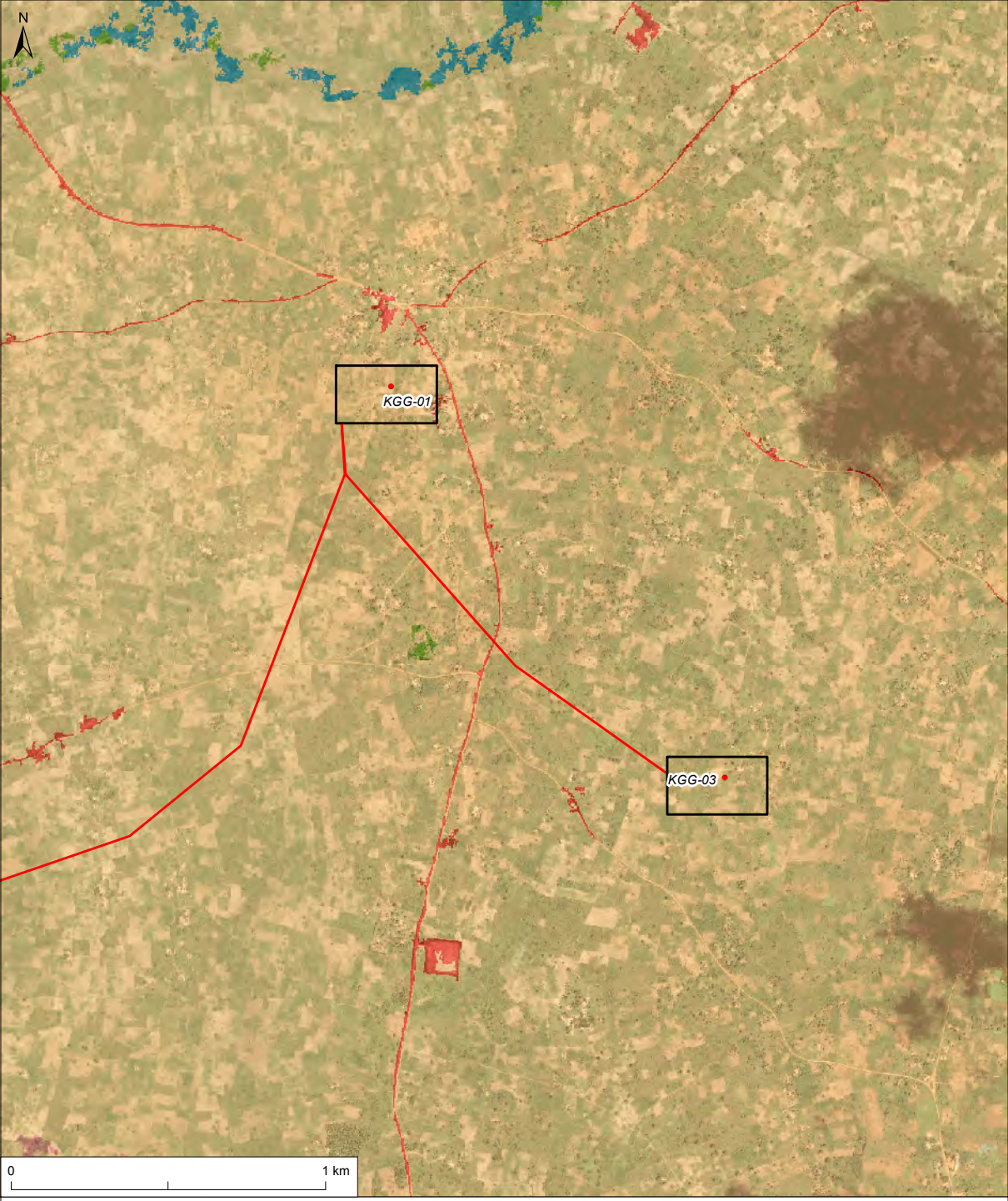

VEGETATION COVER - KGG-03 to KGG-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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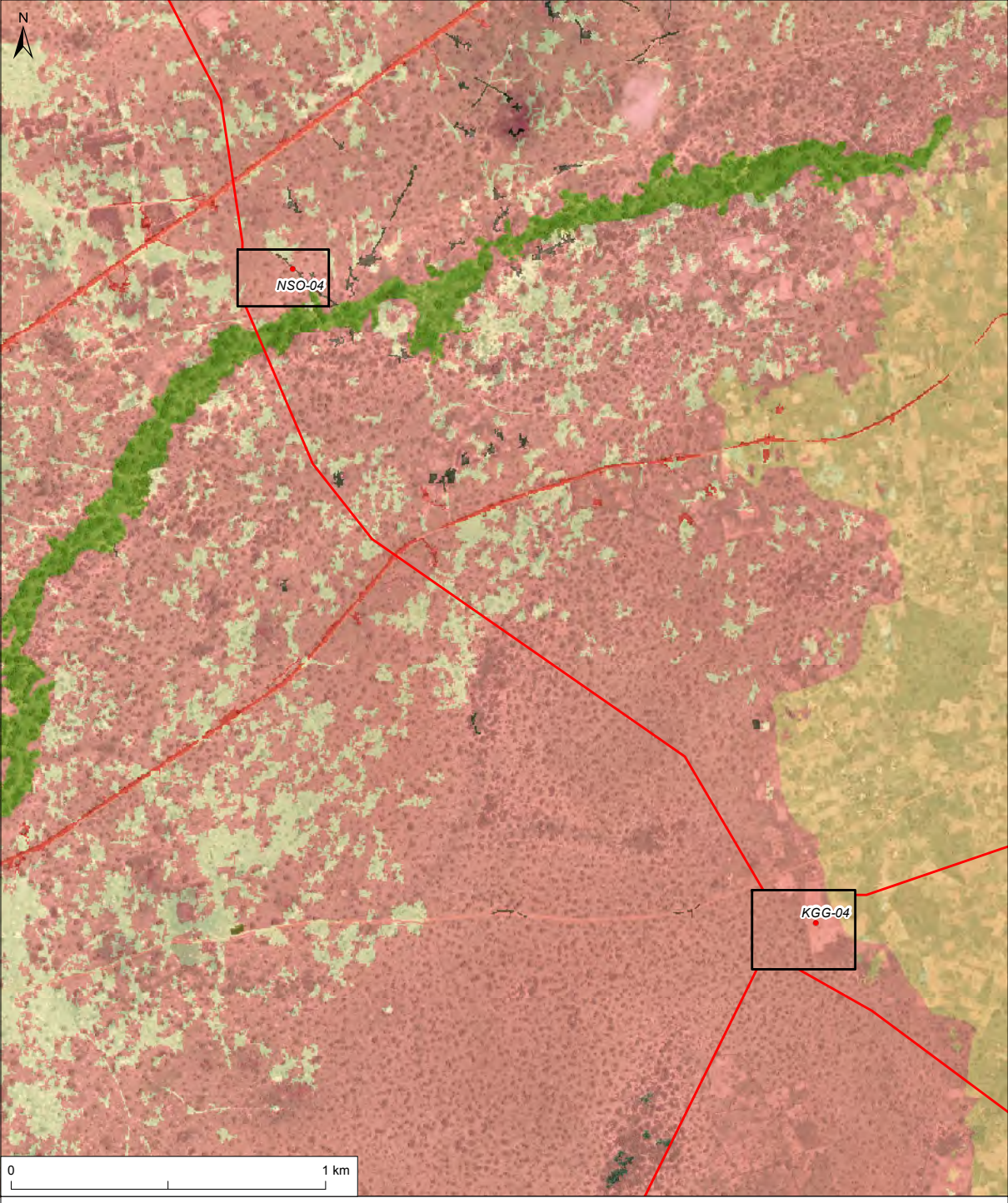


VEGETATION COVER - KGG-04 to NSO-04

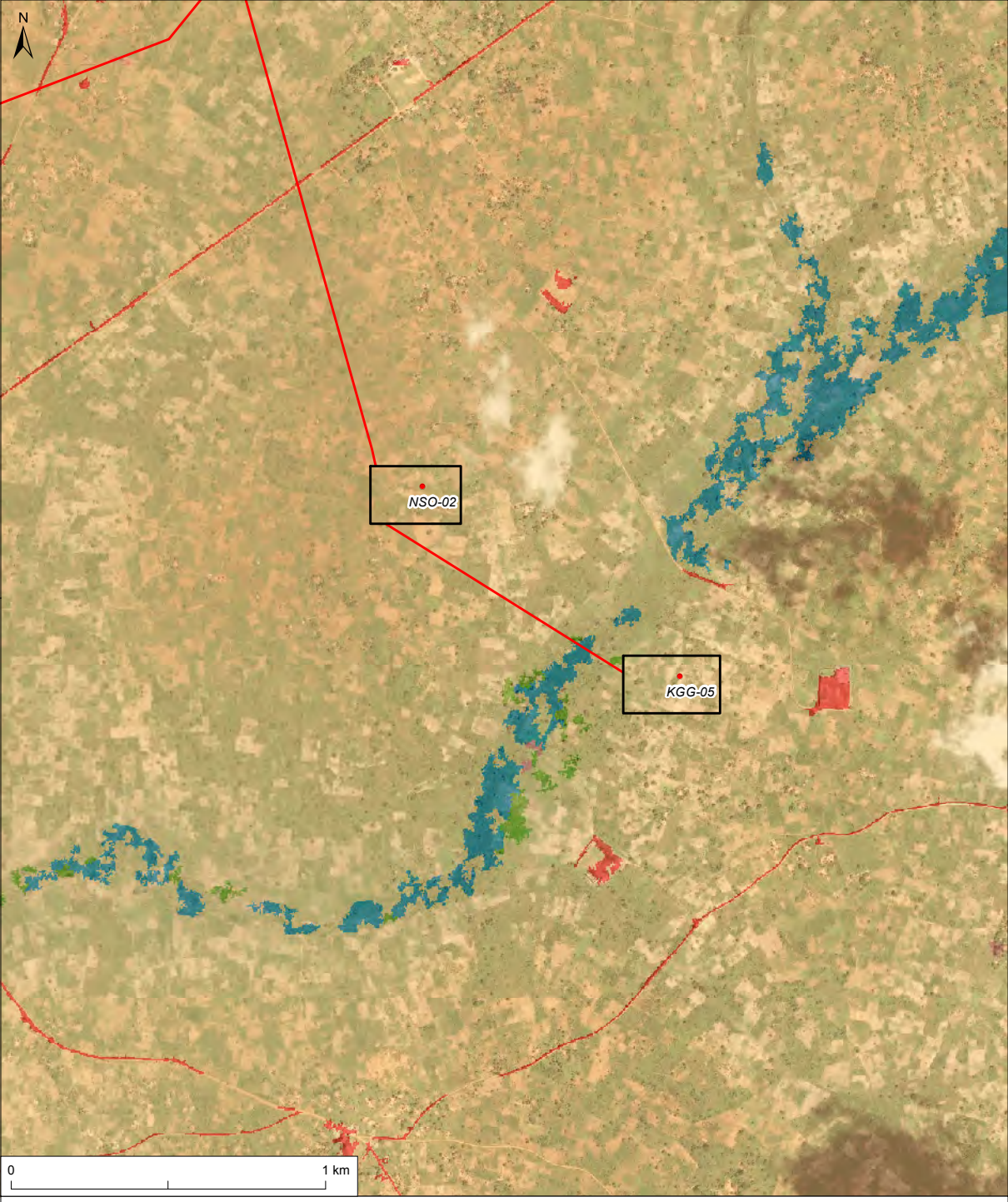
- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



VEGETATION COVER - KGG-05 to NSO-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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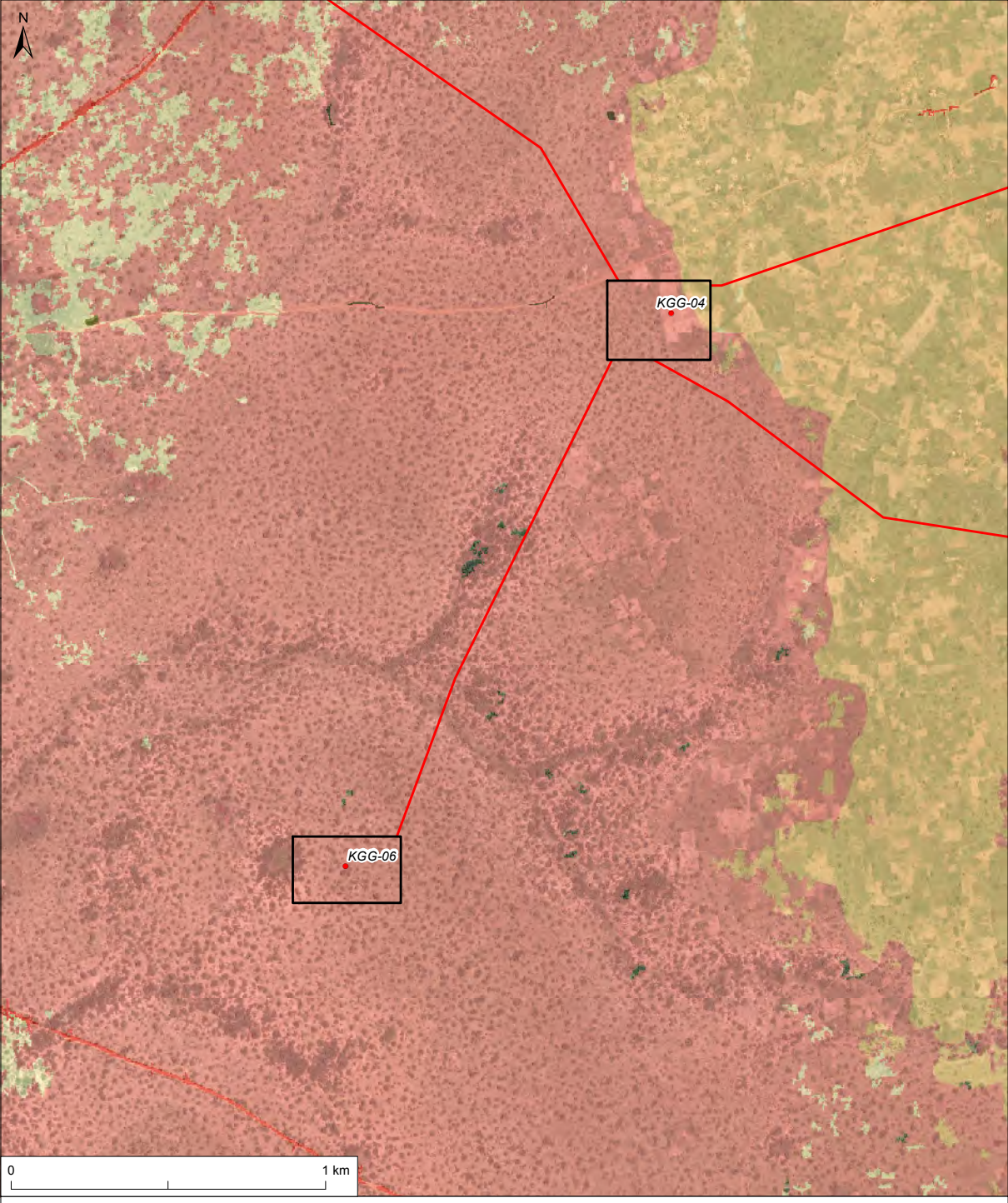

VEGETATION COVER - KGG-06 to KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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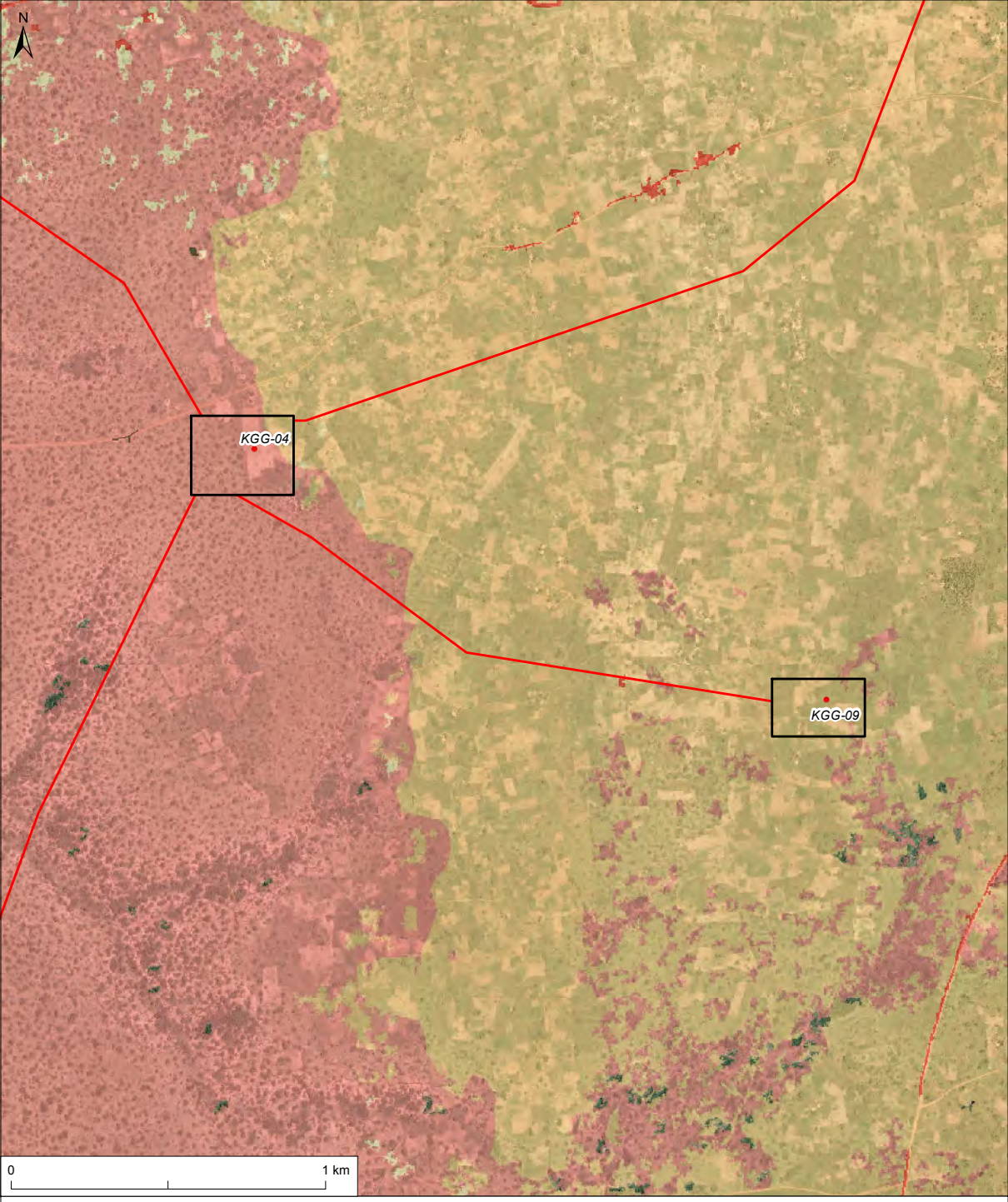

VEGETATION COVER - KGG-09 to KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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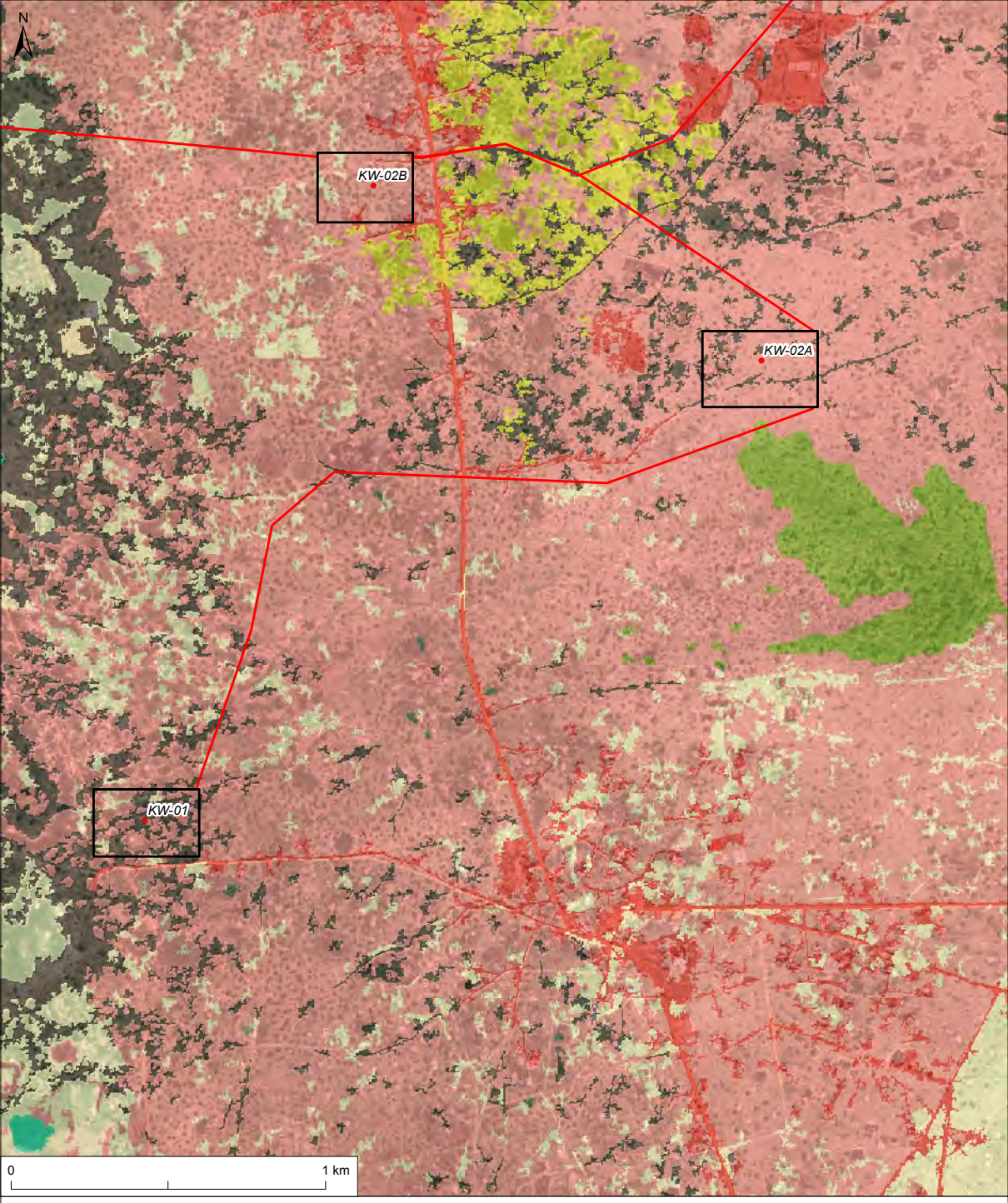

VEGETATION COVER - KW-01 to KW-02A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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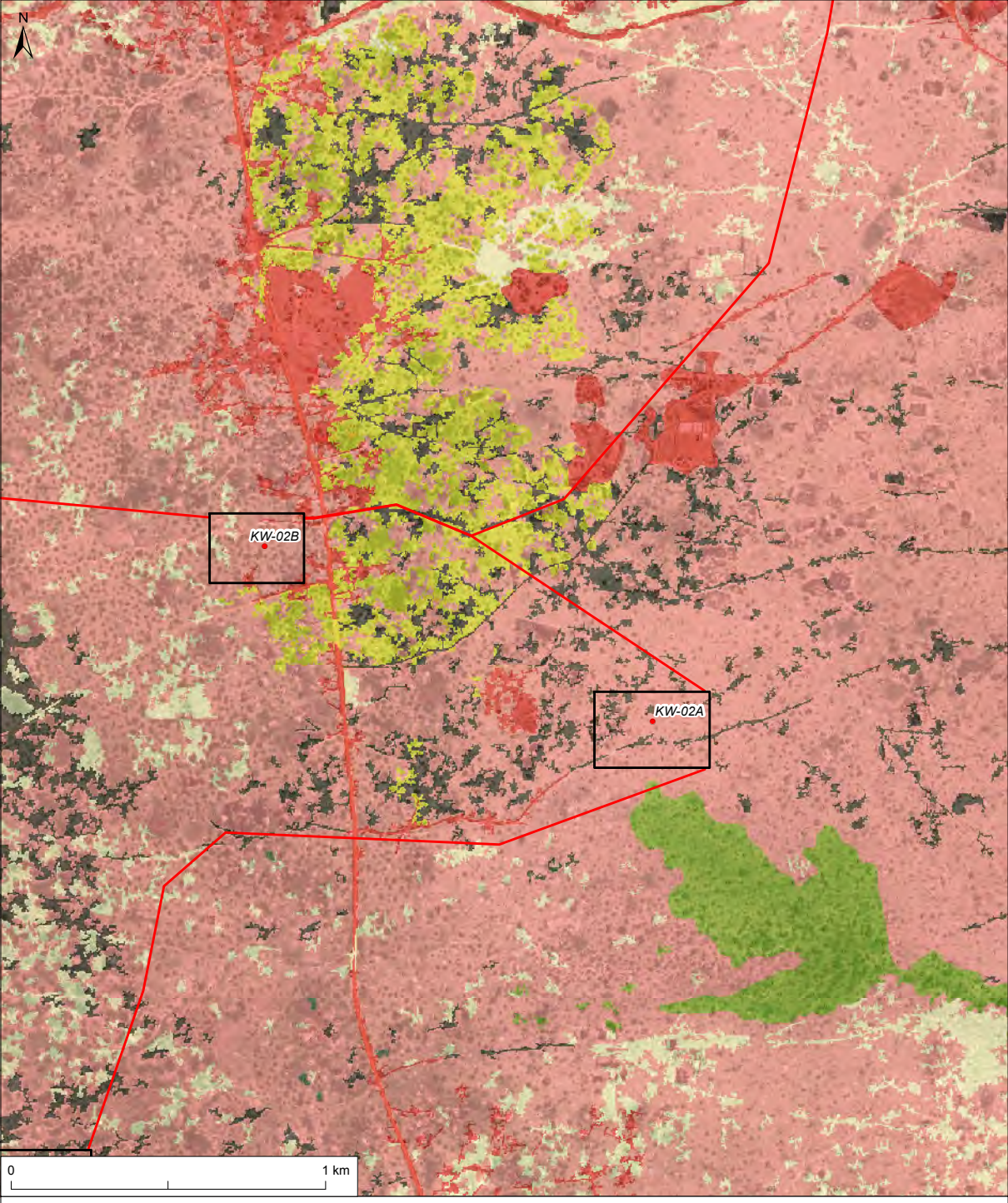

VEGETATION COVER - KW-02A to KW-02B

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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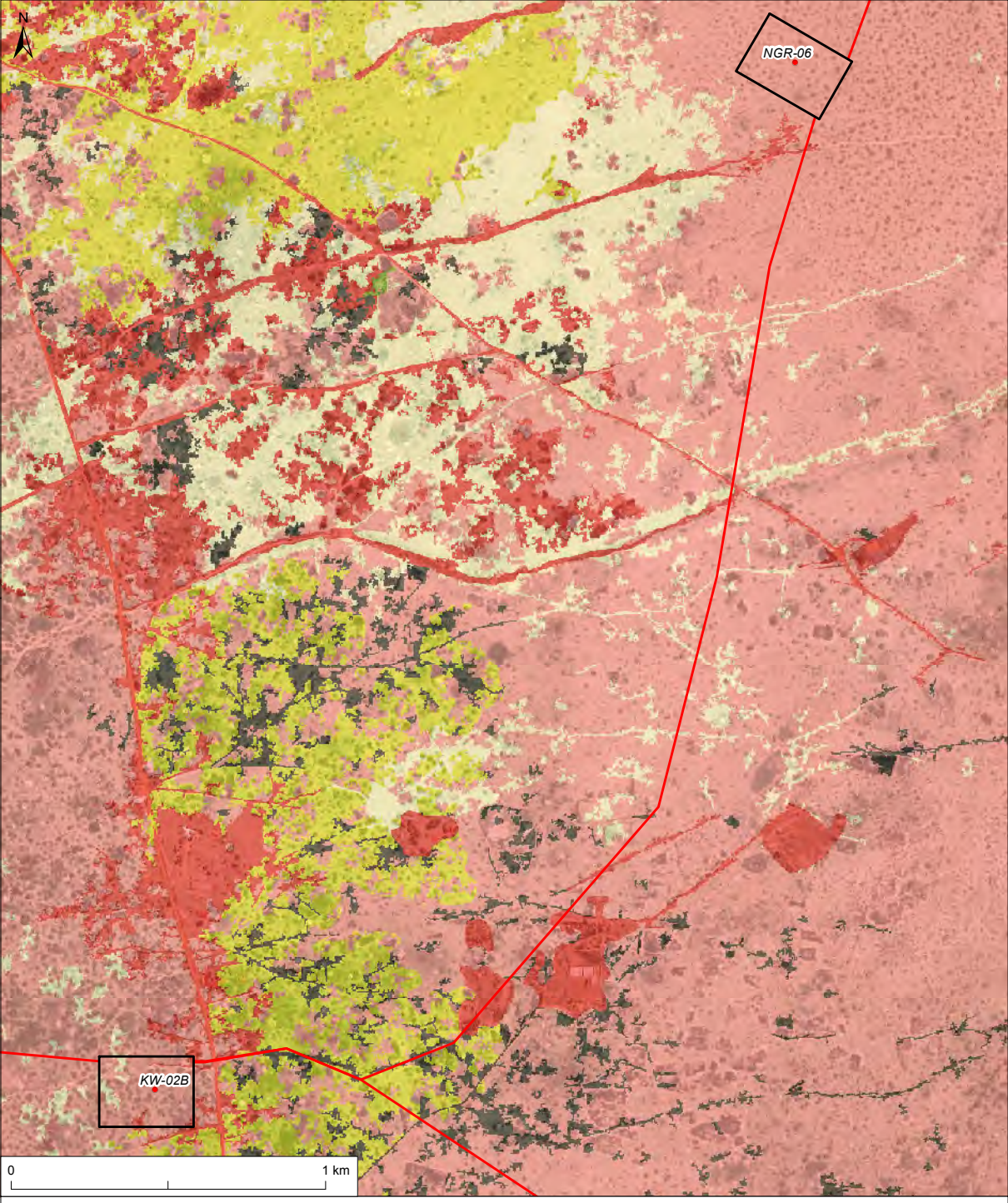

VEGETATION COVER - KW-02B to NGR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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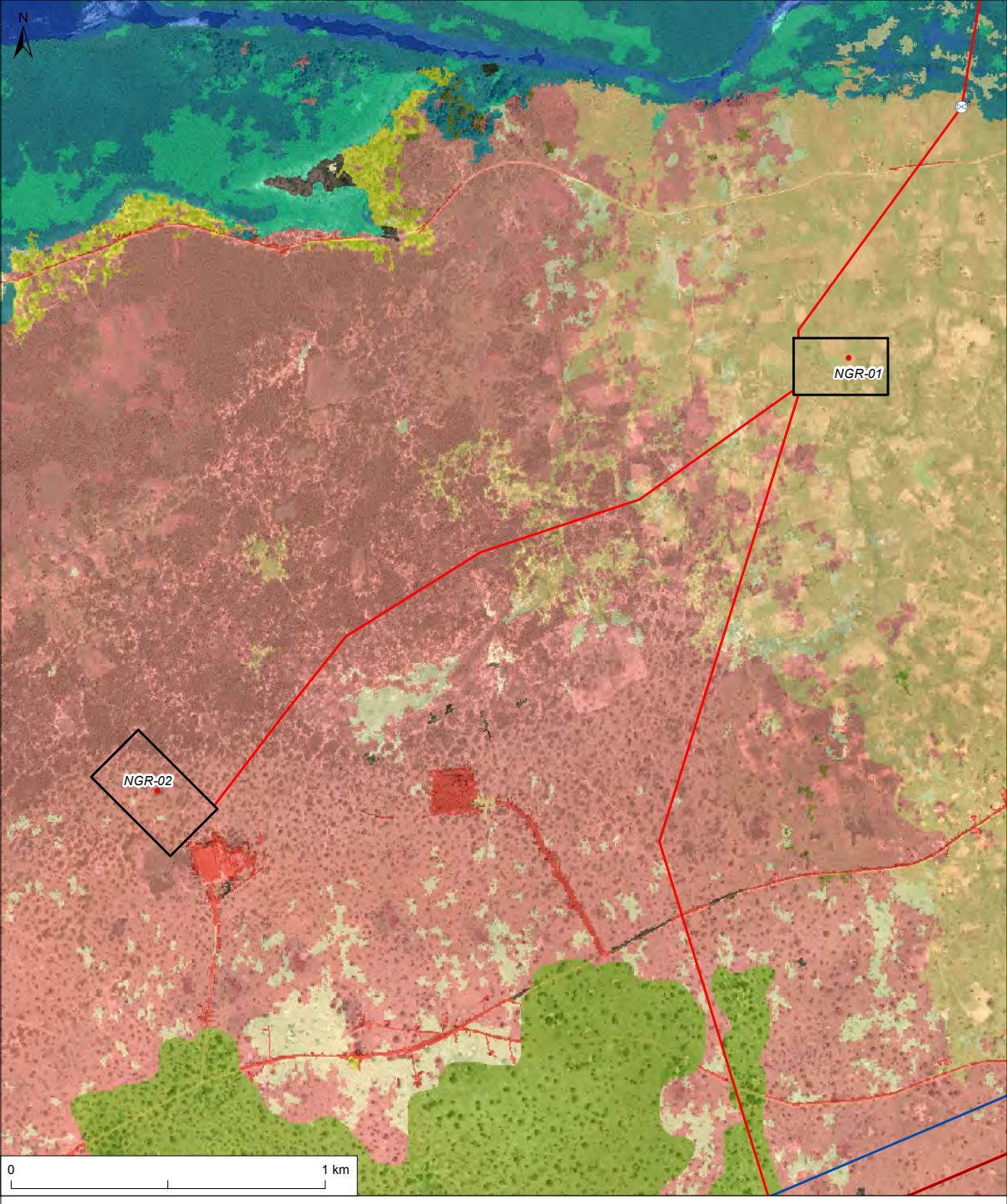

VEGETATION COVER - NGR-02 to NGR-01

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 2
- Industrial Area
- CPF
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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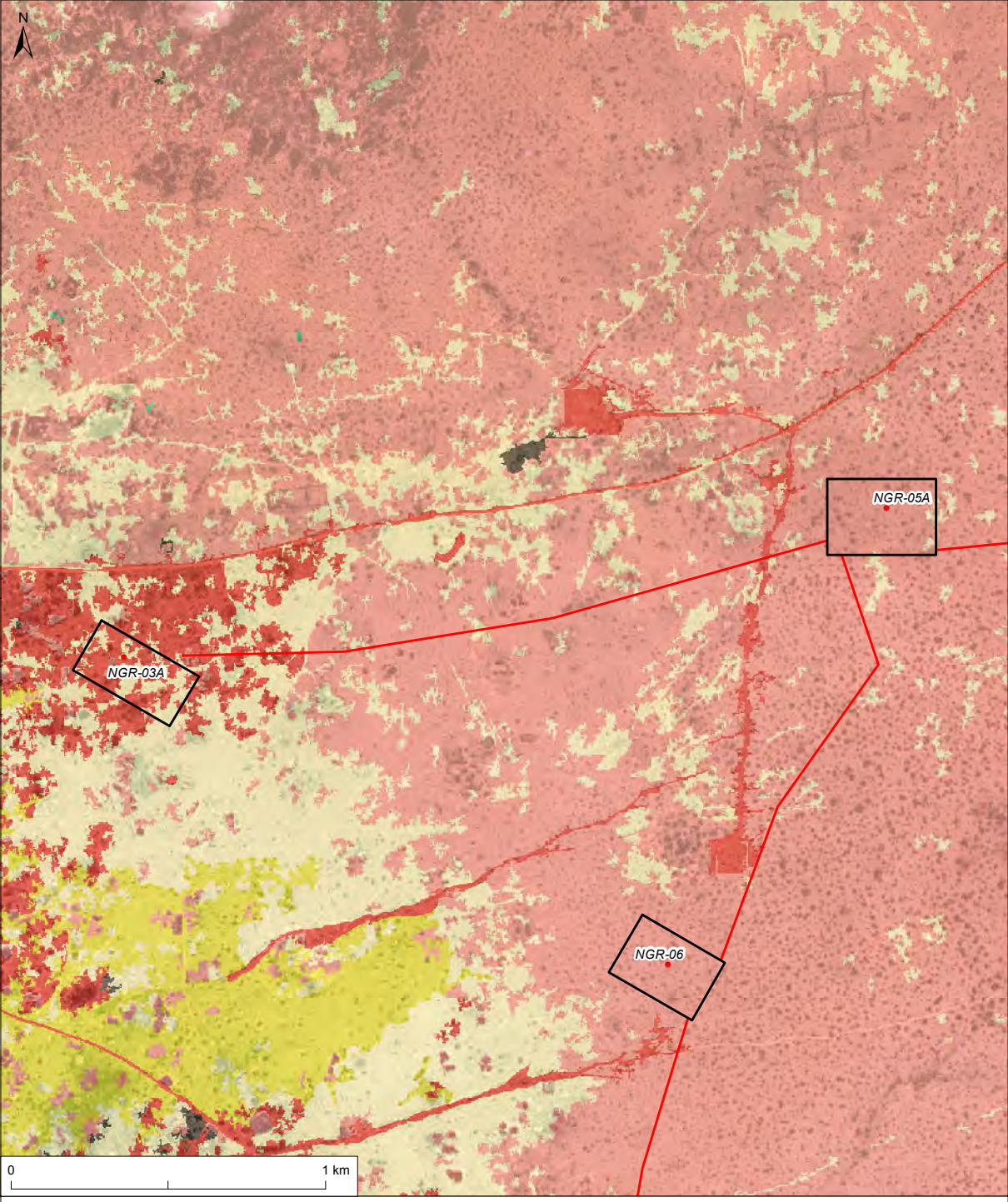

VEGETATION COVER - NGR-03A to NGR-05A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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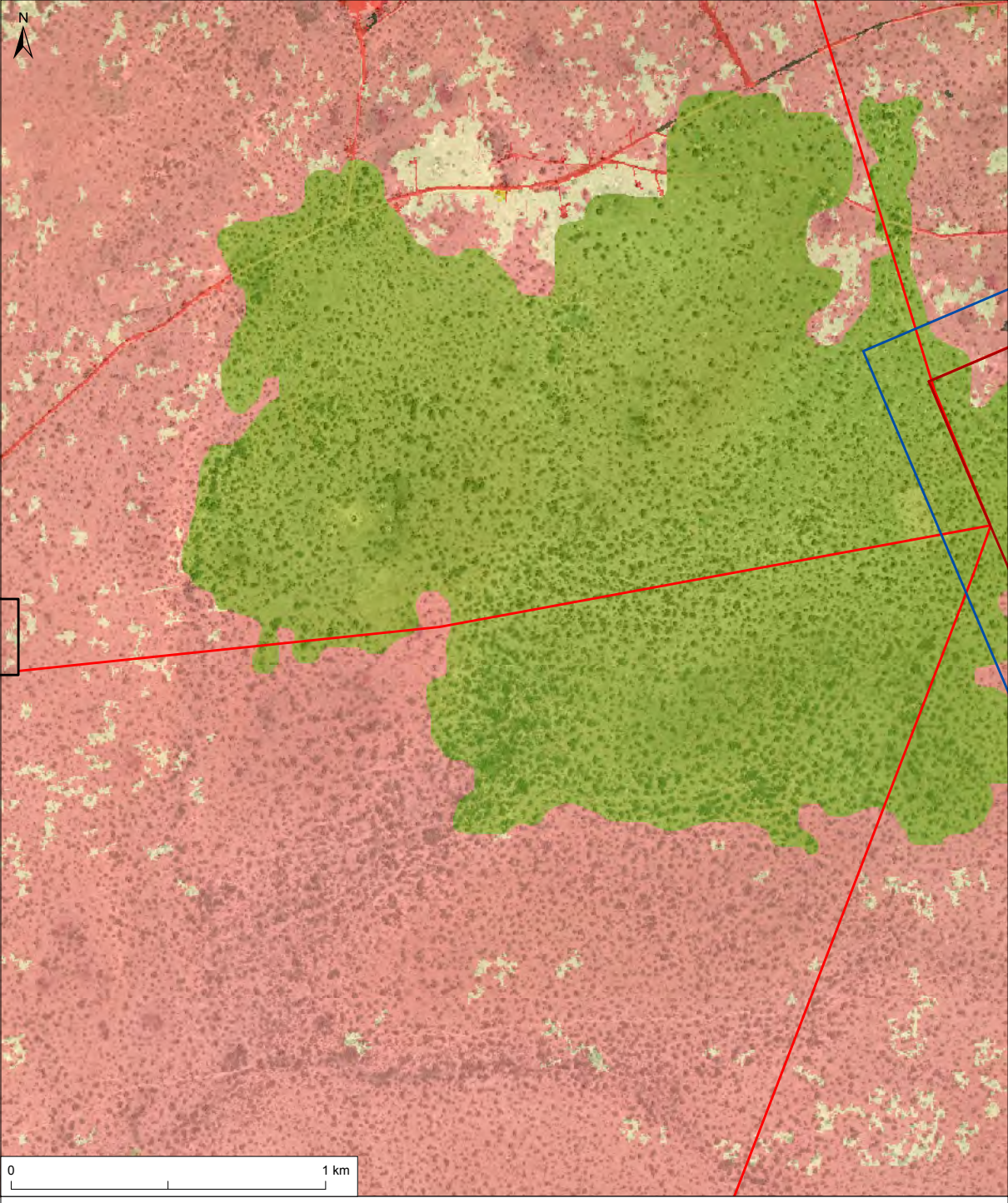

VEGETATION COVER - NGR-05A to CPF

- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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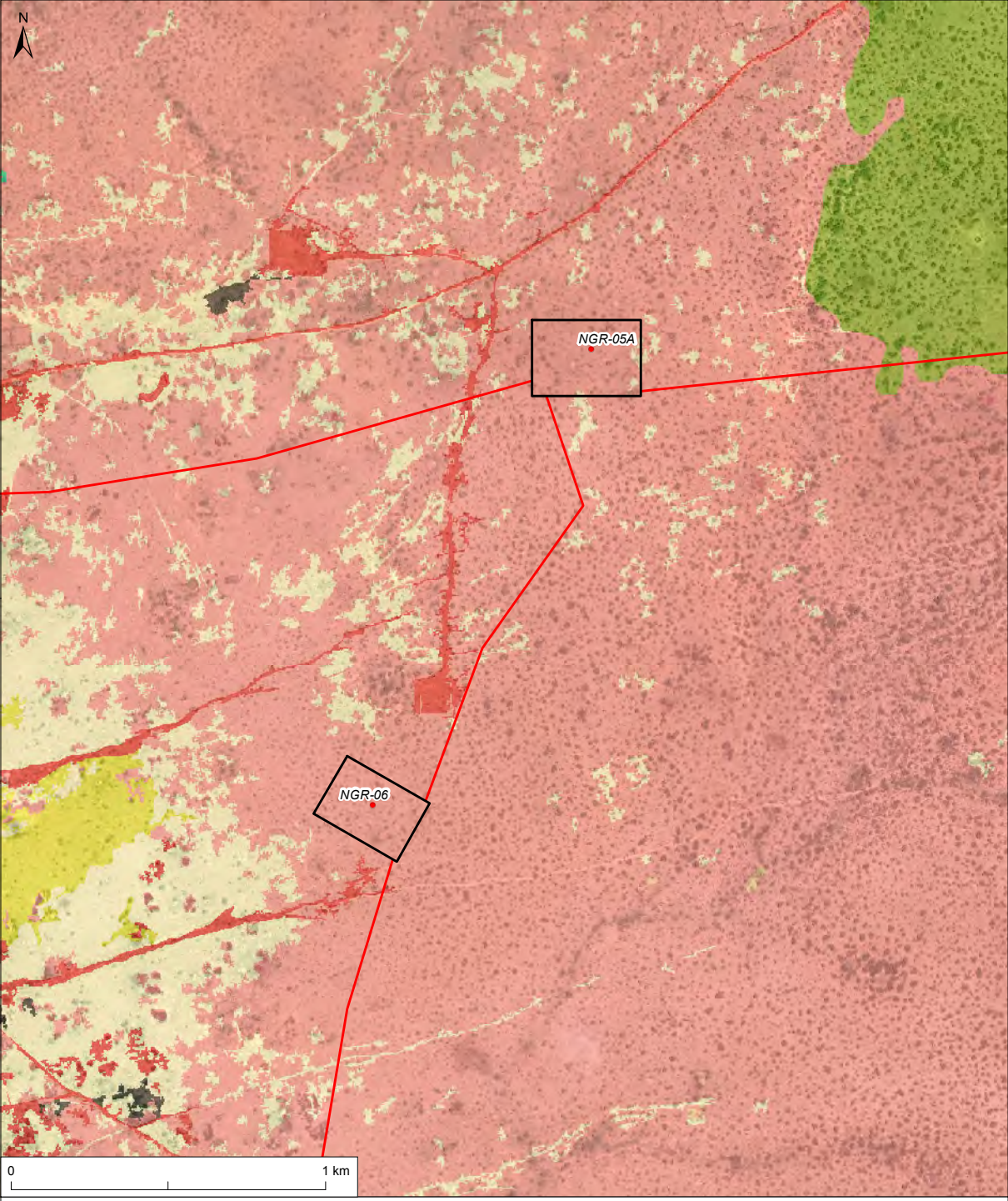

VEGETATION COVER - NGR-06 to NGR-05A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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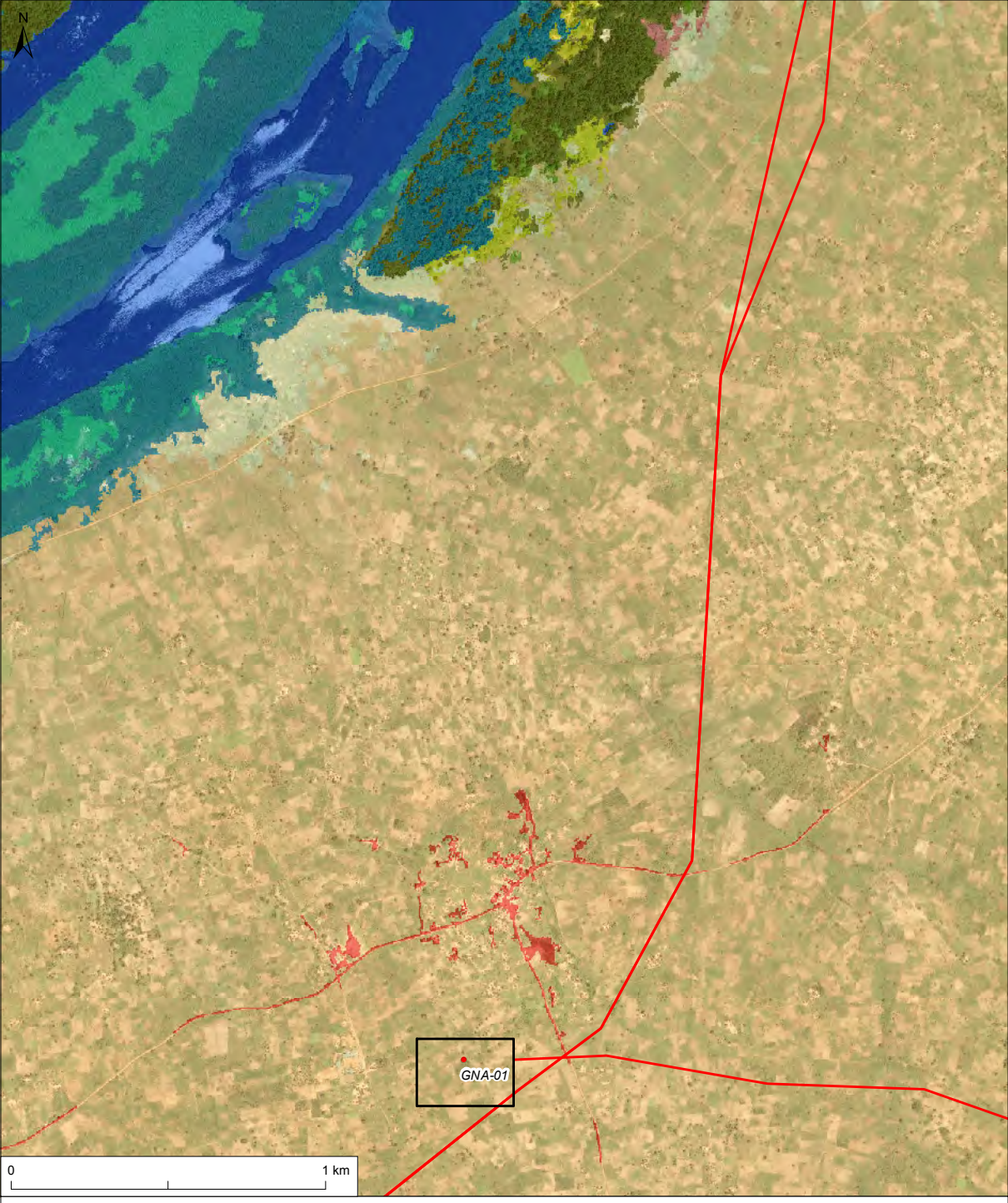

VEGETATION COVER - NIV (Option 1) to CPF

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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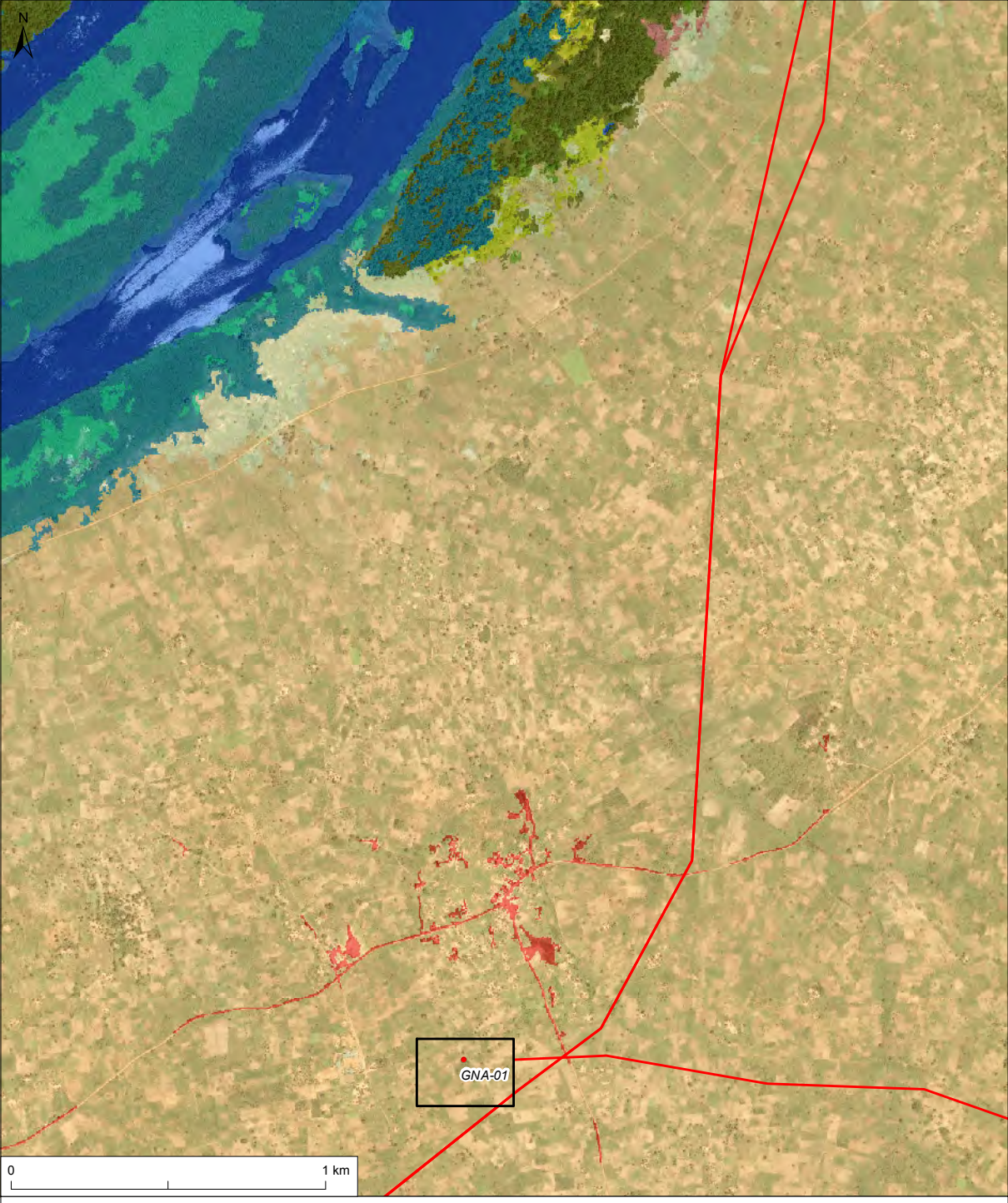

VEGETATION COVER - NIV (Option 1) to CPF - alt

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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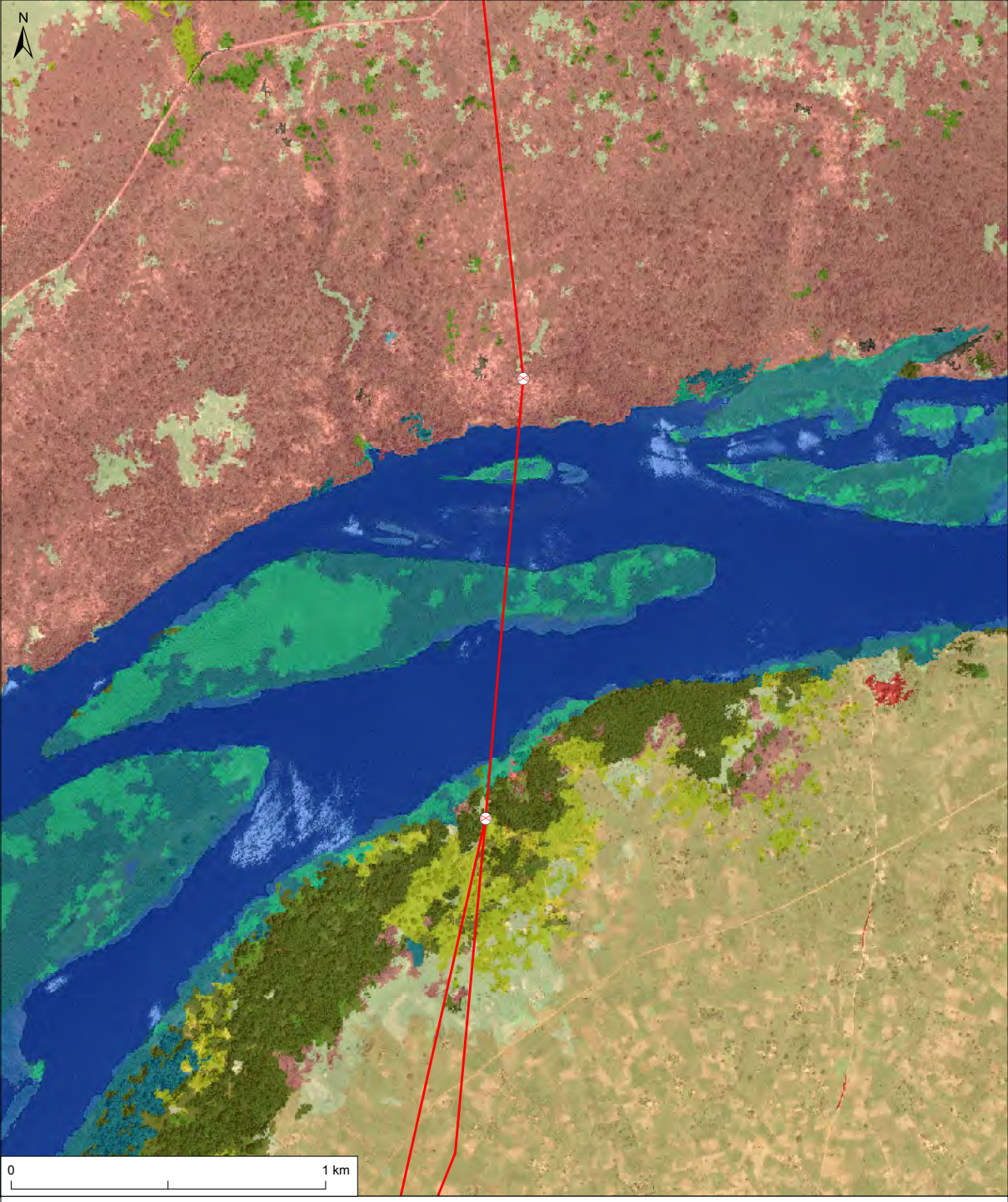

VEGETATION COVER - NIV (Option 1) to NIV (Option 1)

- Victoria Nile Pipeline HDD Crossing - Option 1
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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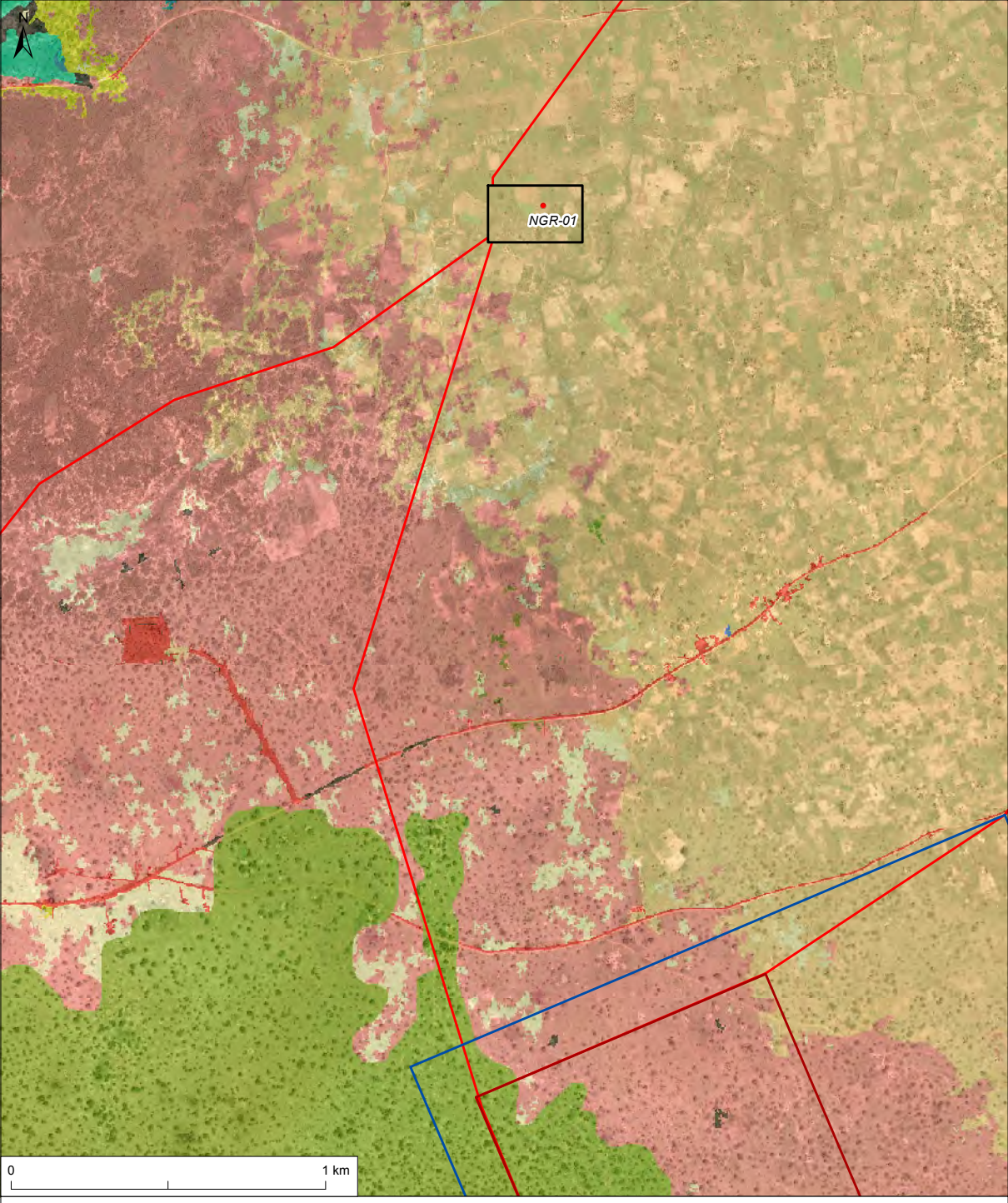

VEGETATION COVER - NIV (Option 2) to CPF via NGR-01

- Wellpad location
- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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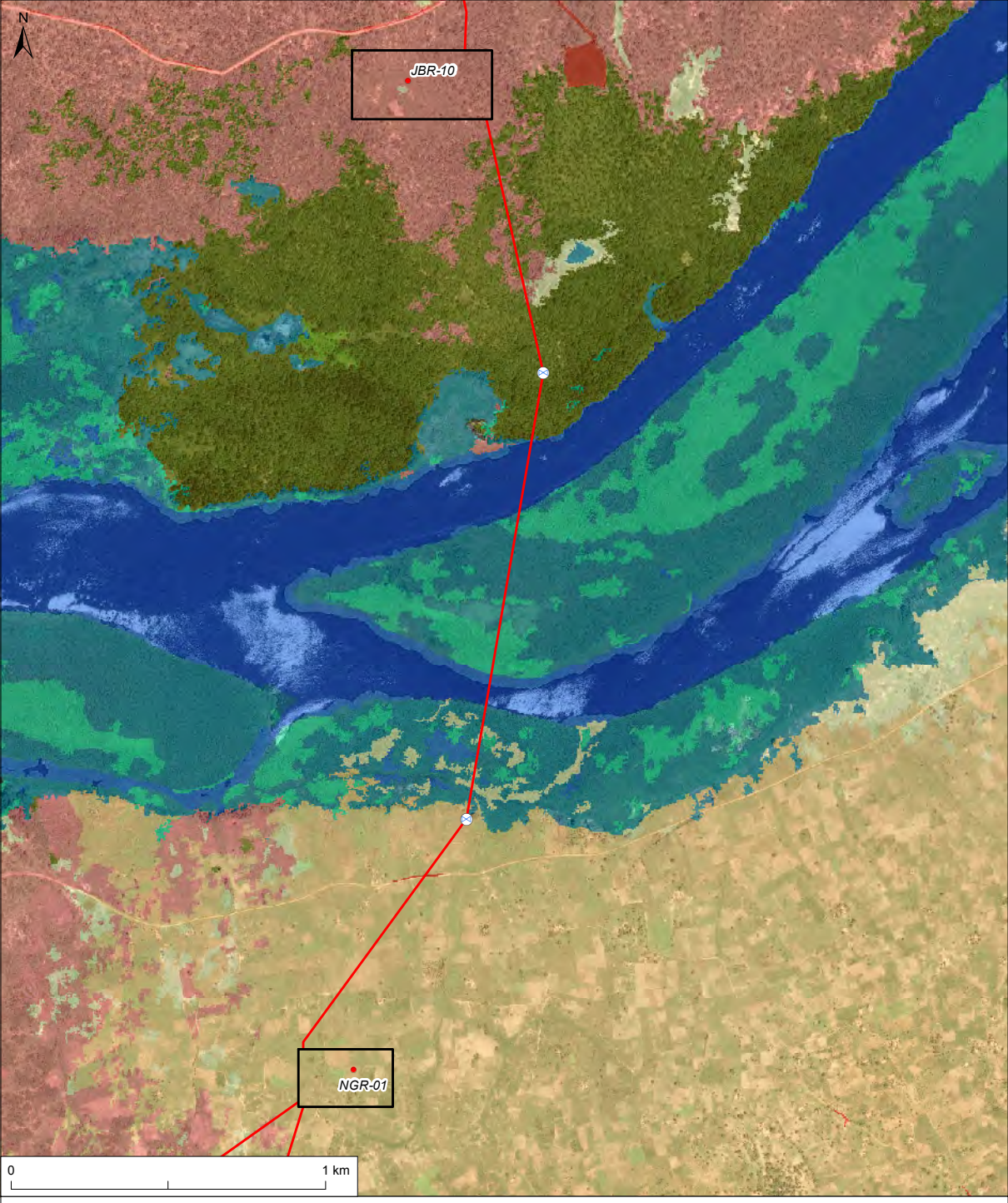

VEGETATION COVER - NIV (Option 2) to NIV (Option 2)

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 2
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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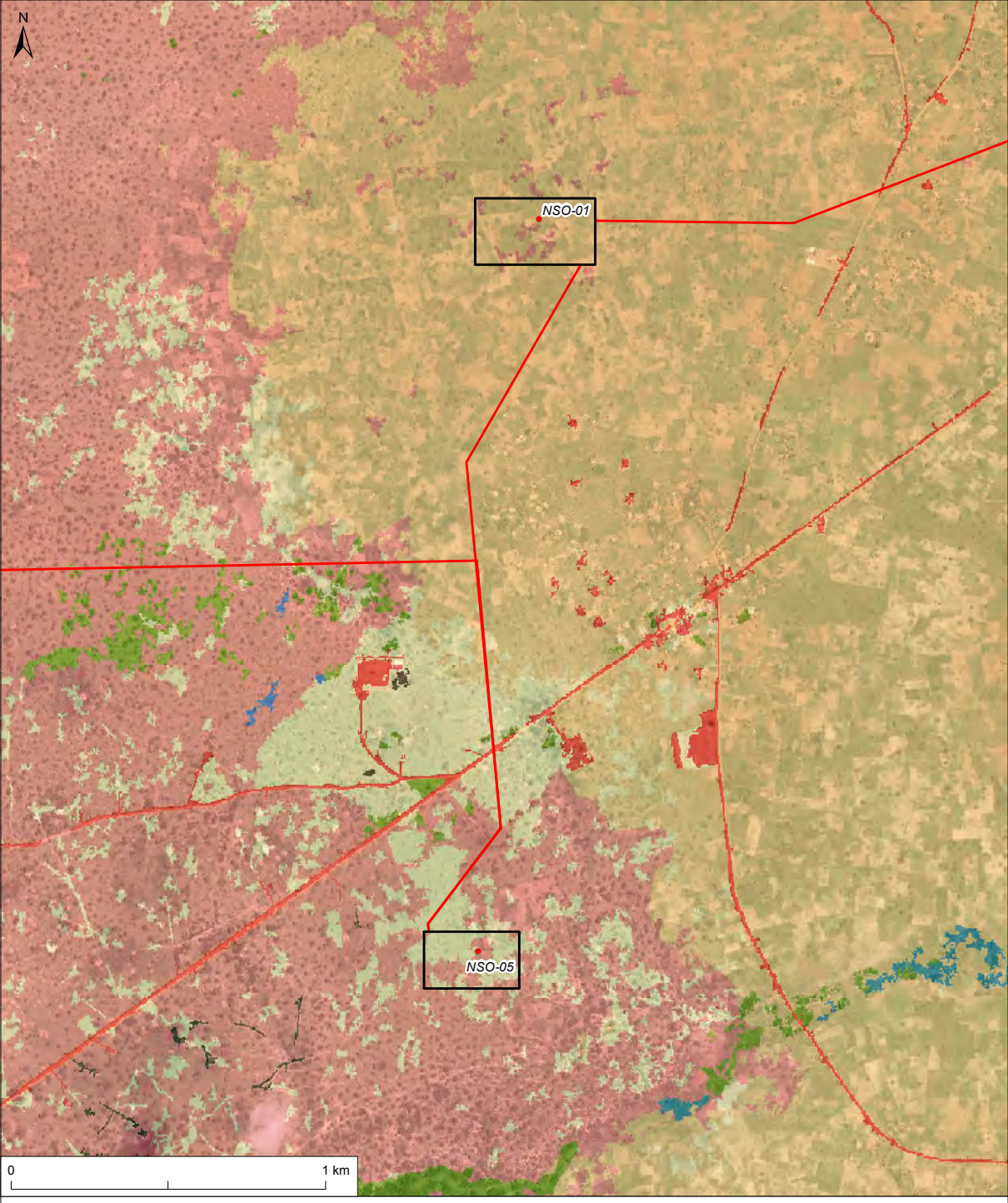

VEGETATION COVER - NSO-01 to NSO-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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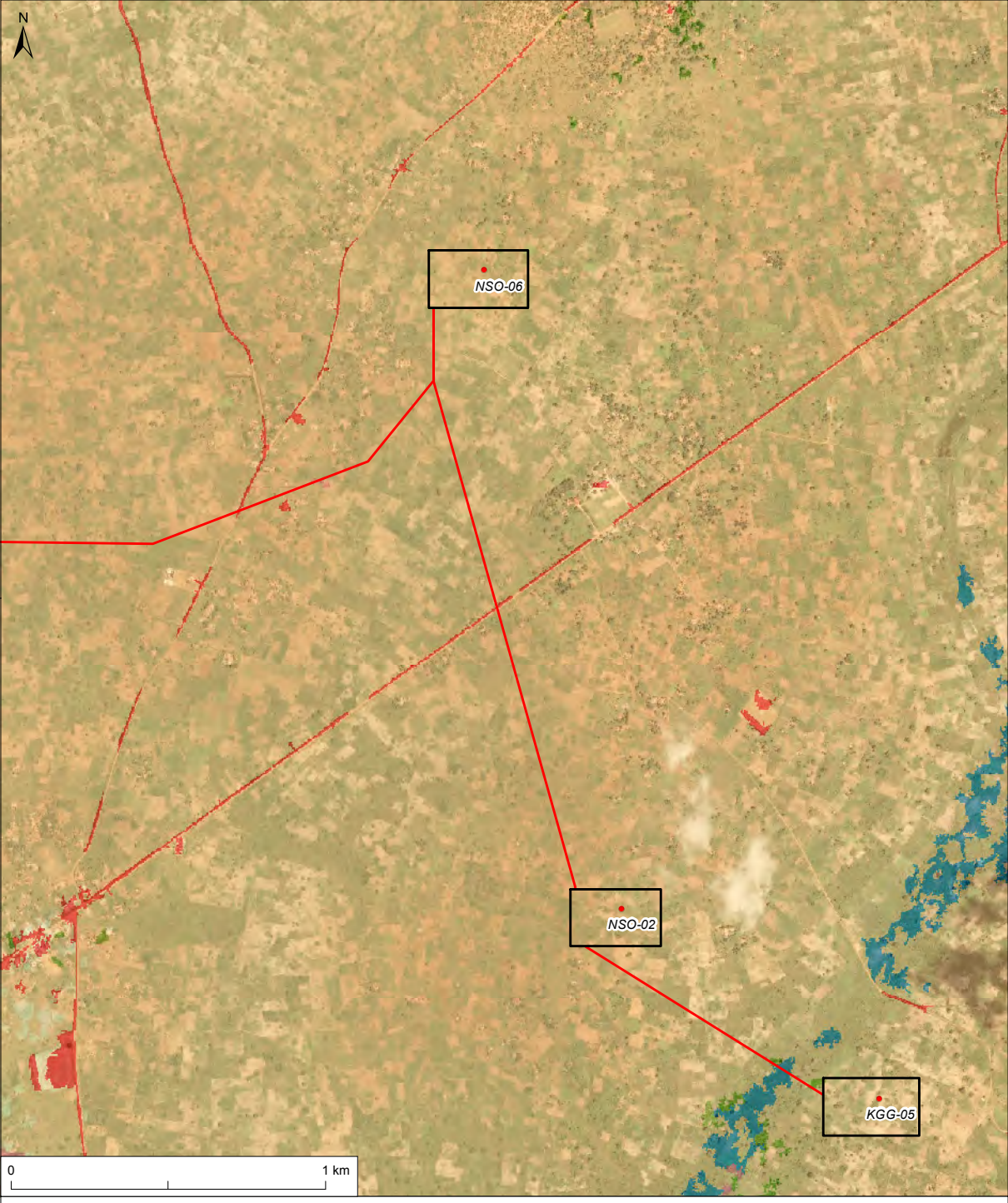


VEGETATION COVER - NSO-02 to NSO-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

VEGETATION COVER - NSO-03 to CPF

- Wellpad location
- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

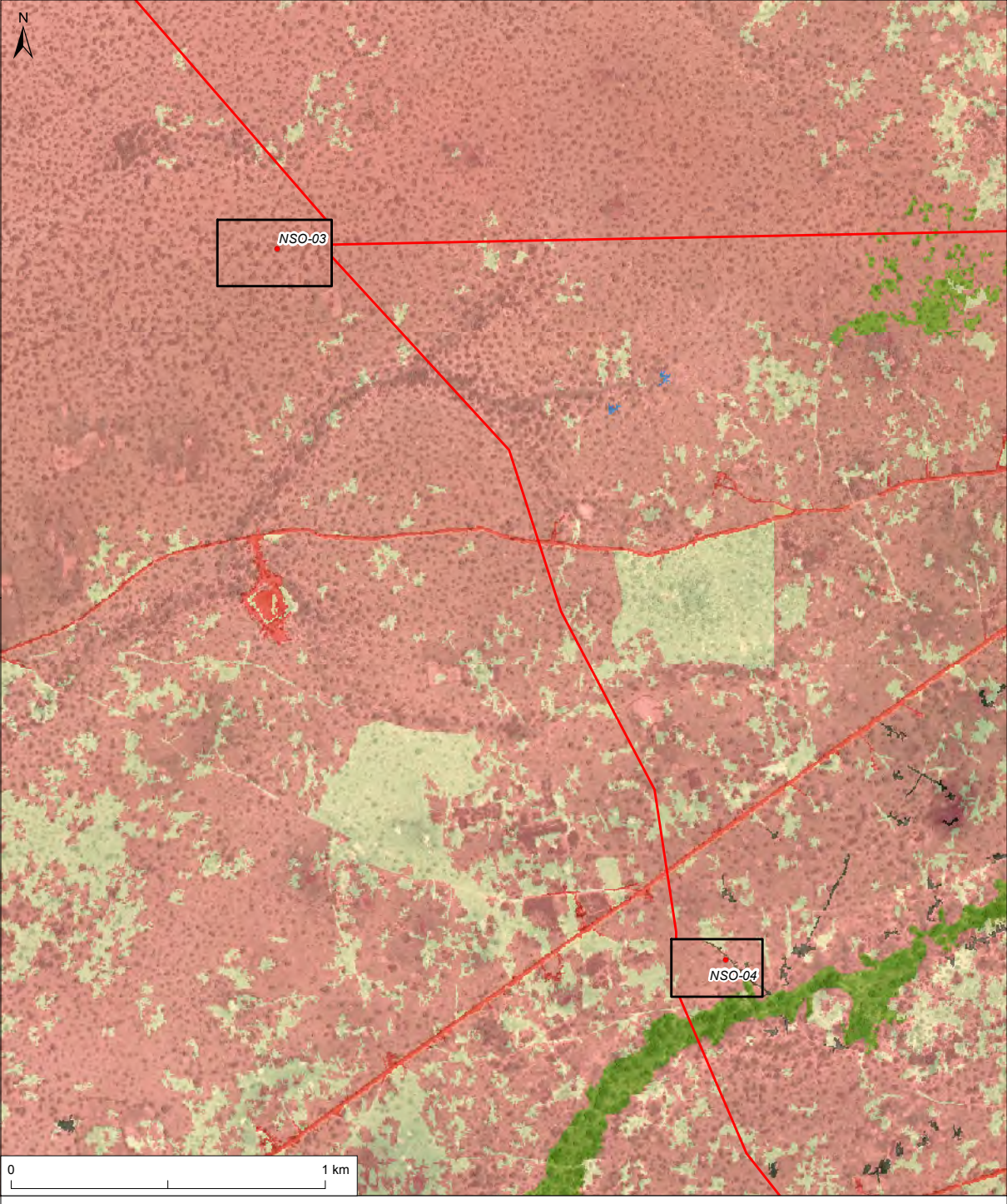
Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Small-scale Farming AG2

TILENGA PROJECT

AECOM

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N



VEGETATION COVER - NSO-04 to NSO-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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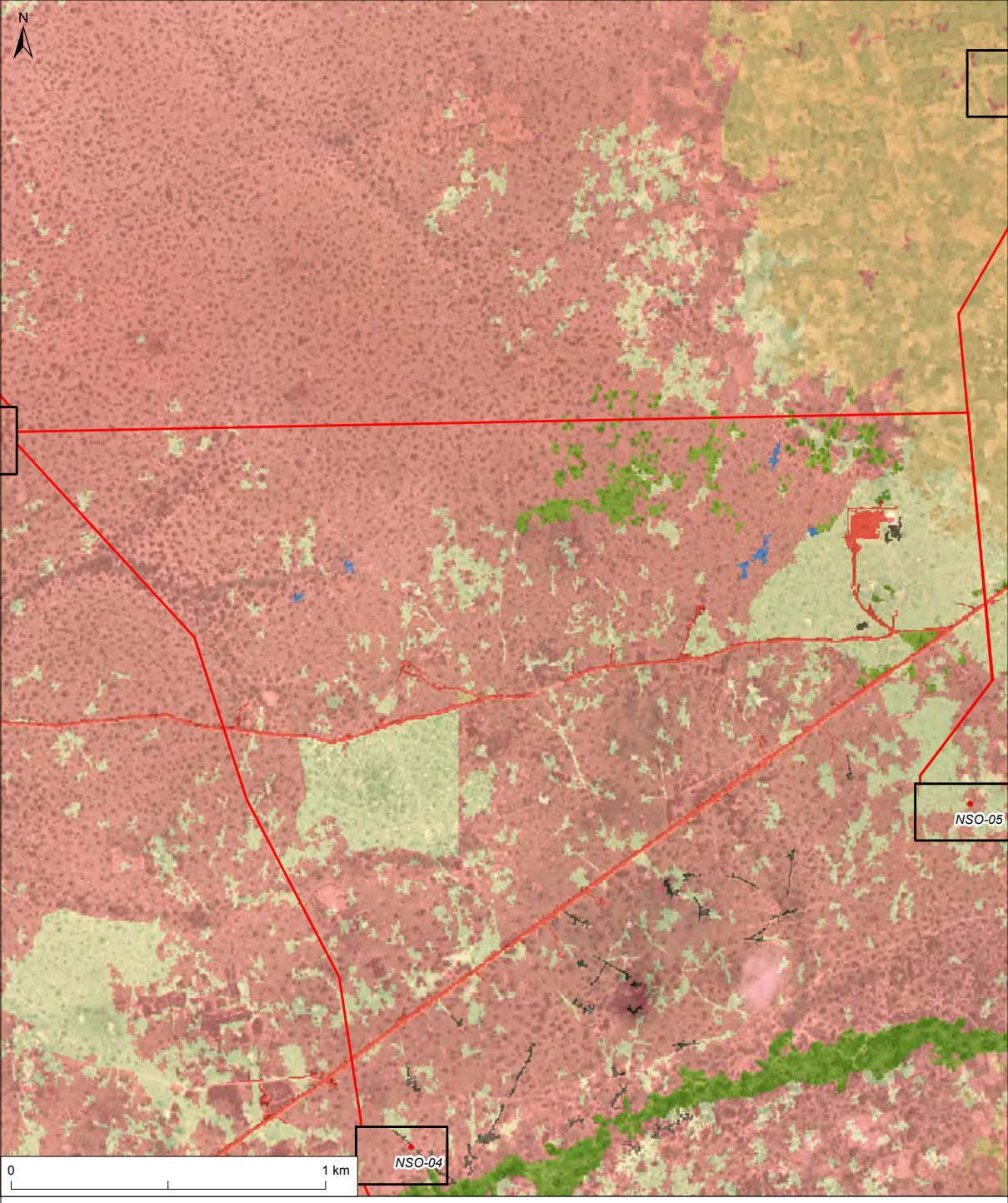

VEGETATION COVER - NSO-05 to NSO-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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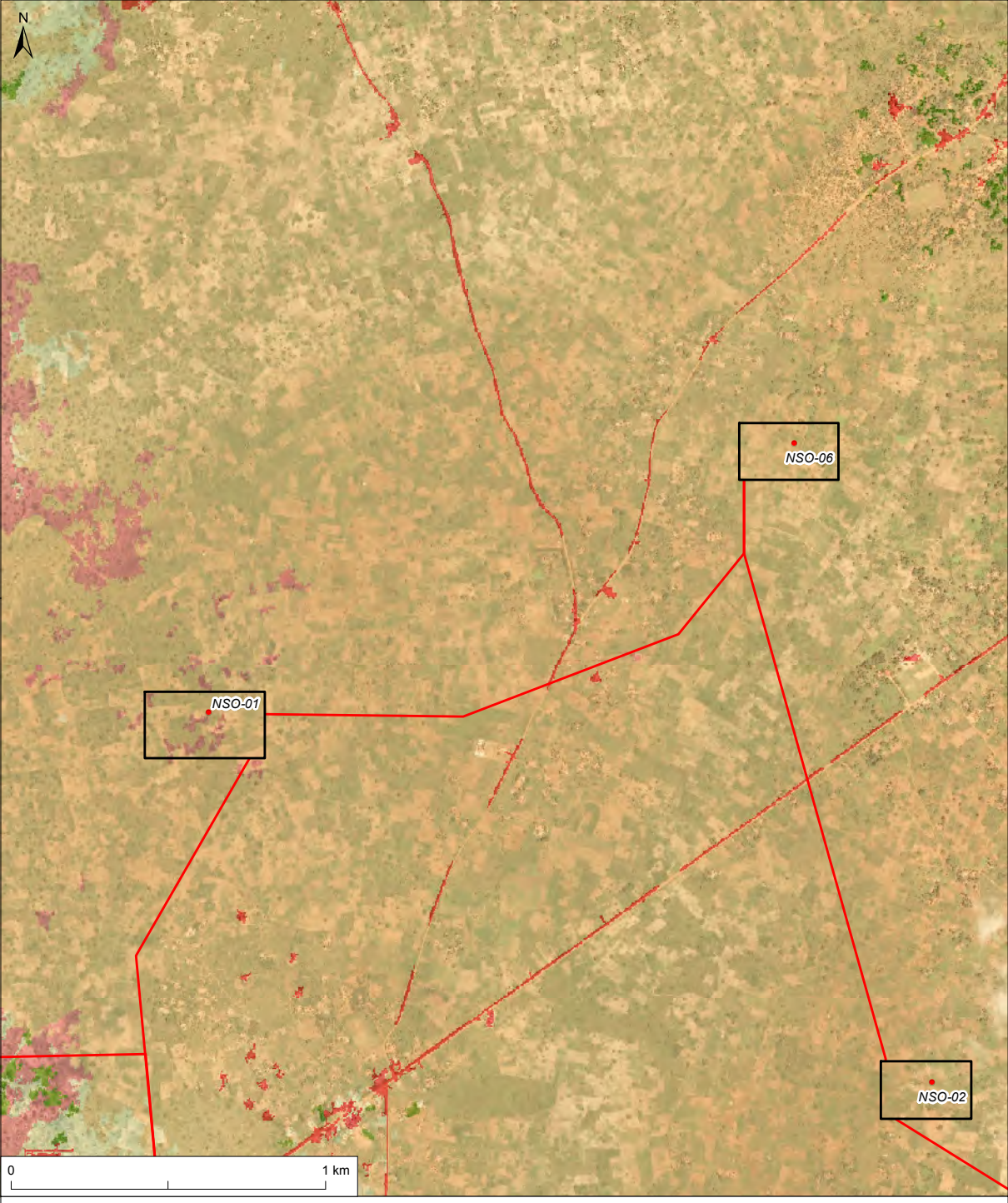

VEGETATION COVER - NSO-06 to NSO-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Closed Moist Woodlands WO1
- Dry Grassland GR2
- Open Moist Woodlands WO1
- Small-scale Farming AG2
- Swamps WE1 (L-B X)

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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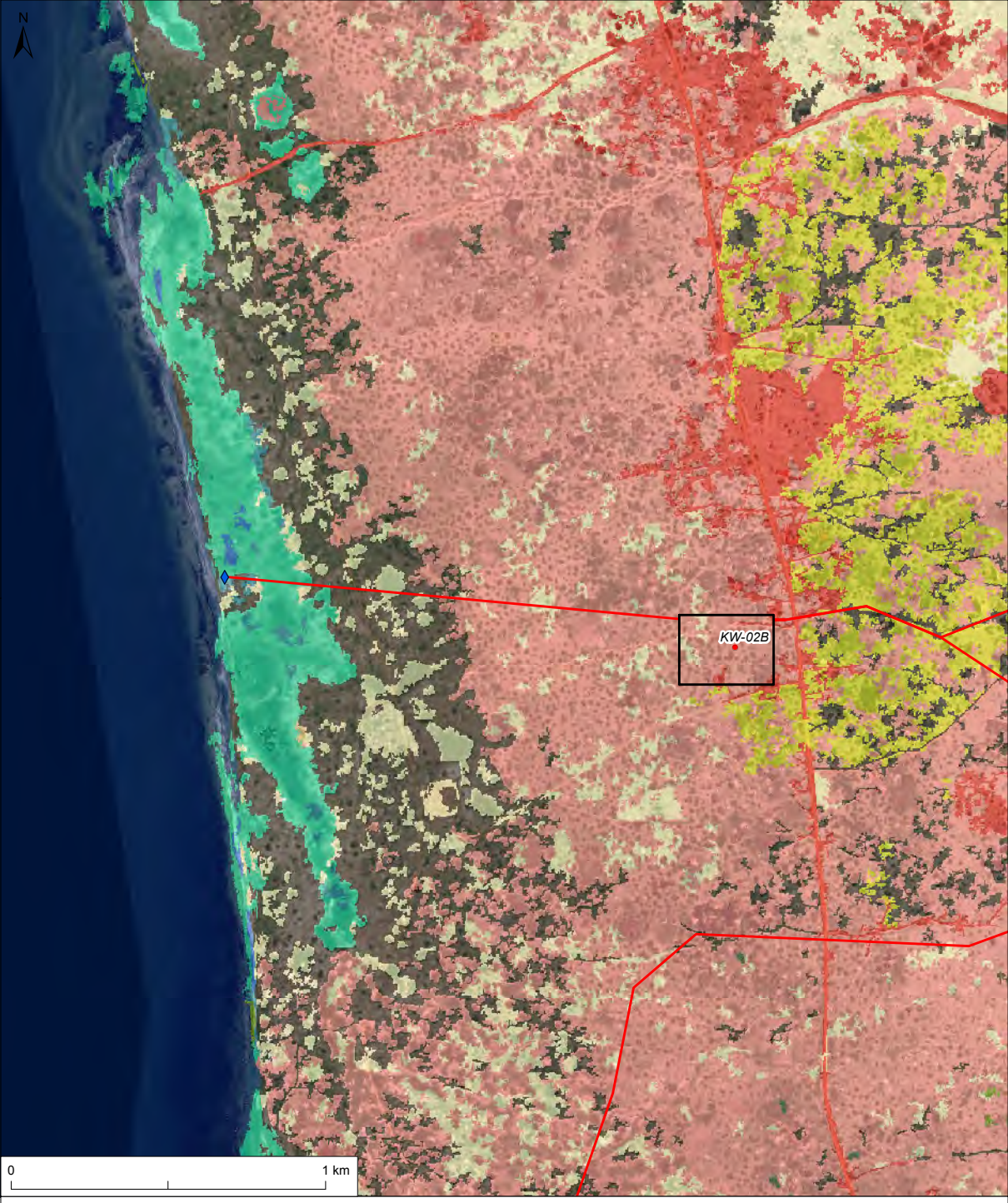

VEGETATION COVER - Water station to KW-02B

- Wellpad location
- Wellpad Extent - Maximum
- Water Abstraction System
- Production and Injection Network

Land Cover Class (WCS 2017)

- Bare Soil (rural) IR3
- Built-up Areas BU
- Bushlands SH2 (L-B T)
- Cyperus Papyrus Swamp WE11 (L-BX1)
- Dry Grassland GR2
- Dry Wooded Grassland WG2
- Open Moist Woodlands WO1
- Permanent Rivers PR
- Small-scale Farming AG2
- Standing Waters SW (L-B WW)
- Swamps WE1 (L-B X)

TILENGA PROJECT

AECOM

Drawn: LC Checked: GM Approved: MW Date: 27/03/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

APPENDIX N3 to N5

Tilenga Project

Sensitivity Mapping

2018

ECOLOGICAL SENSITIVITY MAPPING - KEY

AECOM Survey
- Animal activity/signs
- Animal activity/signs - Leopard
- Bare ground
- Bat roost
- Burrow
- Context feature
- Dust/Sand Bath
- Enclosure
- Erodible/Friable Soils
- Fallow
- Graves
- Gully
- Grassland
- Invasive species
- Lek
- Marsh/Wetland
- Mature tree
- Nest
- New house
- NFA Reserved Species - Albizia spp.
- Non-native/Ornamental
- Notable Tree
- Notable Tree - African Blackwood
- Notable Tree - Kigelia
- Poaching
- Raptor roost
- Recruitment
- Salk Lick
- Seasonal flooding
- Shade/Resting area
- Social Value
- Standing Water
- Termite mound
- Thickets and Bush
- Uganda Red List (EN); NFA Reserved species - Milicia excelsa
- Uganda Red List (VU); NFA Reserved Species - Dalbergia melanoxylon
- Uganda Red List (VU) - Tamarindus indica
- Wallow
- Uncommon species
- Unique tree

AECOM Survey
- ACTIVE CORE KOB LEK
- ACTIVE KOB LEK BUFFER
- AGGREGATION GROUND
- BIRD COLONIES
- BORAS
- BURROW
- CLAYLICK
- CROCODILE ROOSTS
- Chance Find
- DEADW
- ECLIF
- ELEPHANT
- FISH BREEDING
- GULLY
- HIPPO PODS
- INACTIVE CORE KOB LEK
- MARSH/POND
- Other Swamp
- SHOEBILL SIGHTING
- WALLOW

G&G Nile Crossing Scouting (TEPU - 2016)
- Animal track / signs
- Bird Area
- Egrets Roosting
- Elephant Foraging
- Erosion Cliff
- Farmland
- Flood Plain; Marsh; Pond
- Hippo Pods
- Lodge
- Mature tree
- Nile Lawn
- Riverrine Forest
- Settlement
- Termite Mound
- Thicket
- Wallow
- Water Channel
- Weaver bird nesting
- Marsh
- Riverine Forest
- Wallow

G&G Alternative Nile Crossing Scouting (TEPU - 2017)
- Burrow
- Fallow/ Farmland
- Bushed grassland with Thicket
- Riverine forest
- Riverine bushed woodland
- Settlement
- Water source
- Open water / Pond
- Seasonally flooded
- Permanent swamp; Wetland
- Termite mound
- Wallow
- Hyaena den
- Wildlife trail

UG 2017 EBFO Flowline Avoidance (Nov 2017)
- Animal track / signs
- Gulley
- Wallow
- Albizia coriaria
- Fruit Tree
- Mature tree
- Riverine forest
- Medicinal/Shade Tree
- Tree planation - Sena siamea
- Open Grassland/Grassland
- Kraal
- Settlement
- Shade Tree
- Dead wood
- Termite mound
- Thicket/Scrub land
- Seasonal river
- Animal drinking point
- Wetland/Swamp

PAD Avoidance (TEPU - 2017)
- Borehole/Open Water Source
- Compounds and other buildings
- Burial Place
- Play Ground/School
- Meeting Point
- Firewood collection
- Crop Area/Fruit trees
- Livestock grazing/Cattle Kraal
- Thickets and Bush
- Mature tree / Social value
- Mature tree
- Seasonal flooding
- Other

PAD Avoidance (TEPU - 2017)
- Active Kob Lek
- Pond
- Wallow
- Cattle corridor

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018

TILENGA PROJECT
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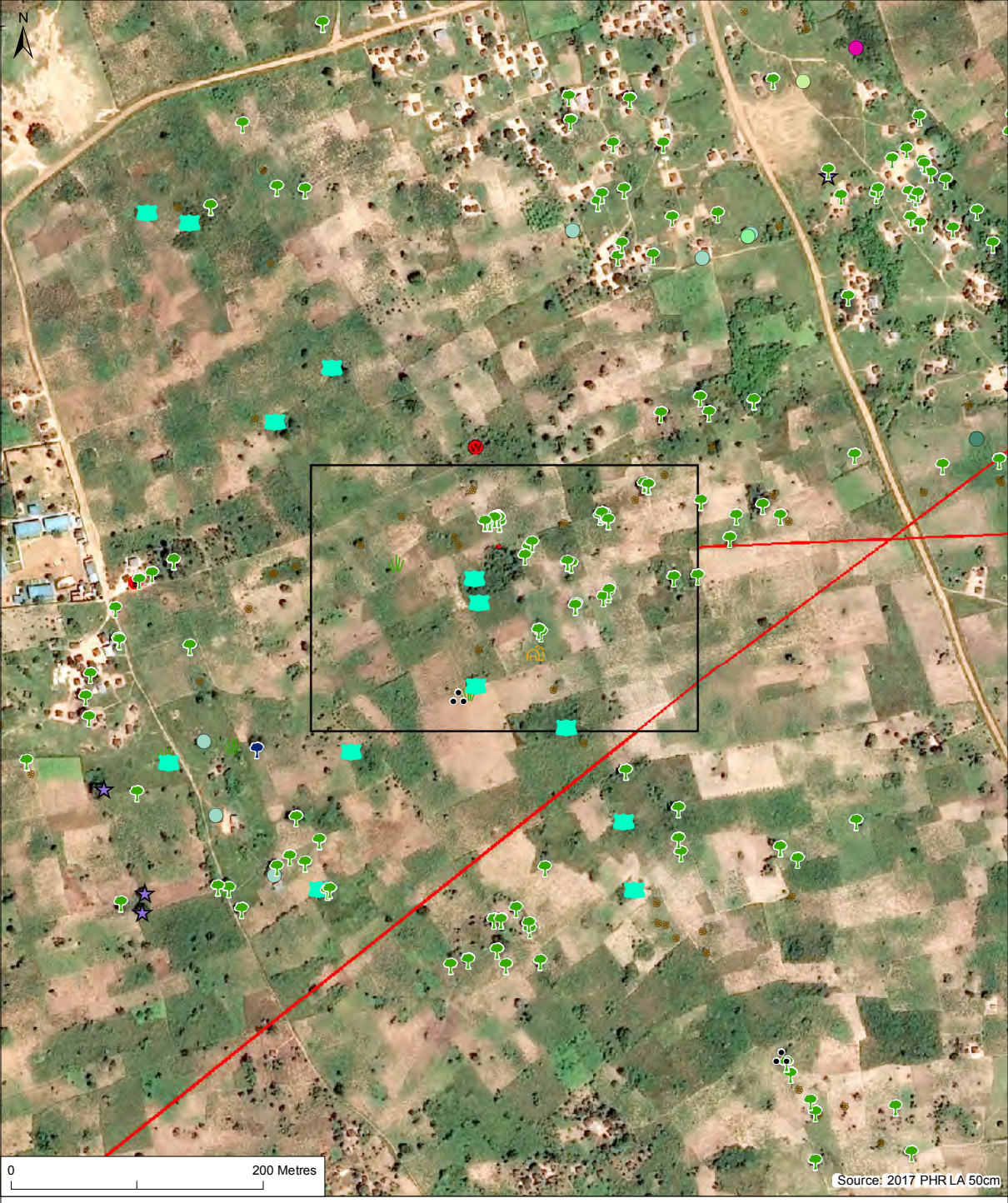

ECOLOGICAL SENSITIVITY MAPPING - GNA-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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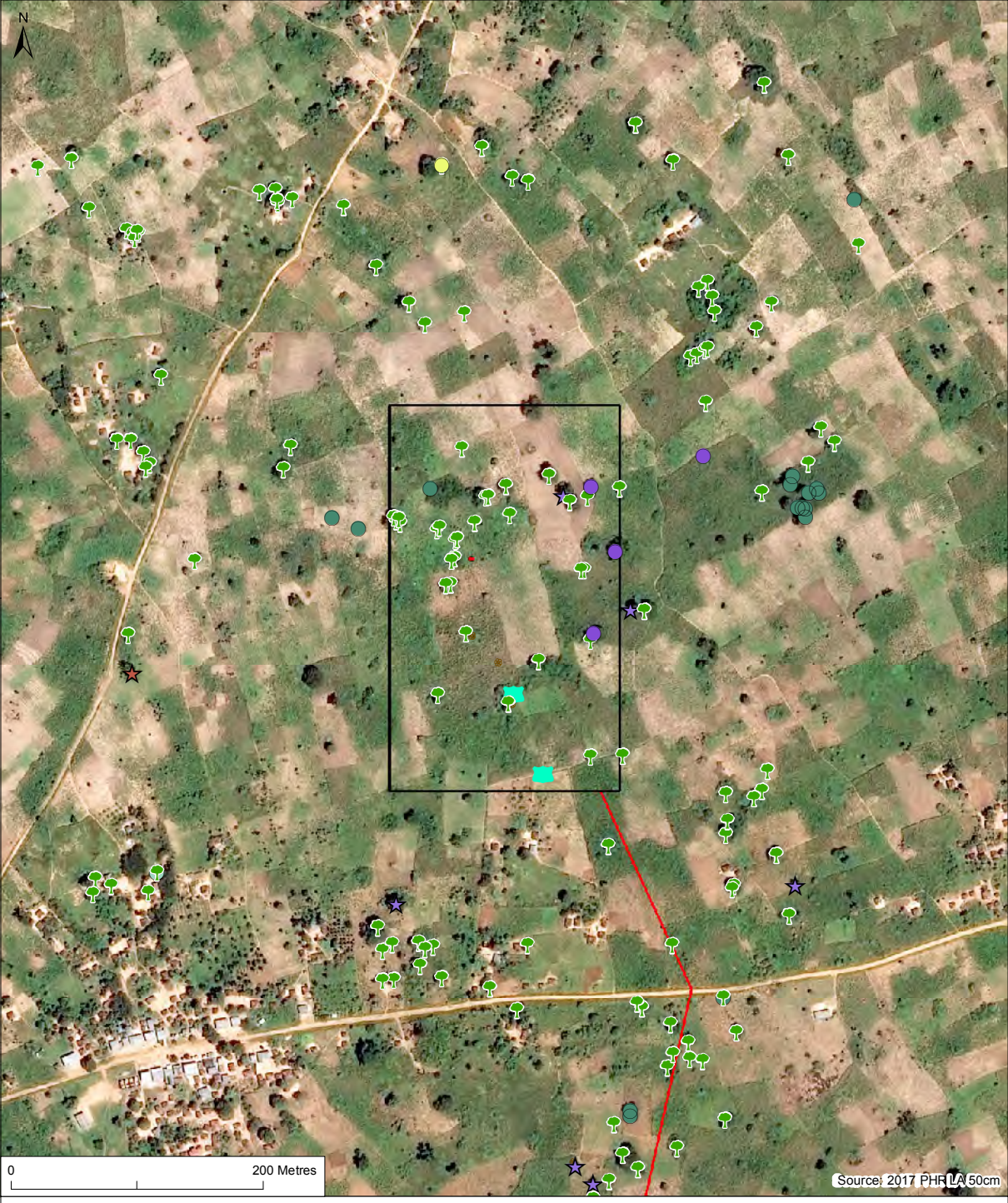
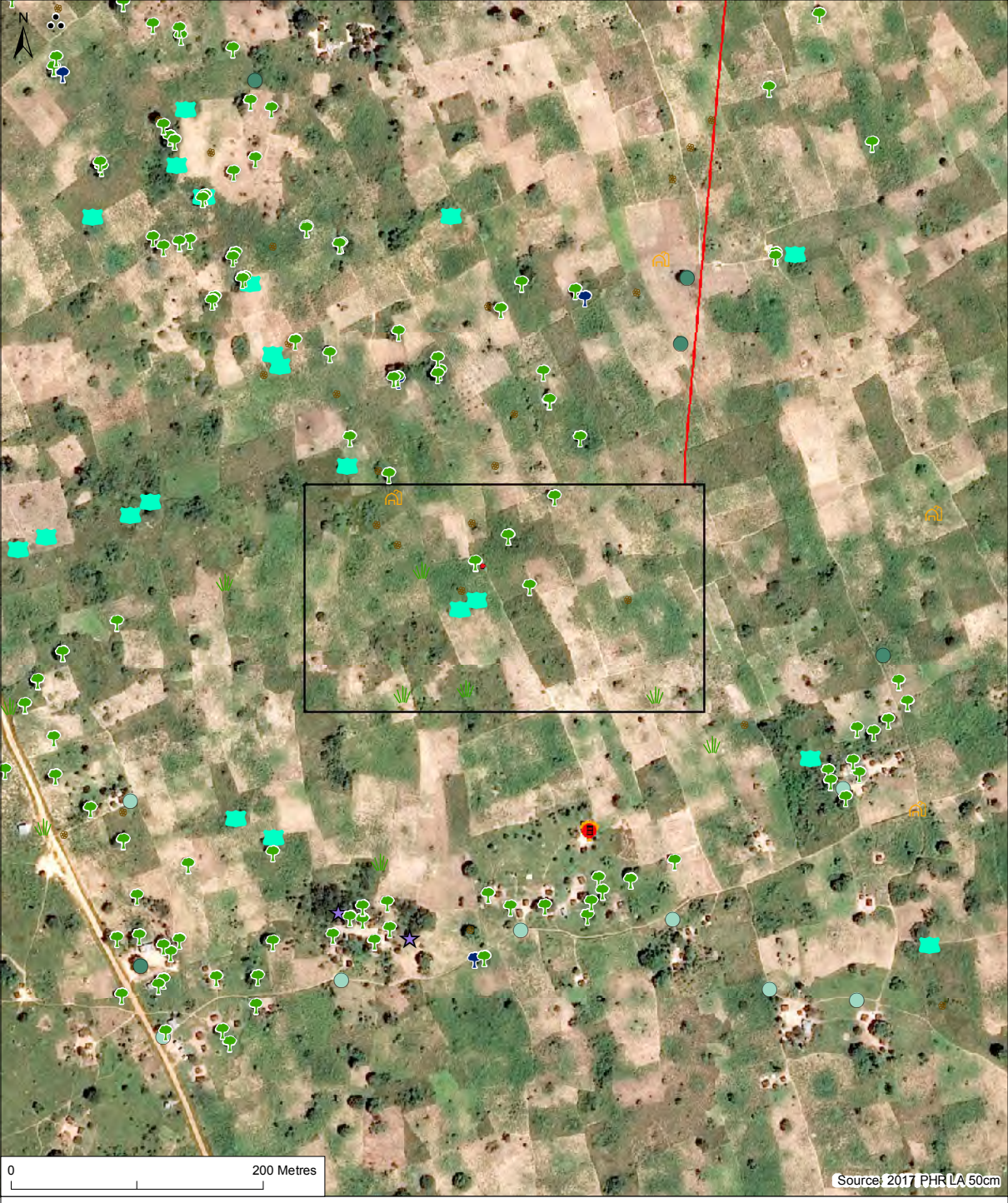


ECOLOGICAL SENSITIVITY MAPPING - GNA-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



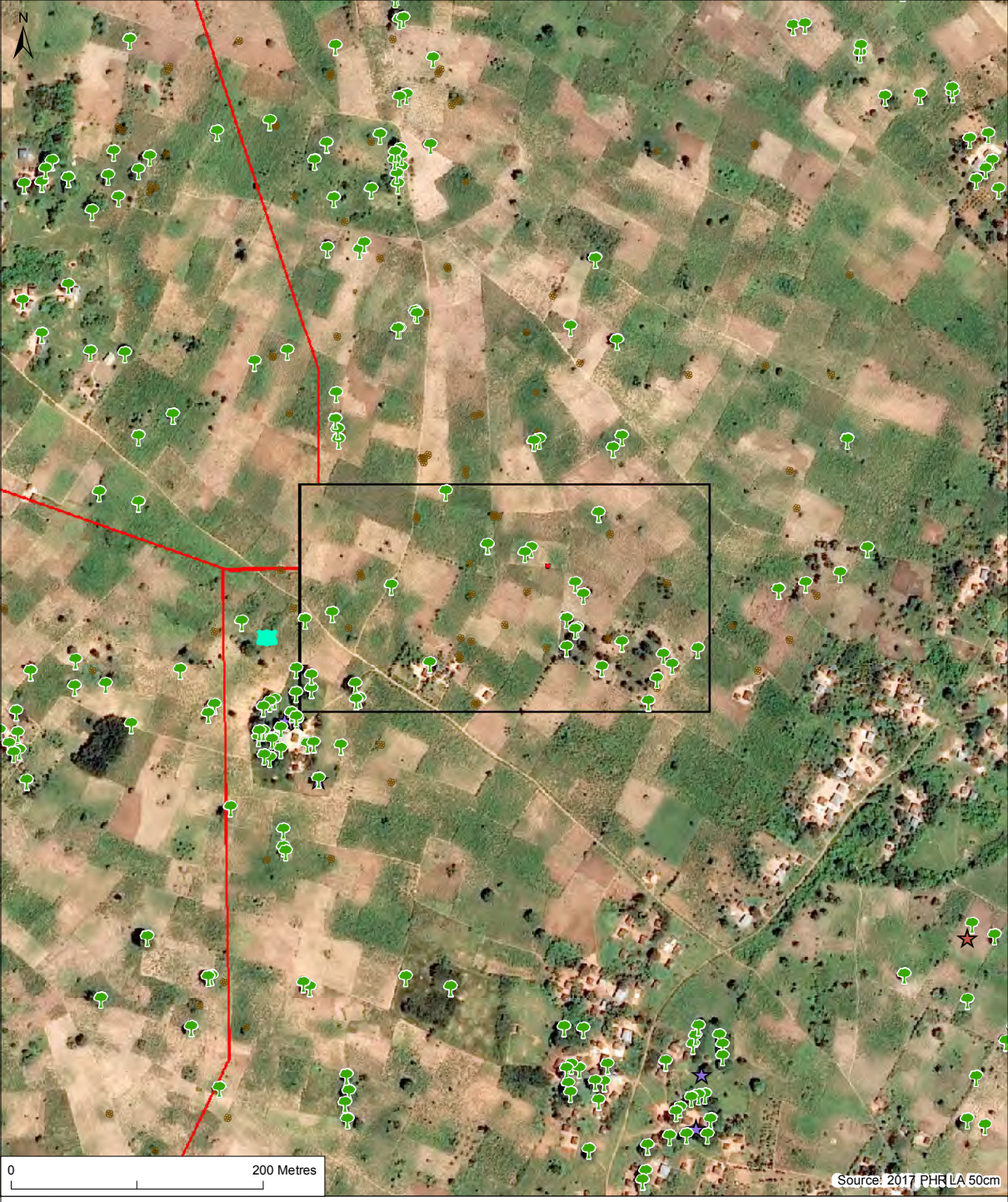
ECOLOGICAL SENSITIVITY MAPPING - GNA-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



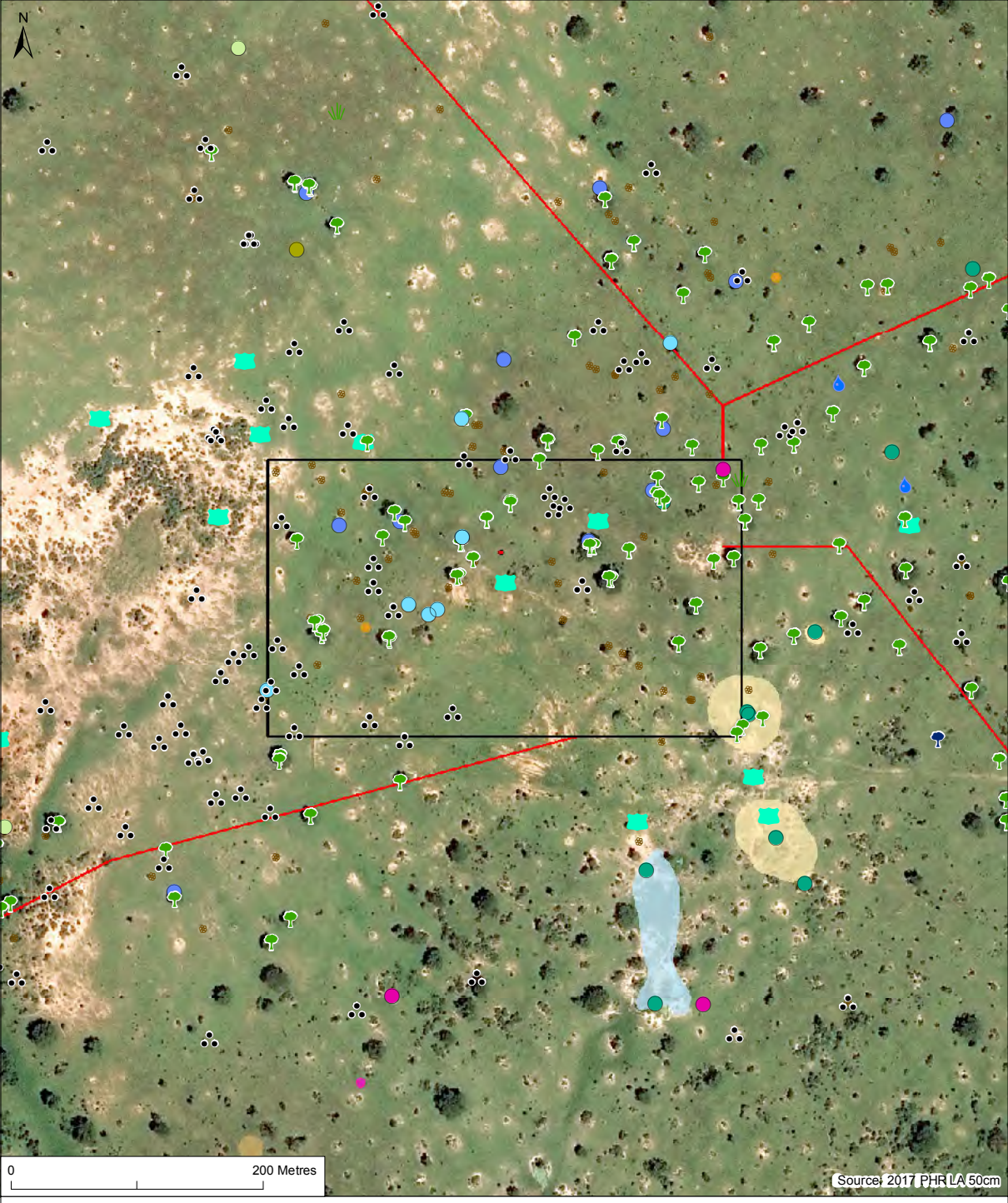
ECOLOGICAL SENSITIVITY MAPPING - GNA-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



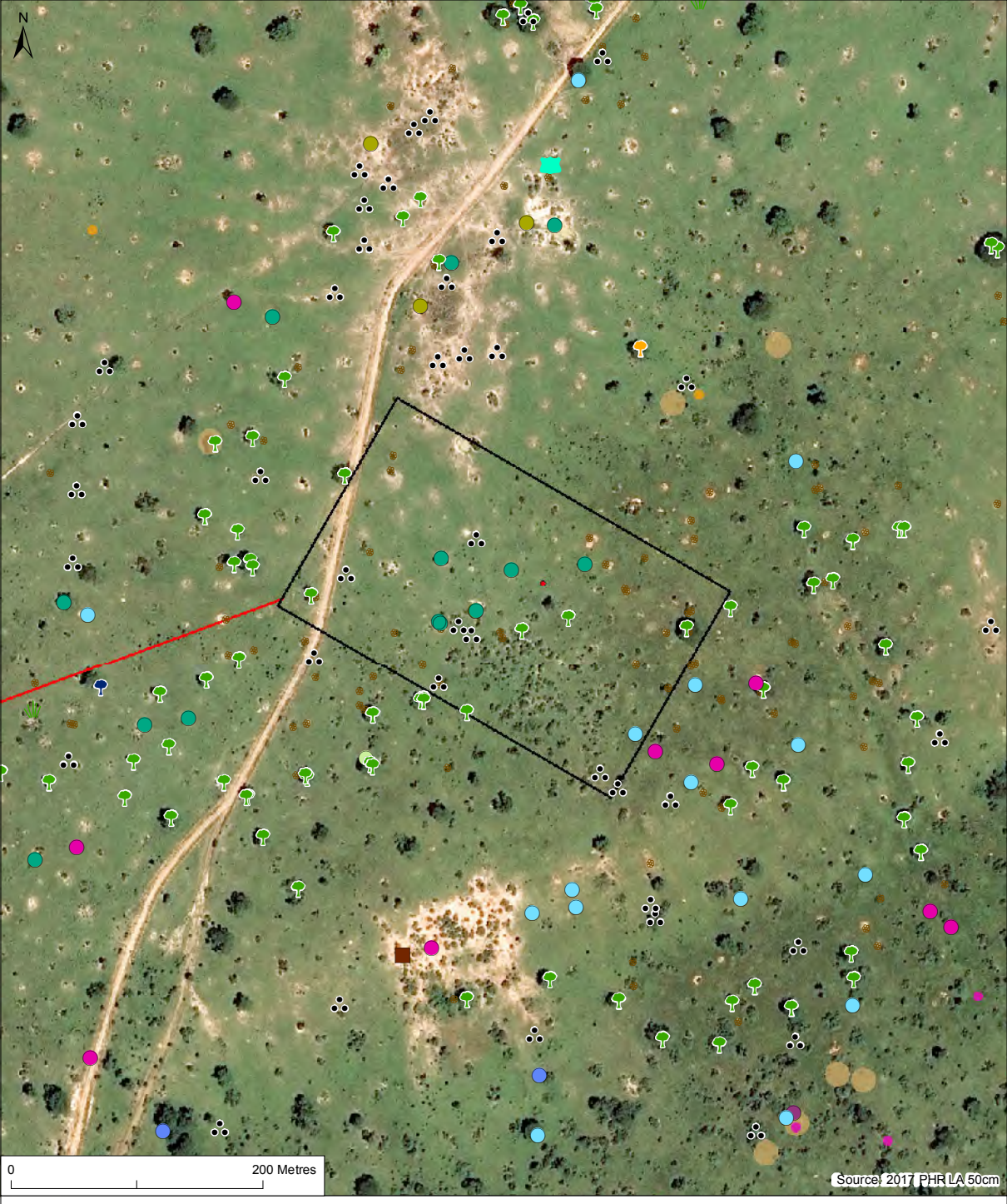
ECOLOGICAL SENSITIVITY MAPPING - JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



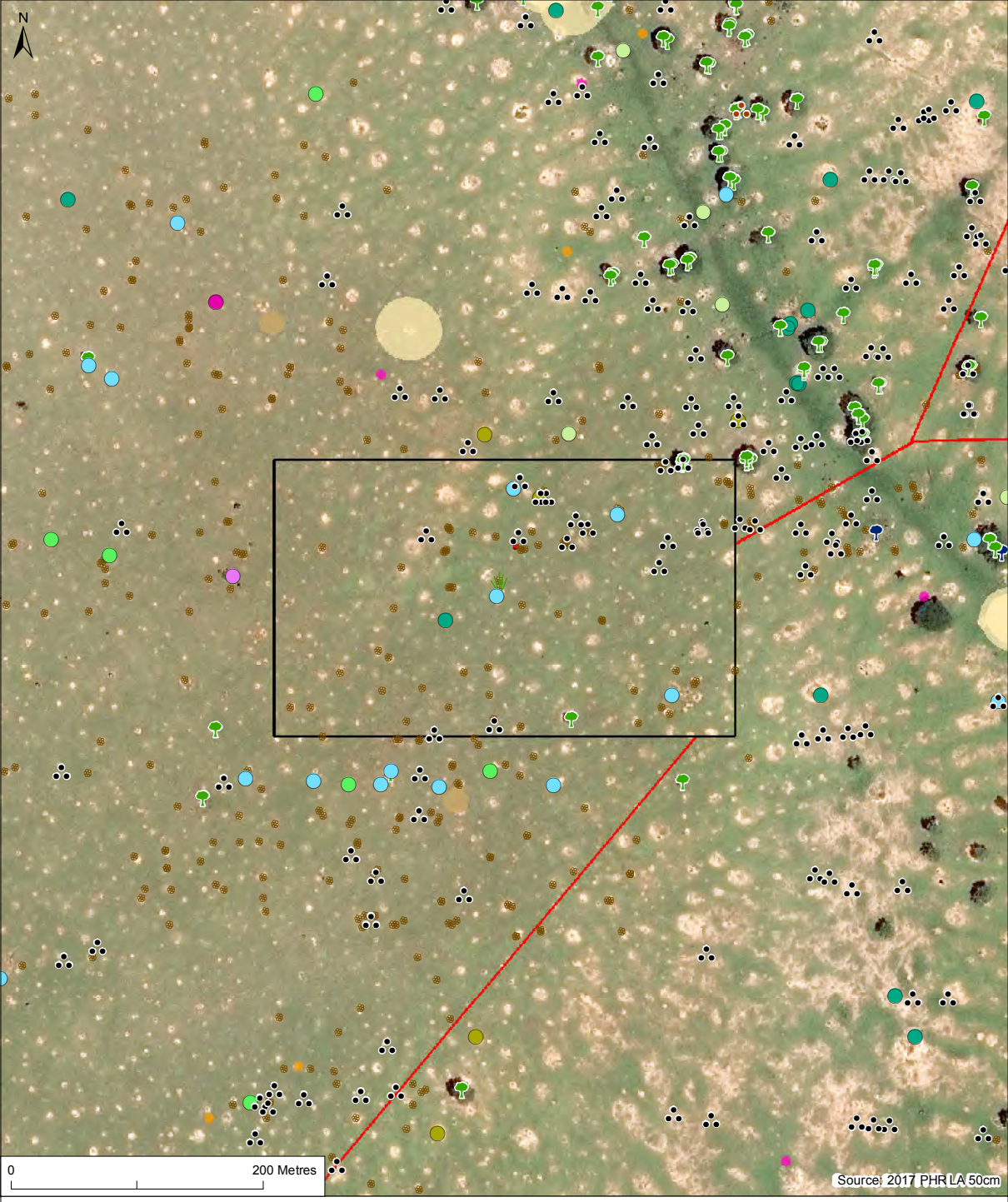
ECOLOGICAL SENSITIVITY MAPPING - JBR-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

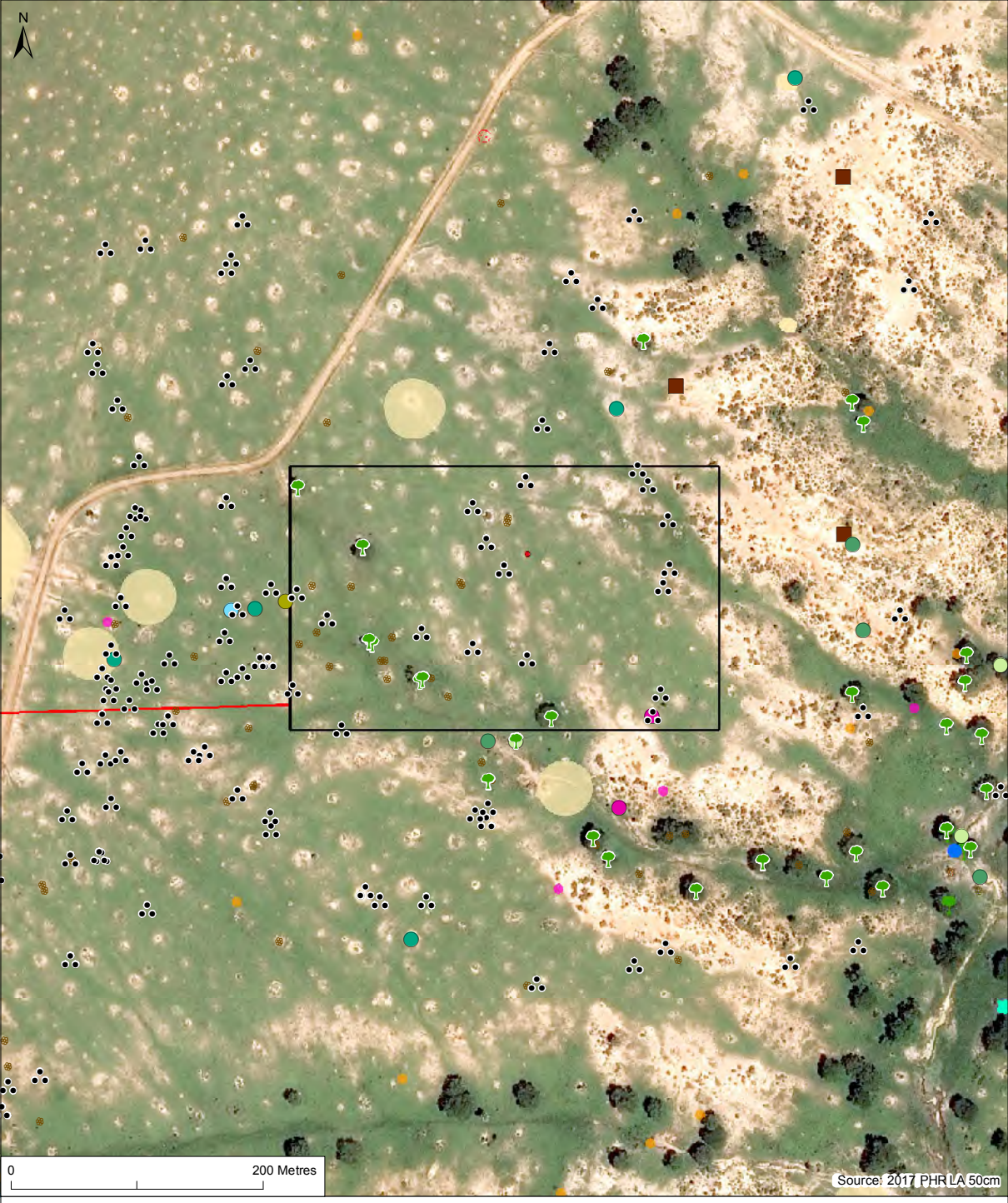


ECOLOGICAL SENSITIVITY MAPPING - JBR-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



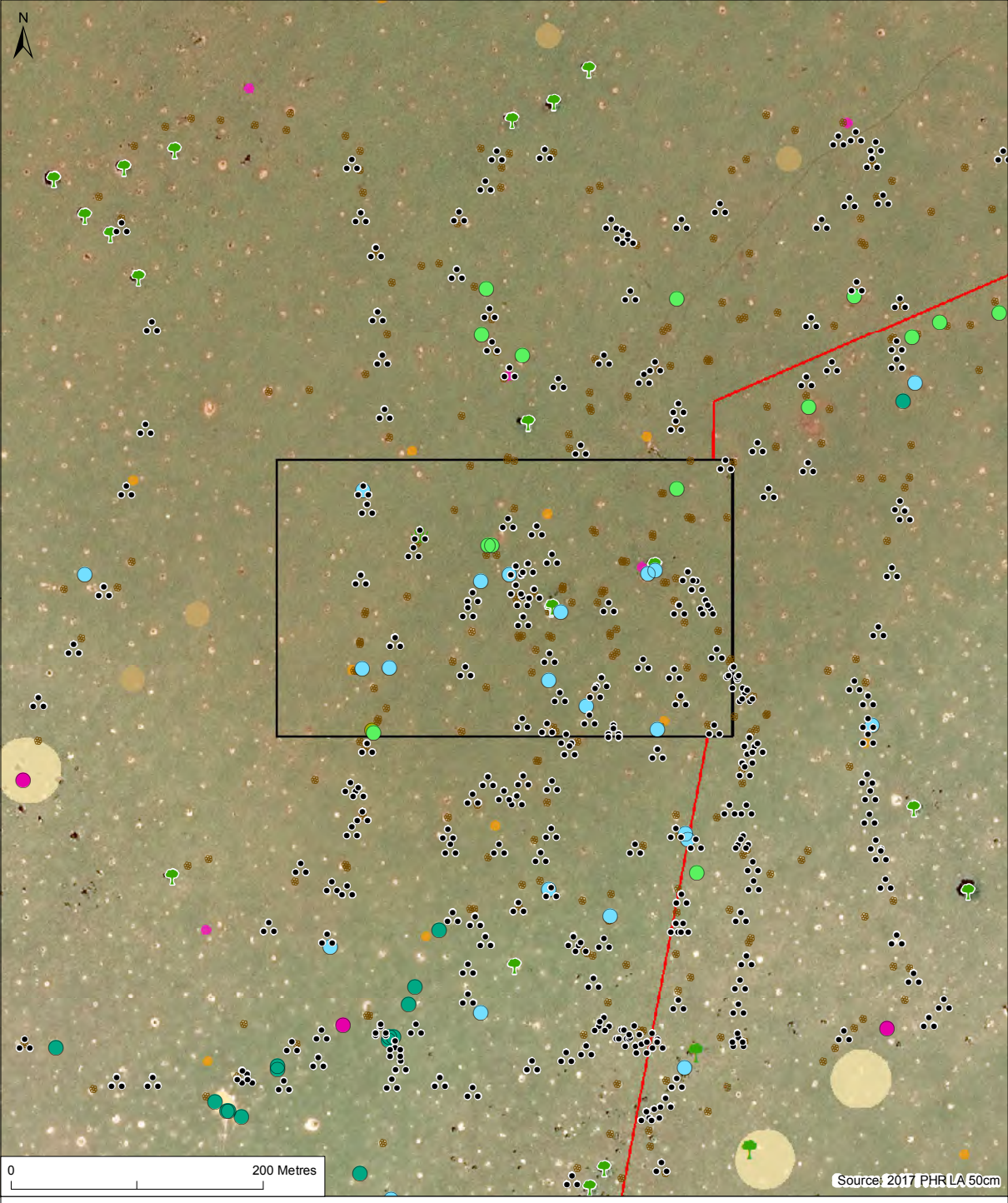
ECOLOGICAL SENSITIVITY MAPPING - JBR-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



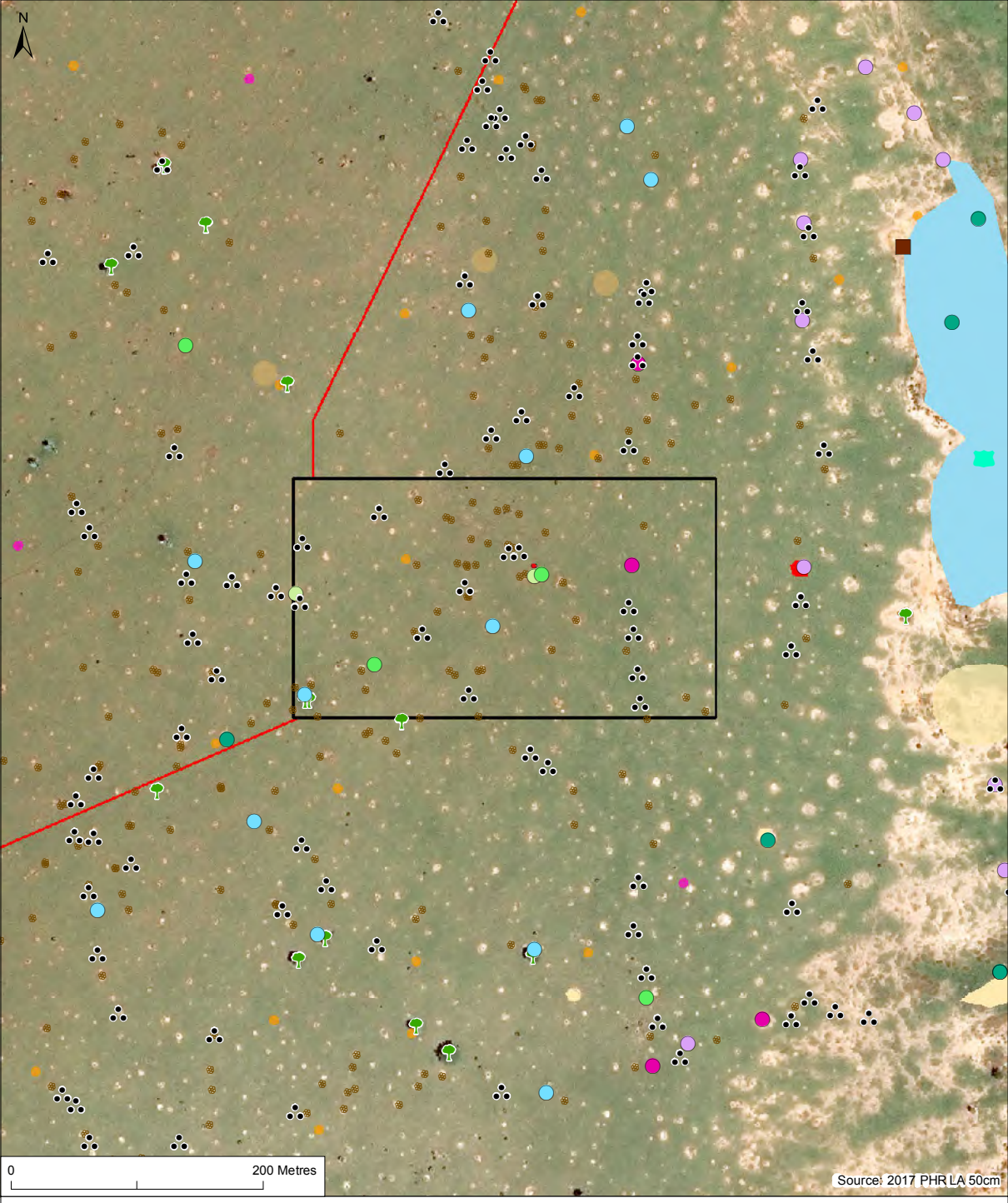
ECOLOGICAL SENSITIVITY MAPPING - JBR-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



ECOLOGICAL SENSITIVITY MAPPING - JBR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

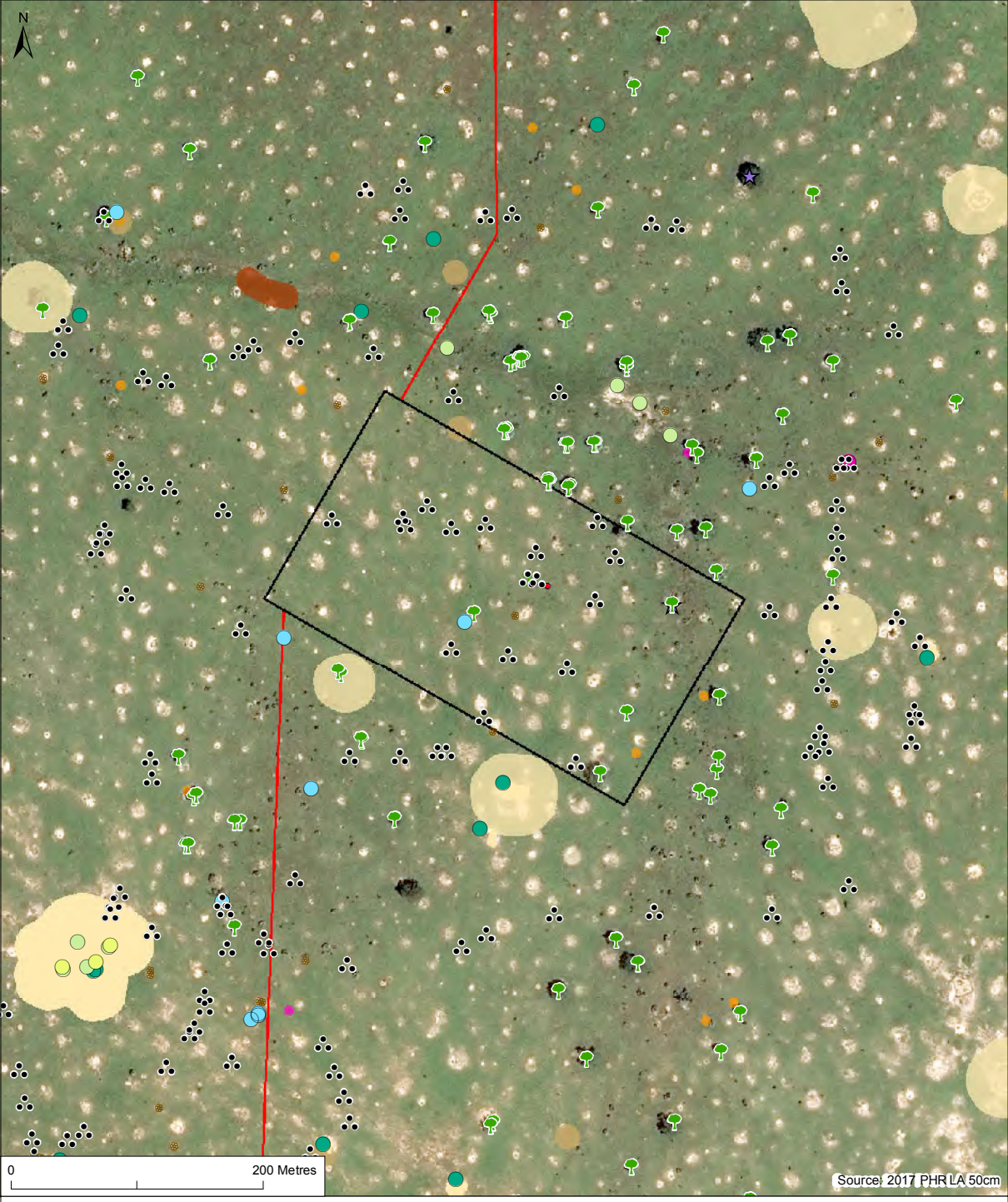
ECOLOGICAL SENSITIVITY MAPPING - JBR-07

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



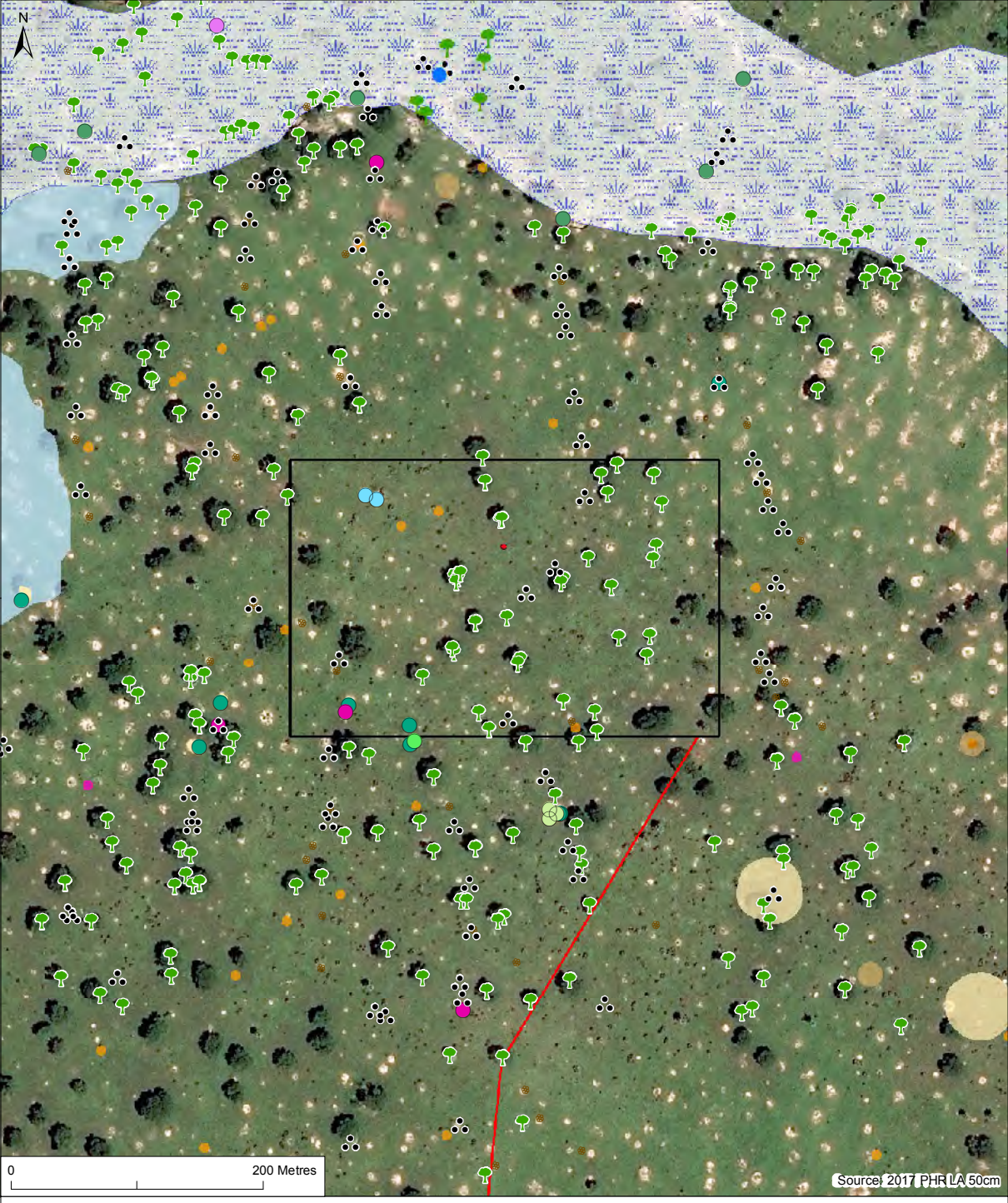
ECOLOGICAL SENSITIVITY MAPPING - JBR-08

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



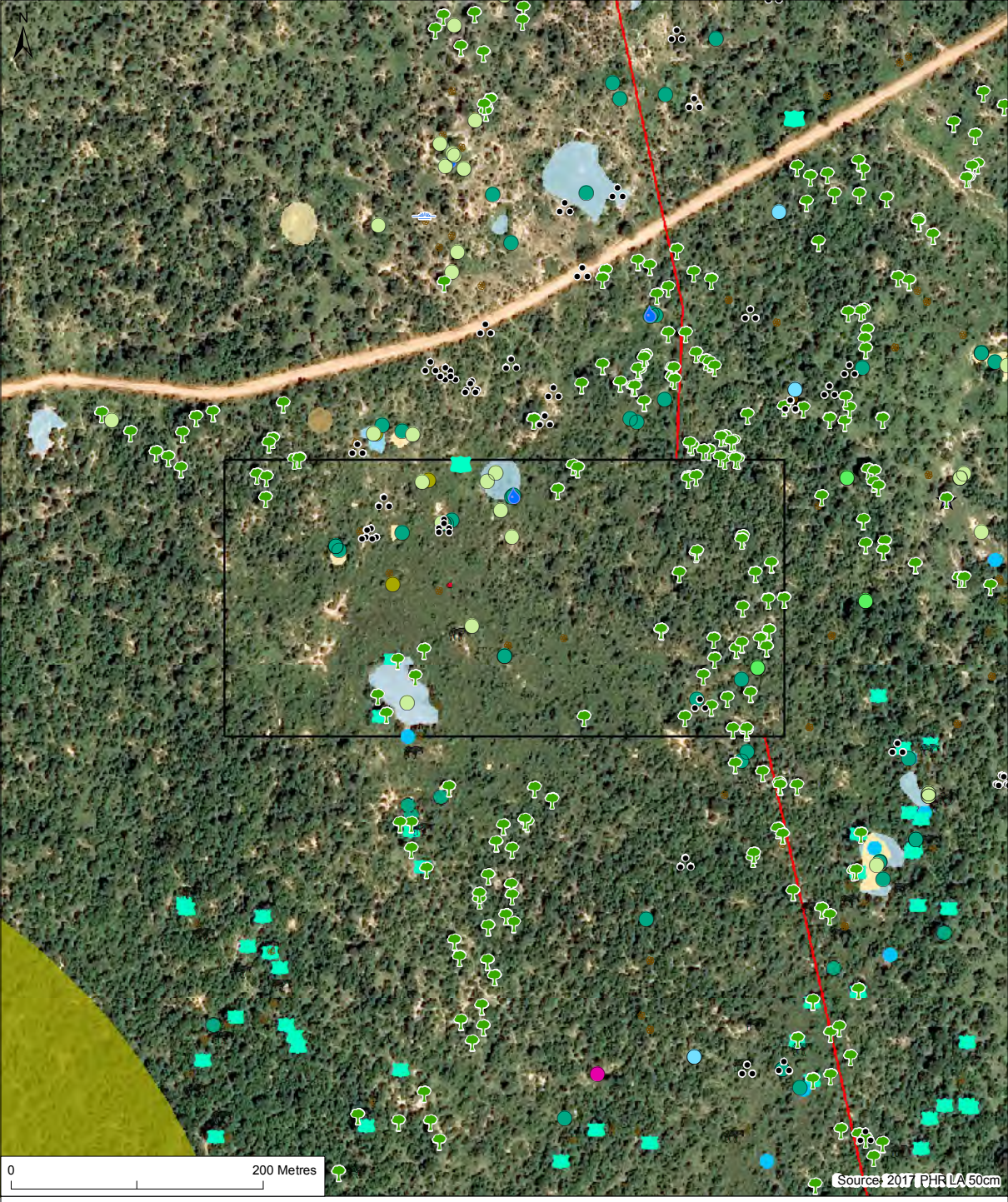
ECOLOGICAL SENSITIVITY MAPPING - JBR-09

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



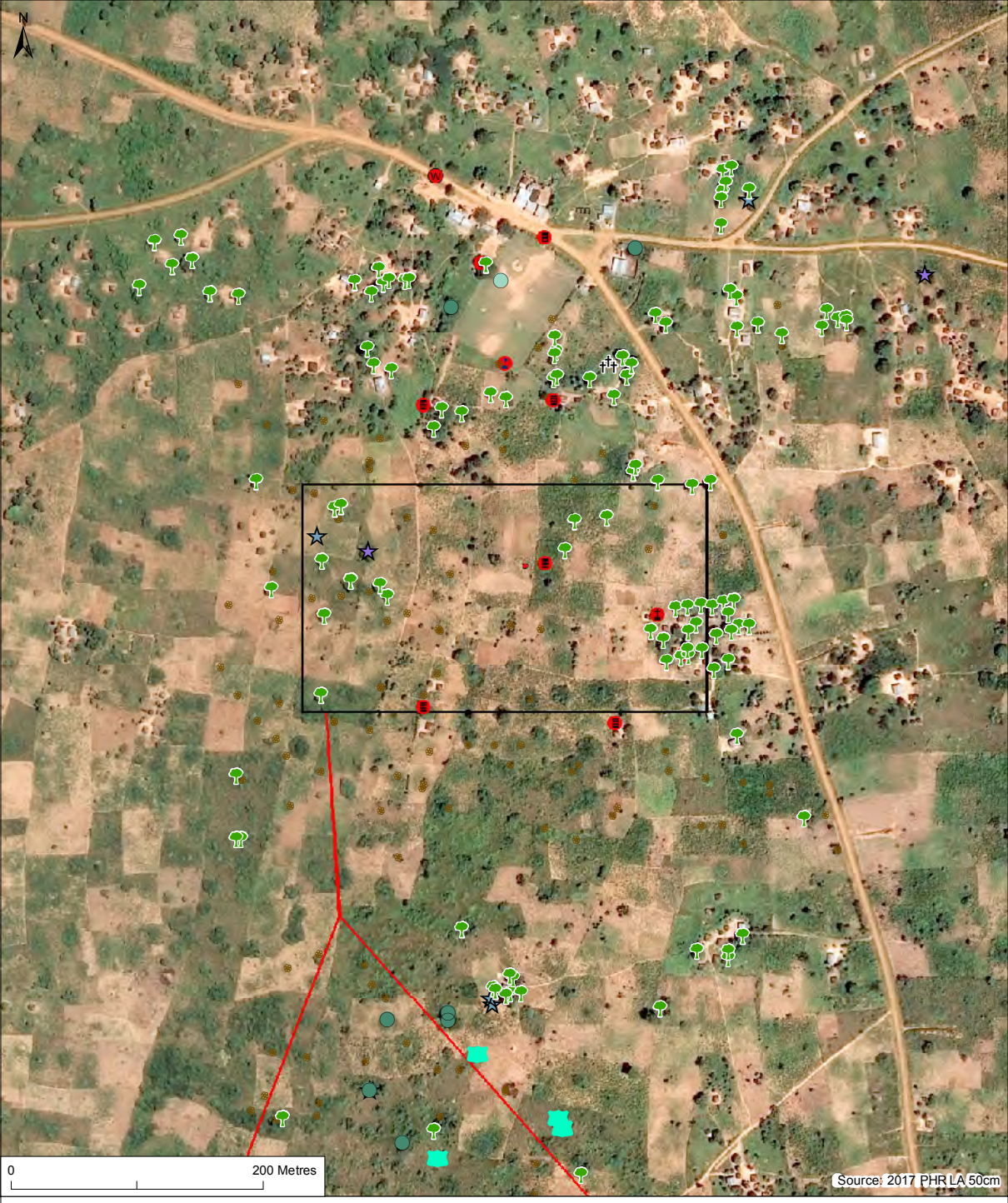
ECOLOGICAL SENSITIVITY MAPPING - JBR-10

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



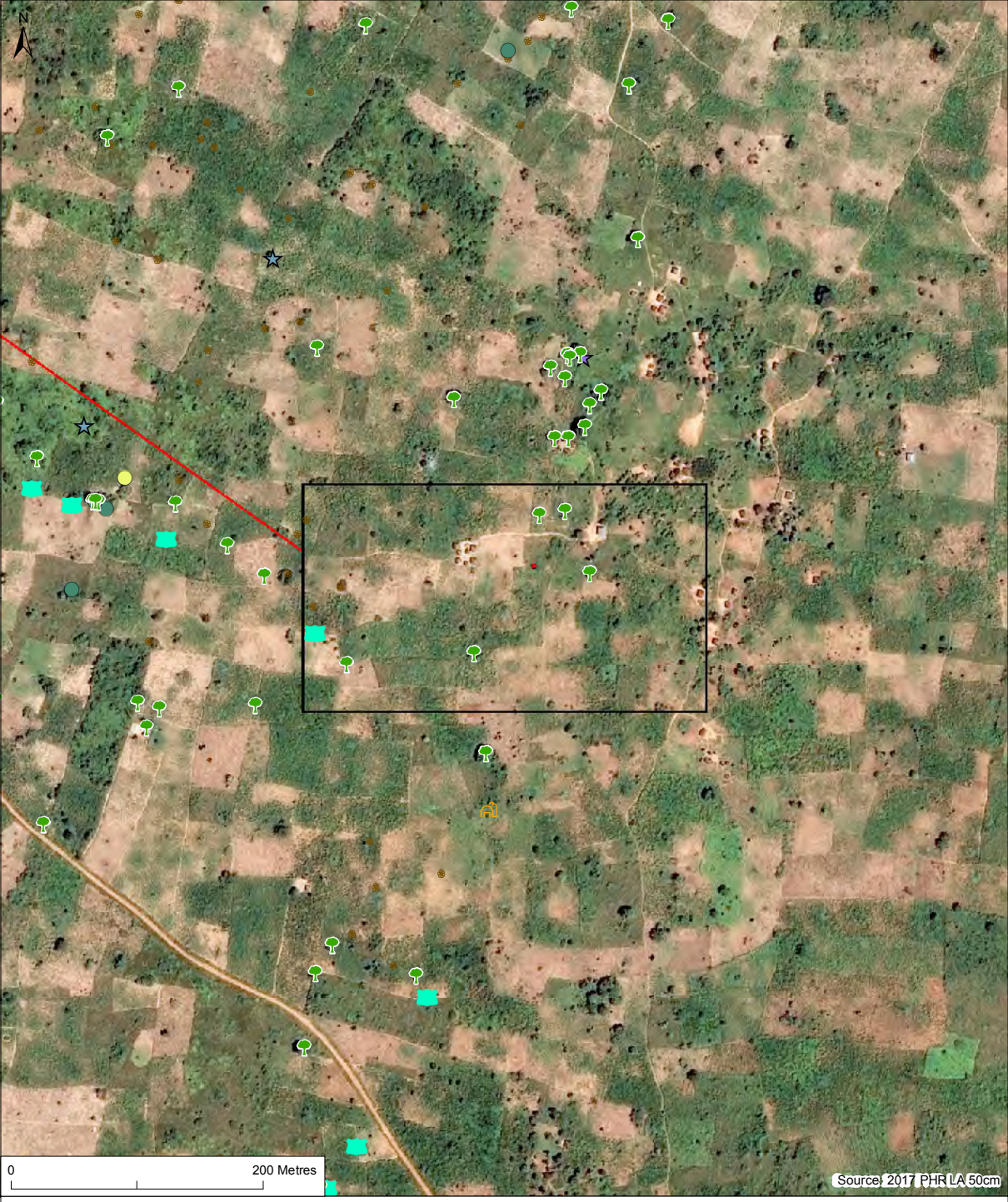
ECOLOGICAL SENSITIVITY MAPPING - KGG-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

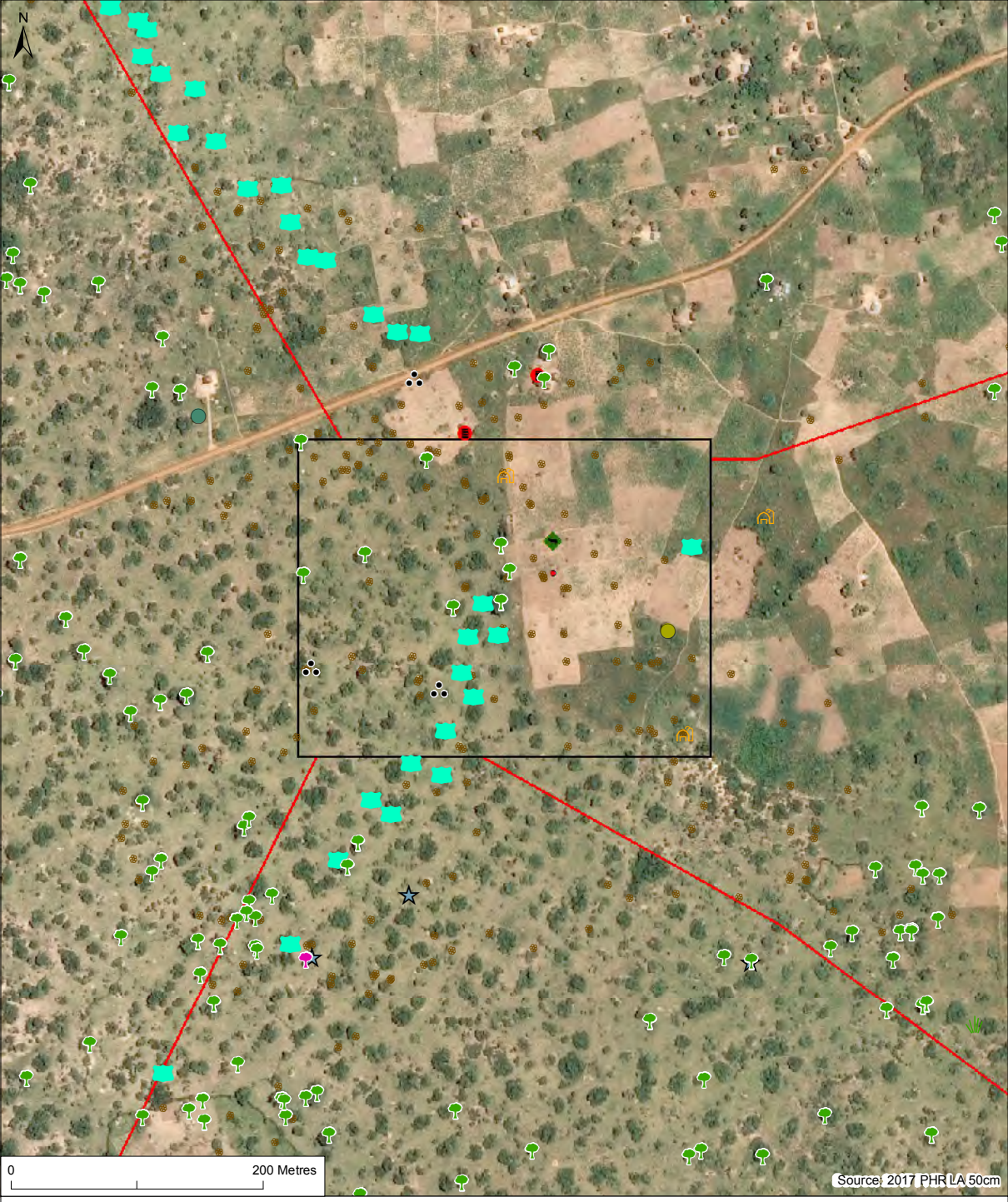


ECOLOGICAL SENSITIVITY MAPPING - KGG-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



ECOLOGICAL SENSITIVITY MAPPING - KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

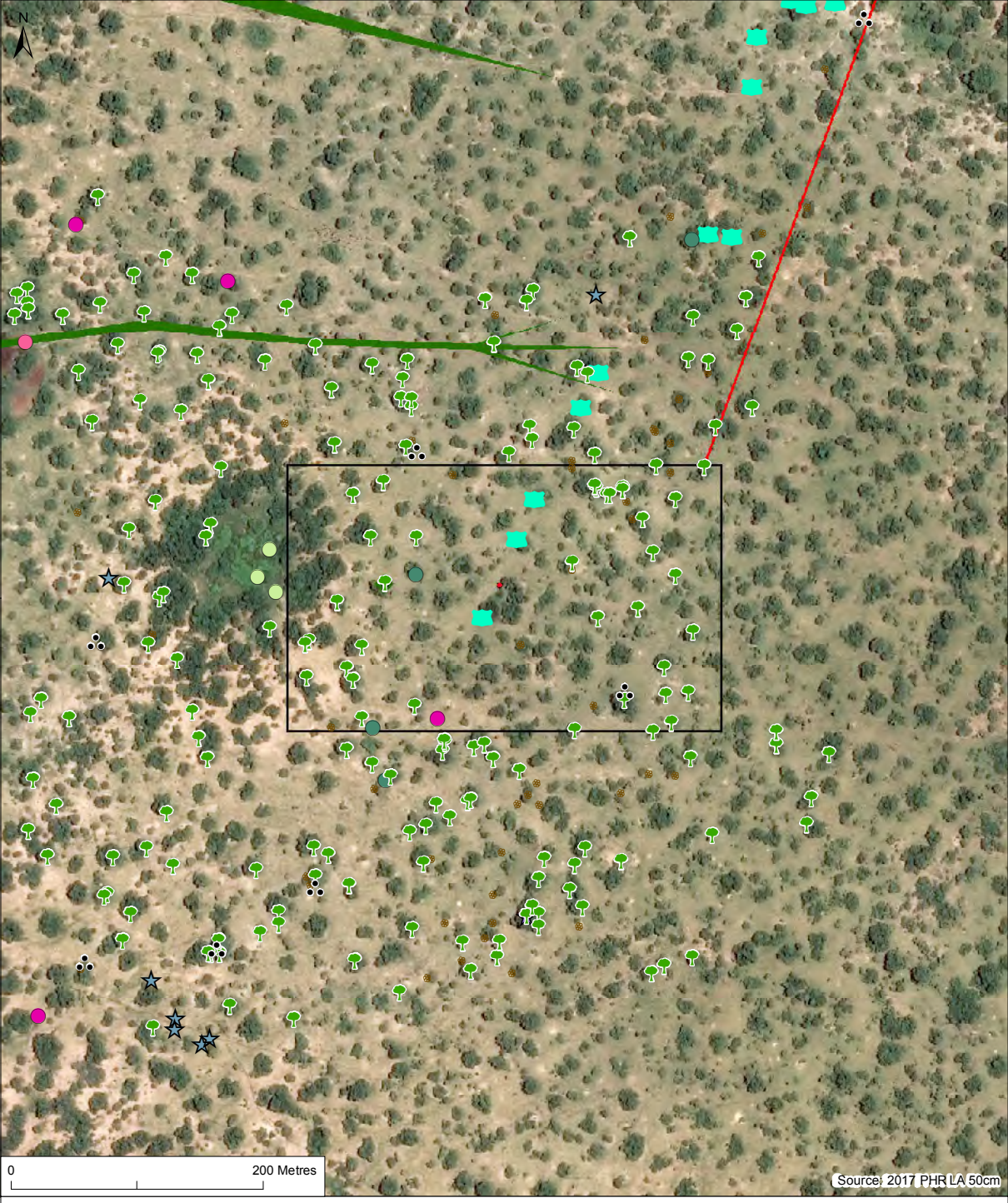
ECOLOGICAL SENSITIVITY MAPPING - KGG-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



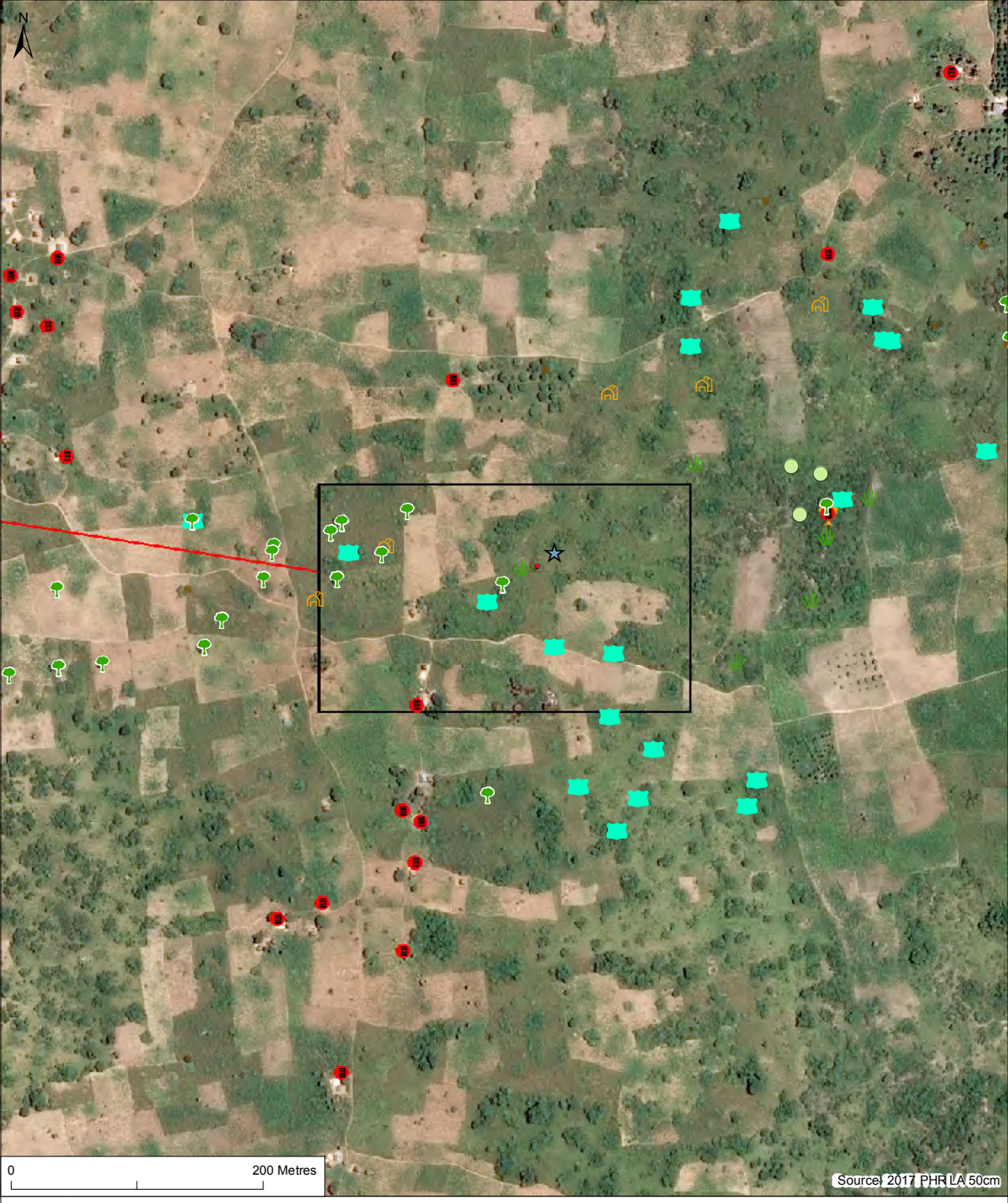
ECOLOGICAL SENSITIVITY MAPPING - KGG-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



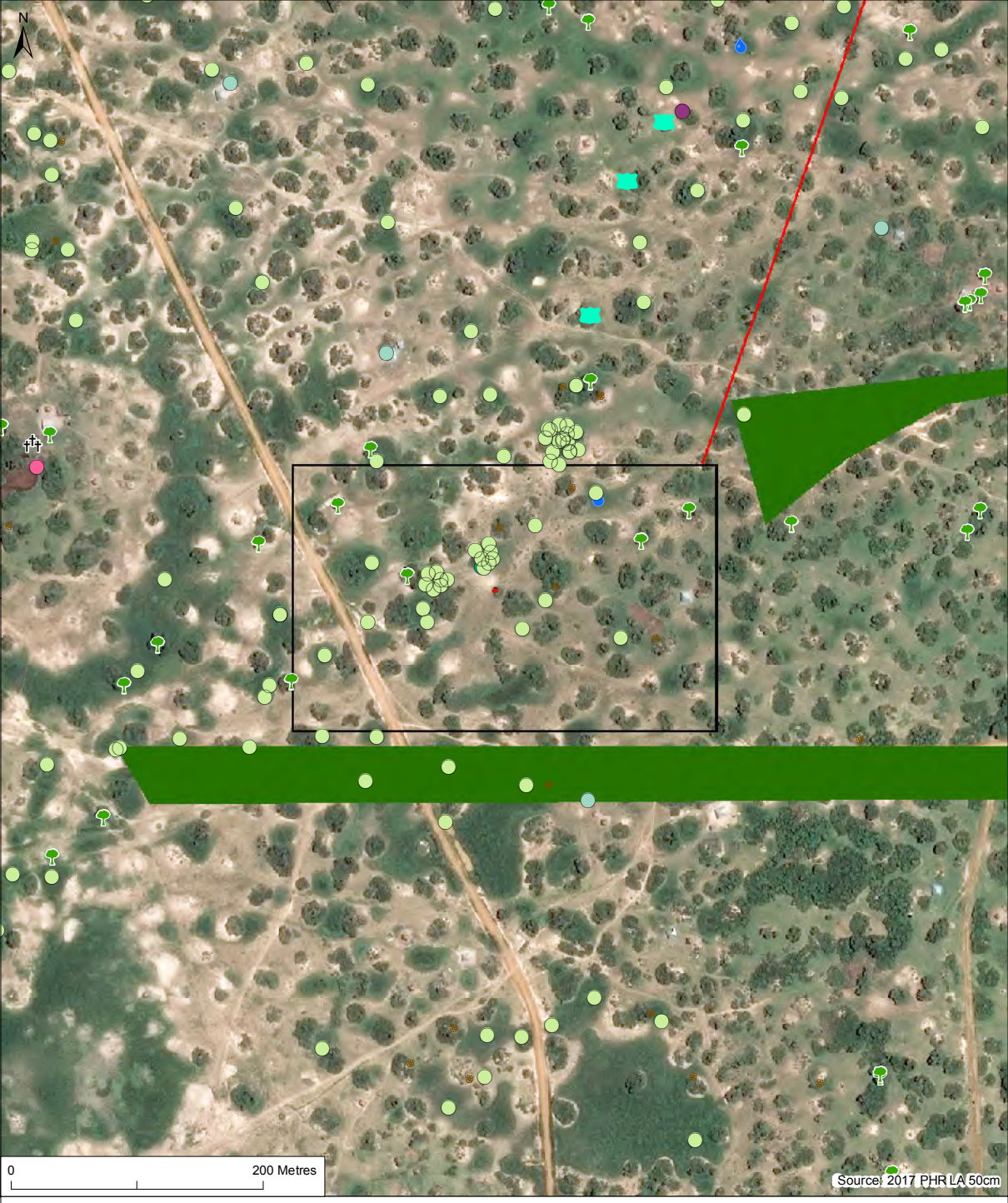
ECOLOGICAL SENSITIVITY MAPPING - KGG-09

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

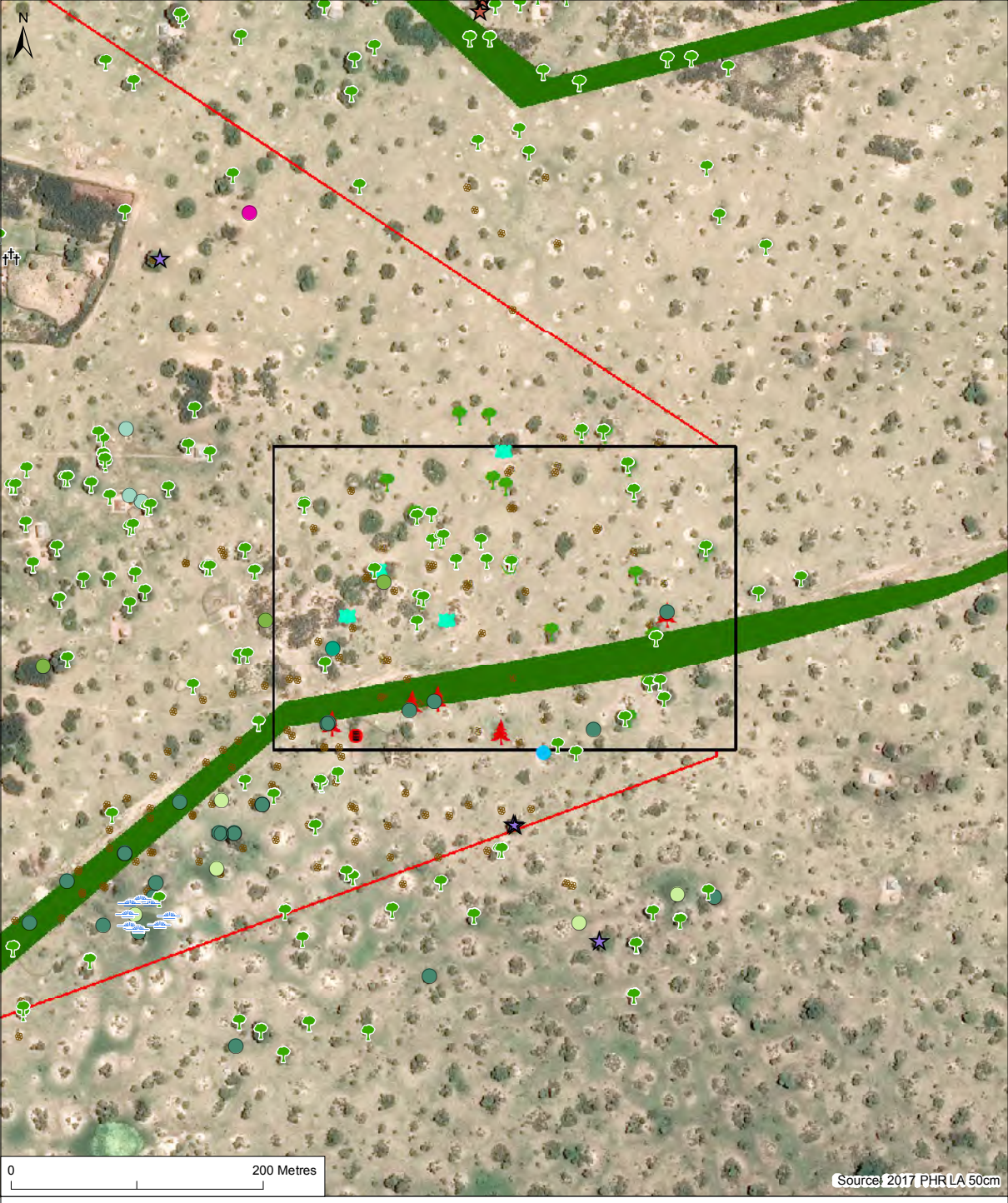


ECOLOGICAL SENSITIVITY MAPPING - KW-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



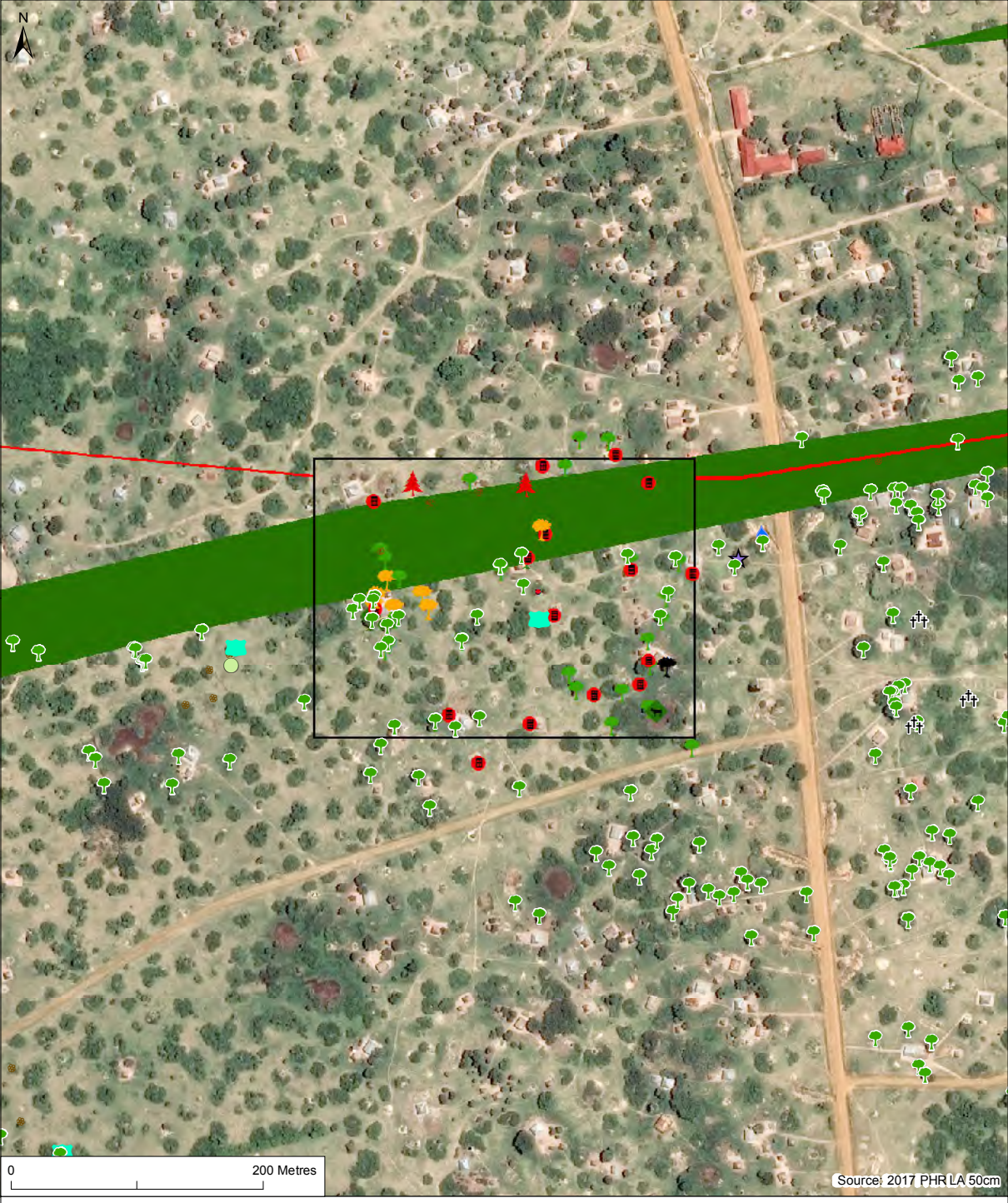
ECOLOGICAL SENSITIVITY MAPPING - KW-02A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

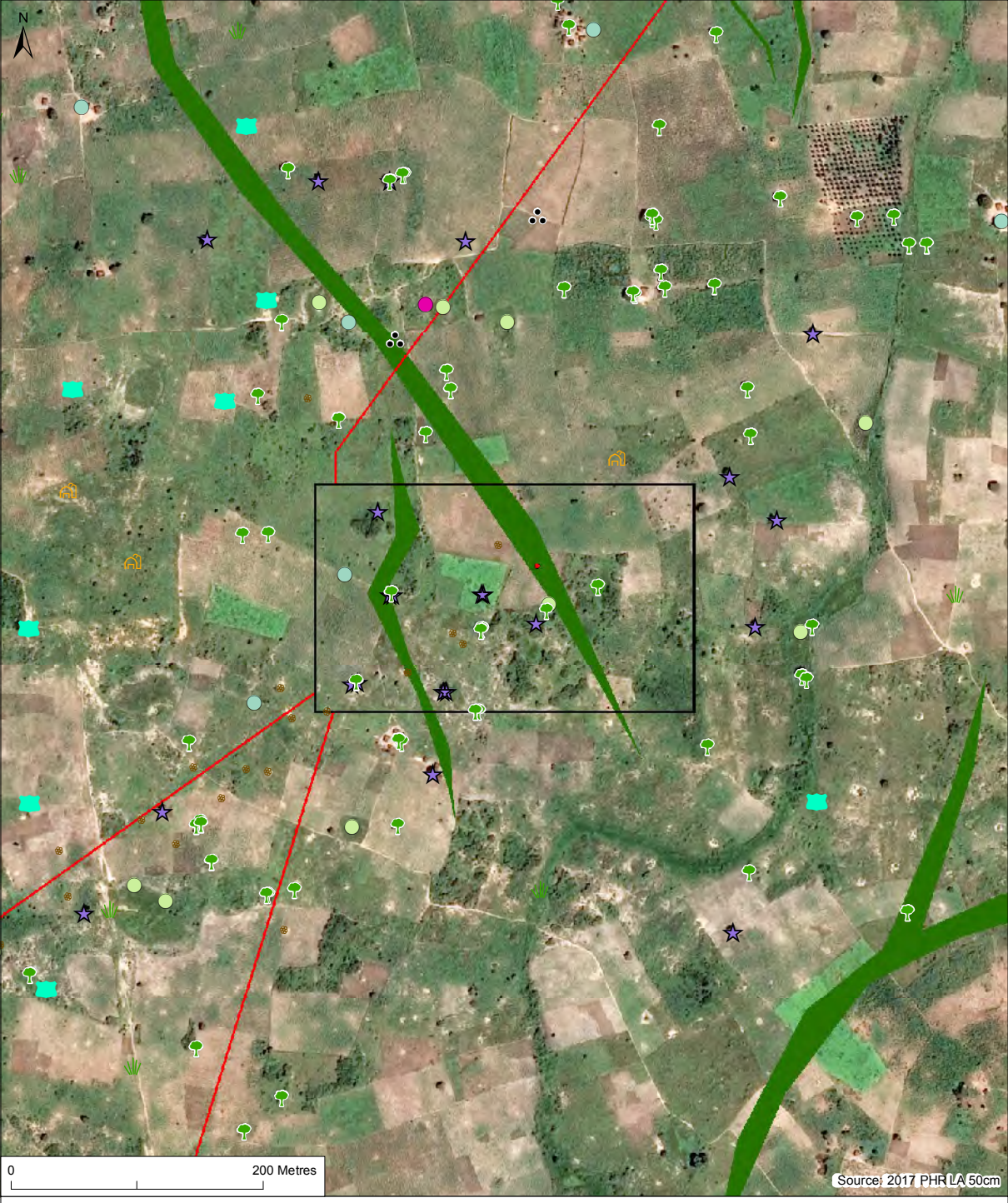


ECOLOGICAL SENSITIVITY MAPPING - KW-02B

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



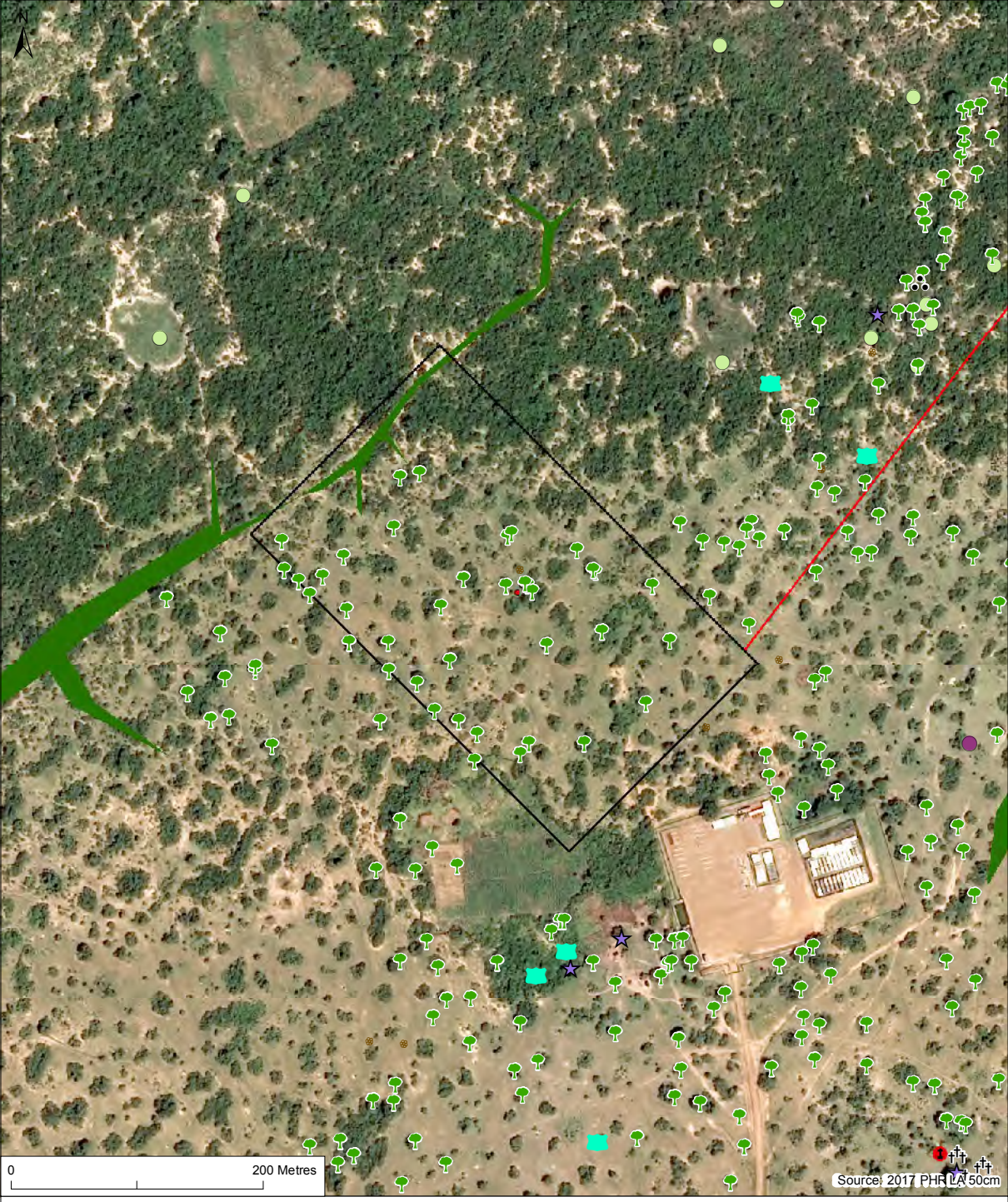
ECOLOGICAL SENSITIVITY MAPPING - NGR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



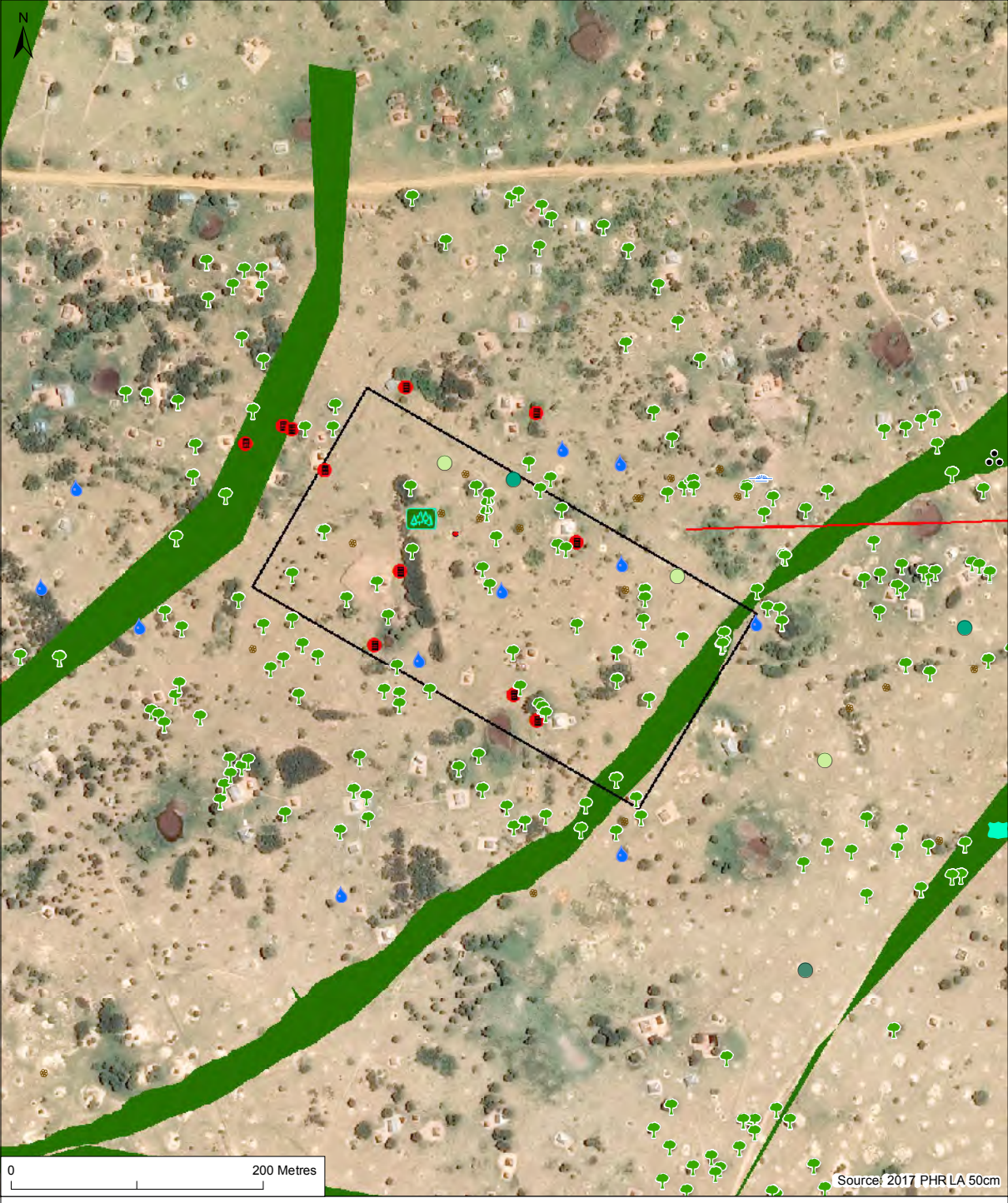
ECOLOGICAL SENSITIVITY MAPPING - NGR-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



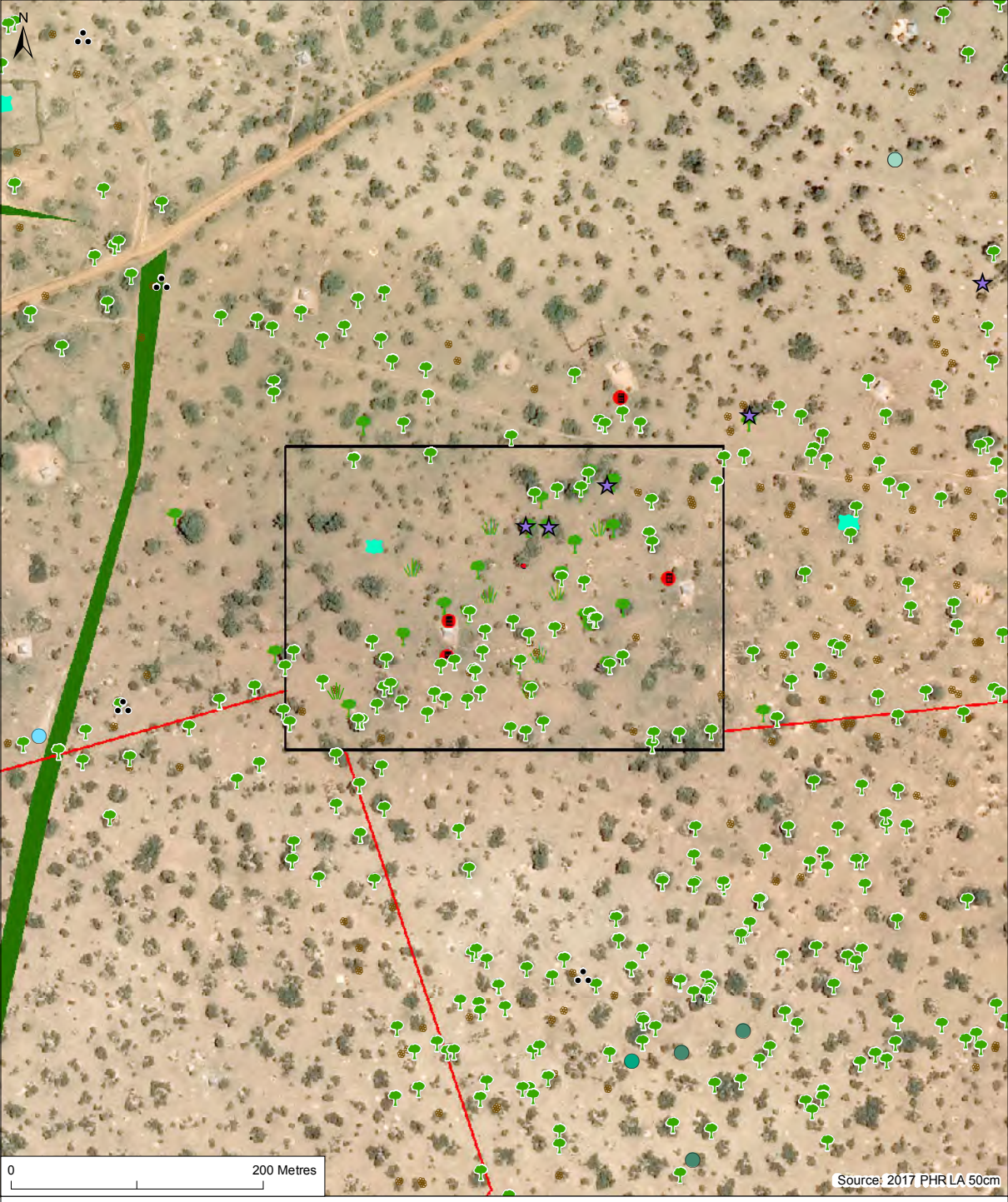
ECOLOGICAL SENSITIVITY MAPPING - NGR-03A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



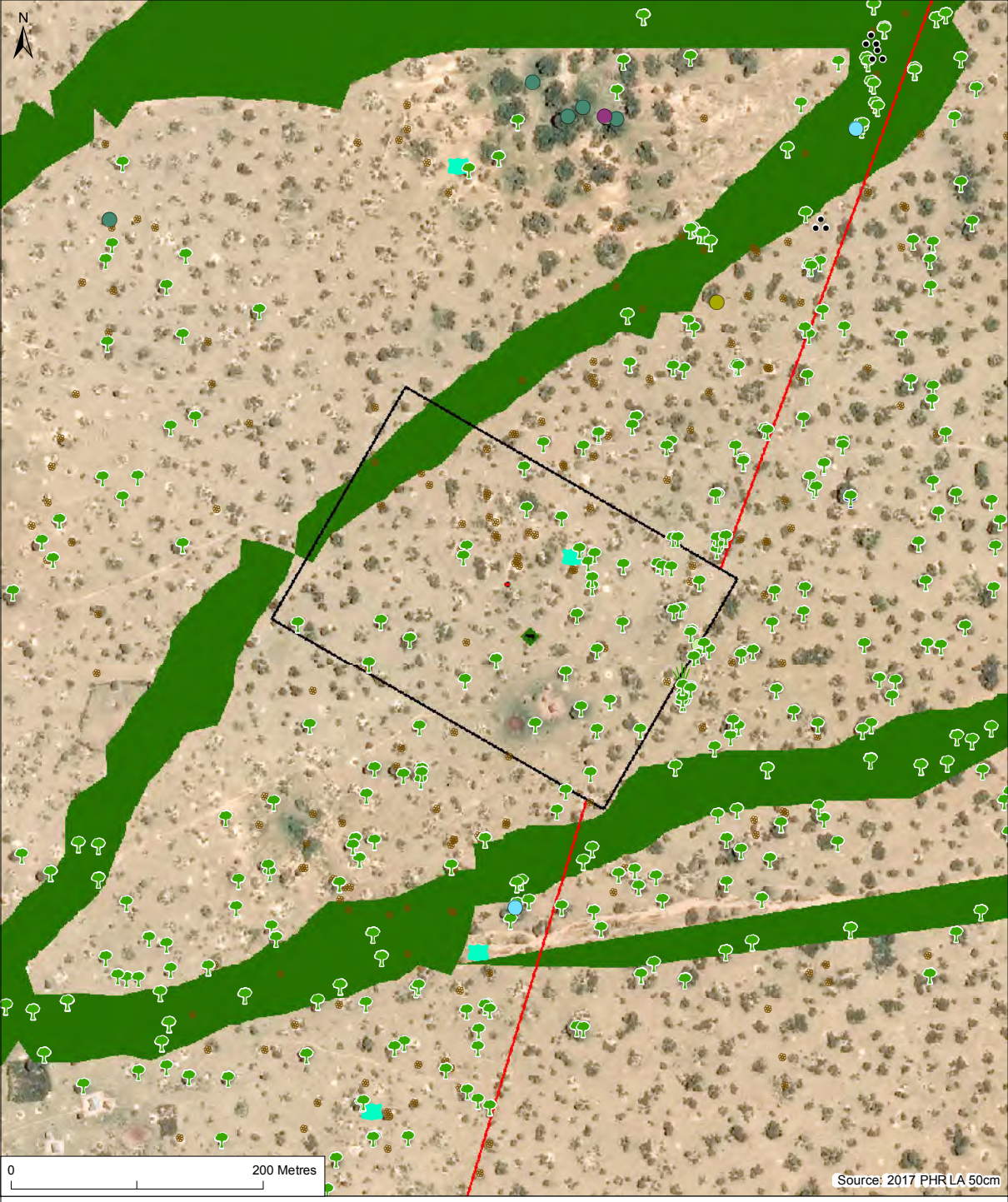
ECOLOGICAL SENSITIVITY MAPPING - NGR-05A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



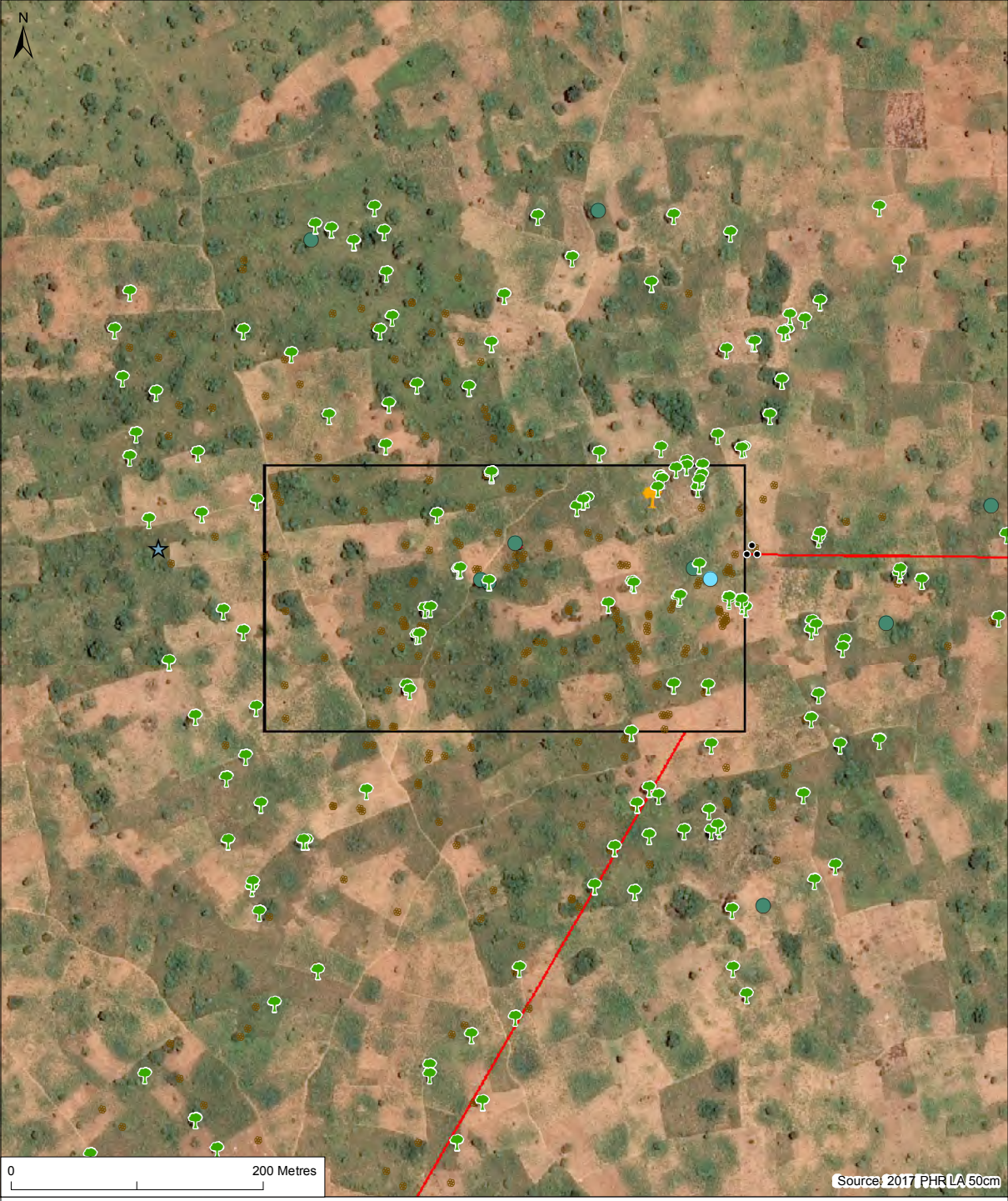
ECOLOGICAL SENSITIVITY MAPPING - NGR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



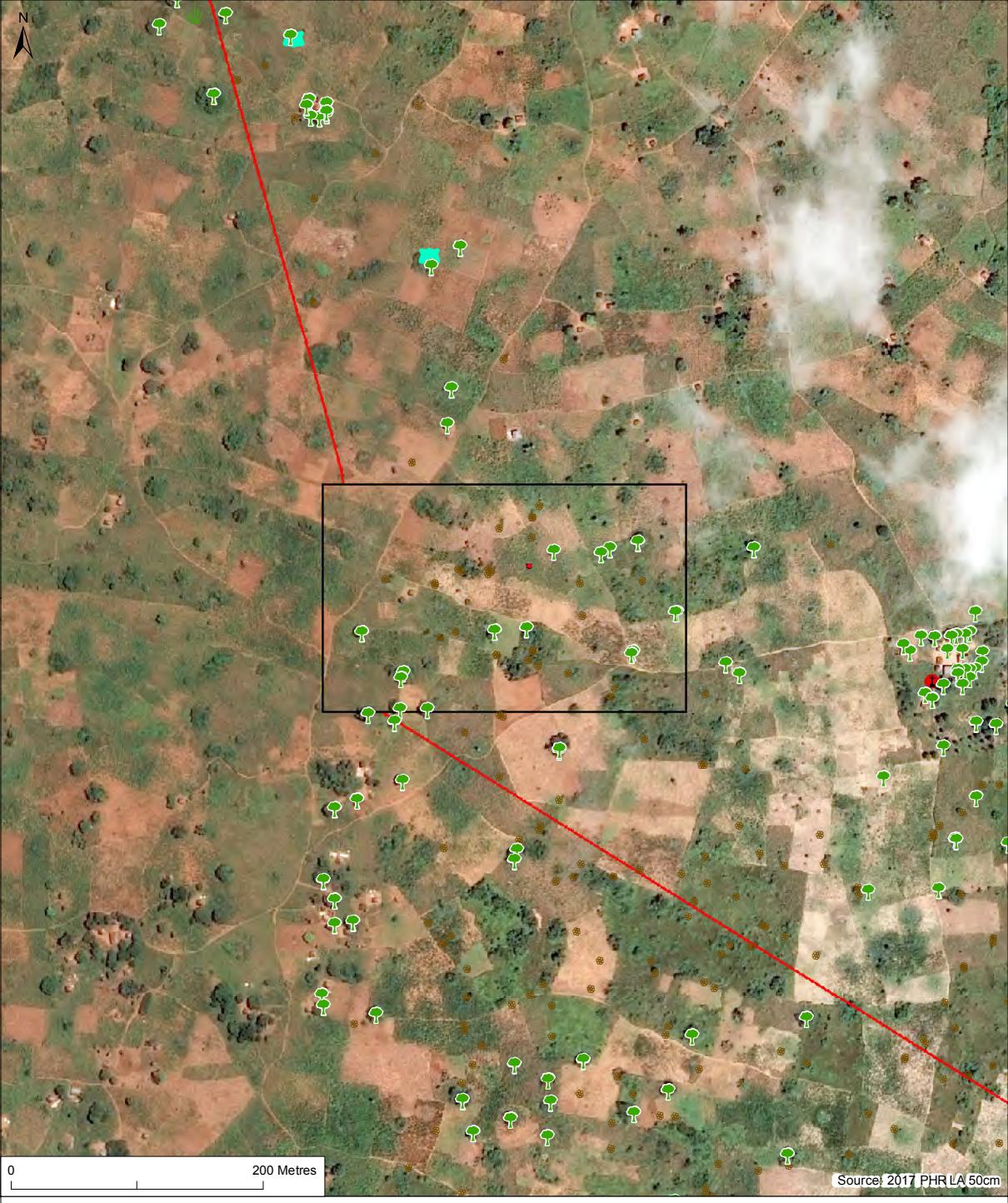
ECOLOGICAL SENSITIVITY MAPPING - NSO-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

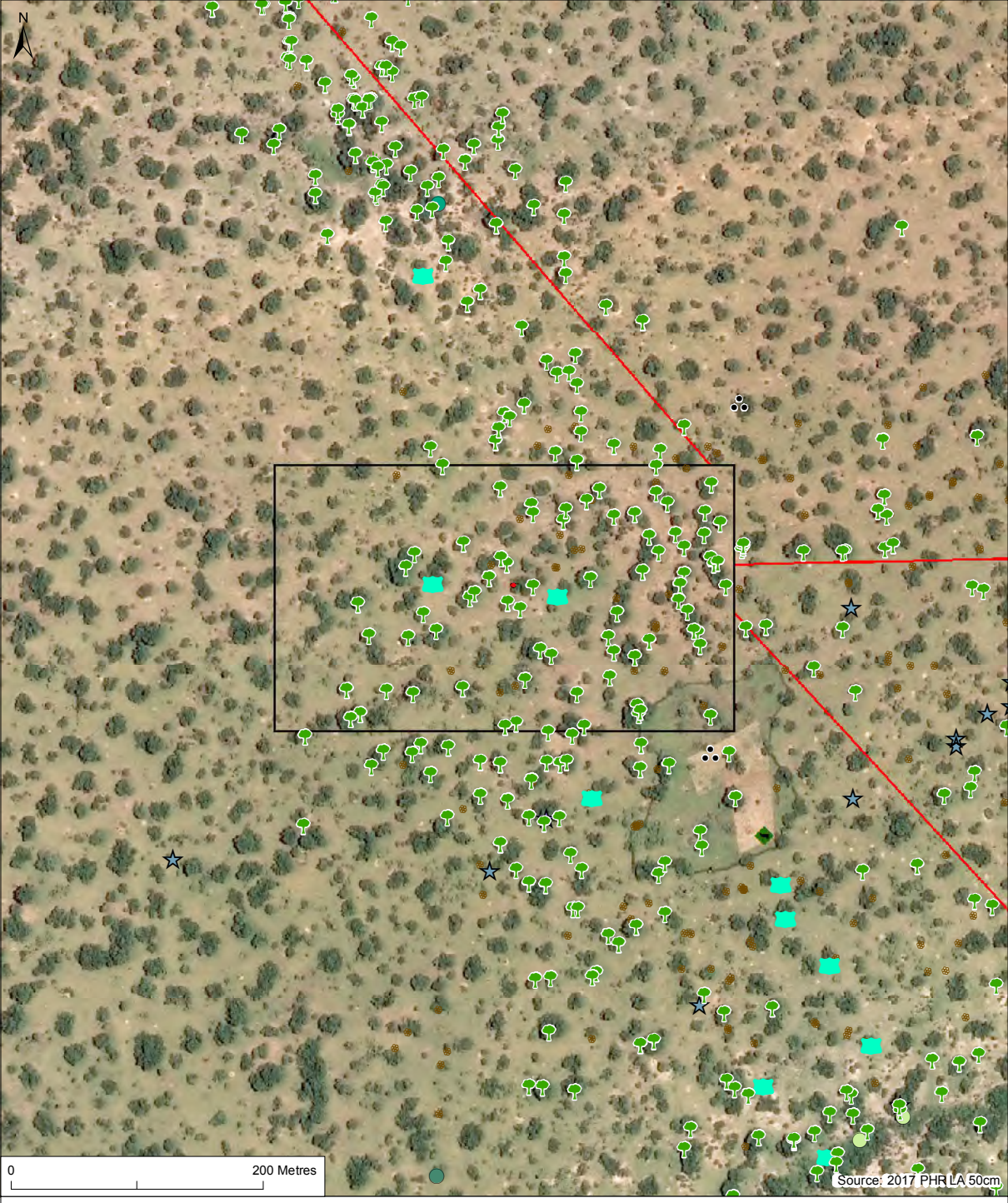


ECOLOGICAL SENSITIVITY MAPPING - NSO-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



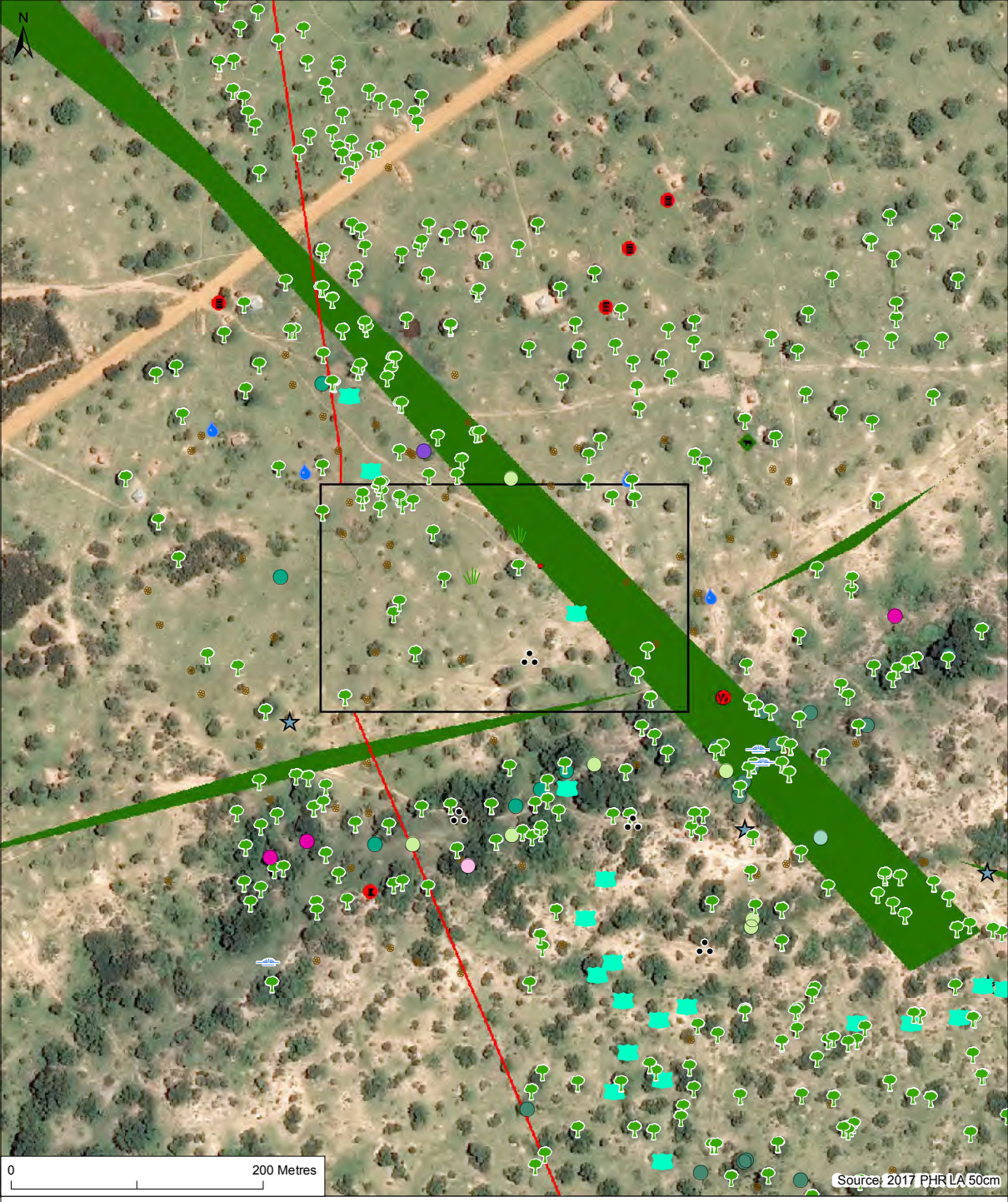
ECOLOGICAL SENSITIVITY MAPPING - NSO-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



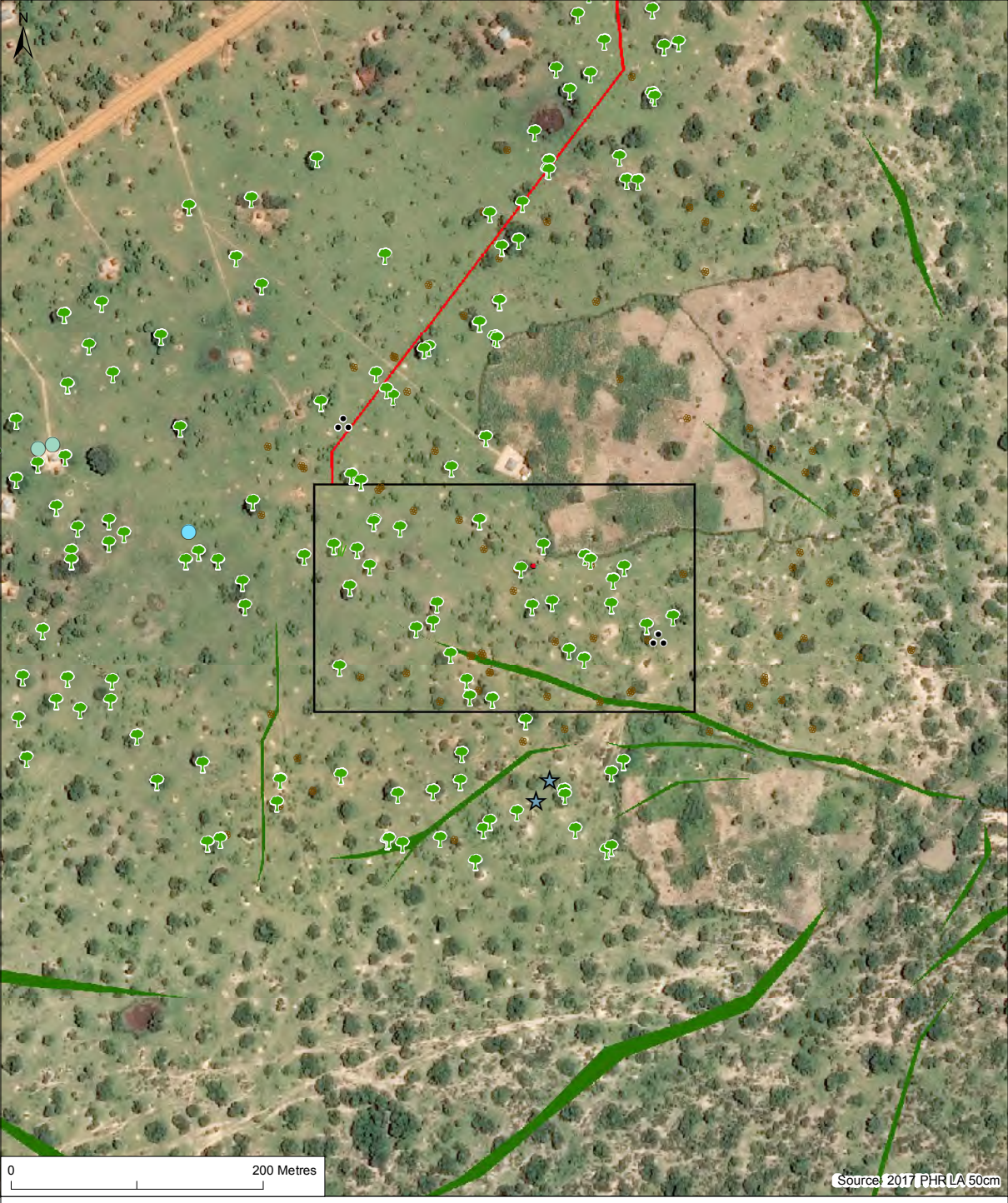
ECOLOGICAL SENSITIVITY MAPPING - NSO-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



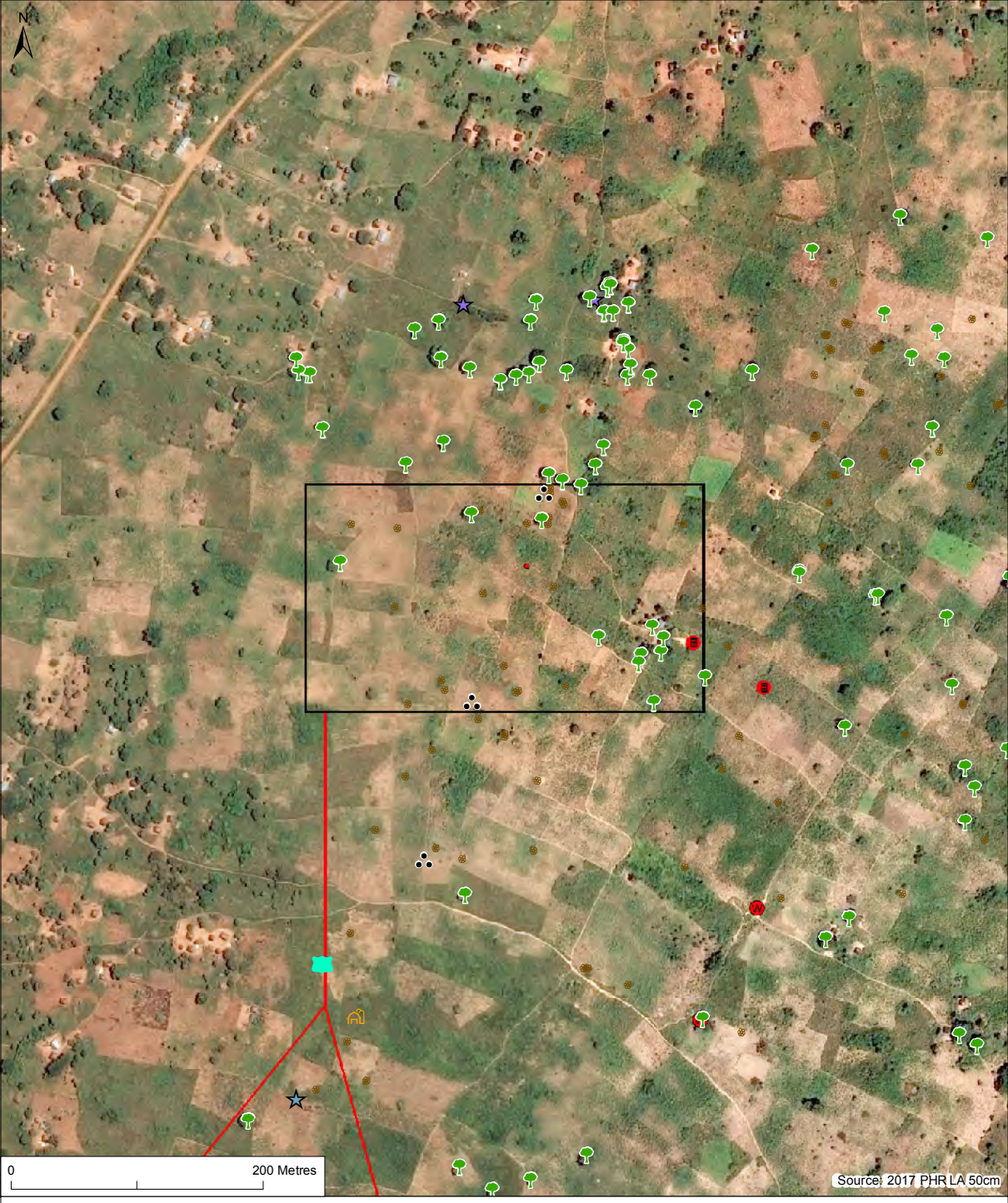
ECOLOGICAL SENSITIVITY MAPPING - NSO-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



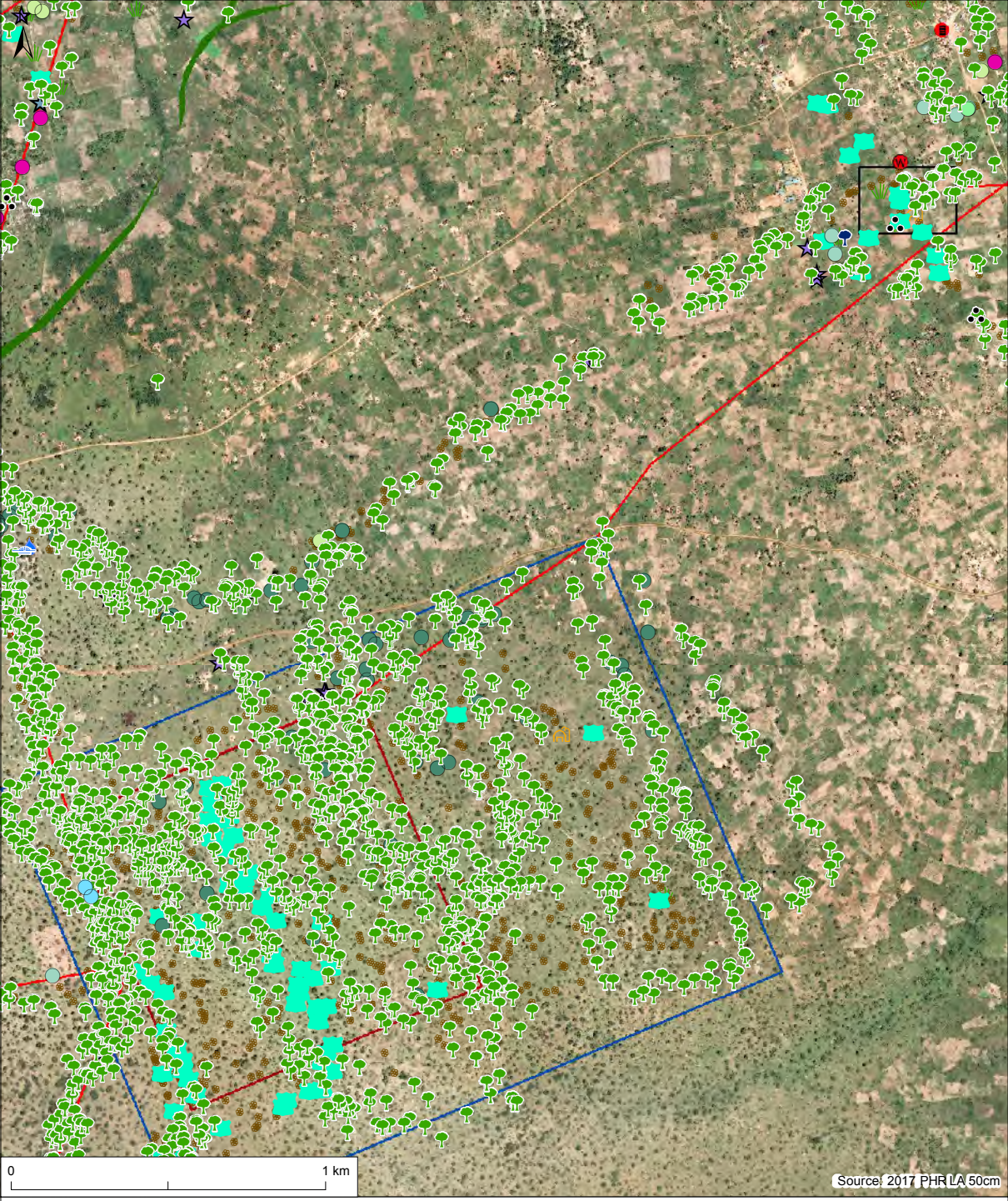
ECOLOGICAL SENSITIVITY MAPPING - NSO-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:5,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

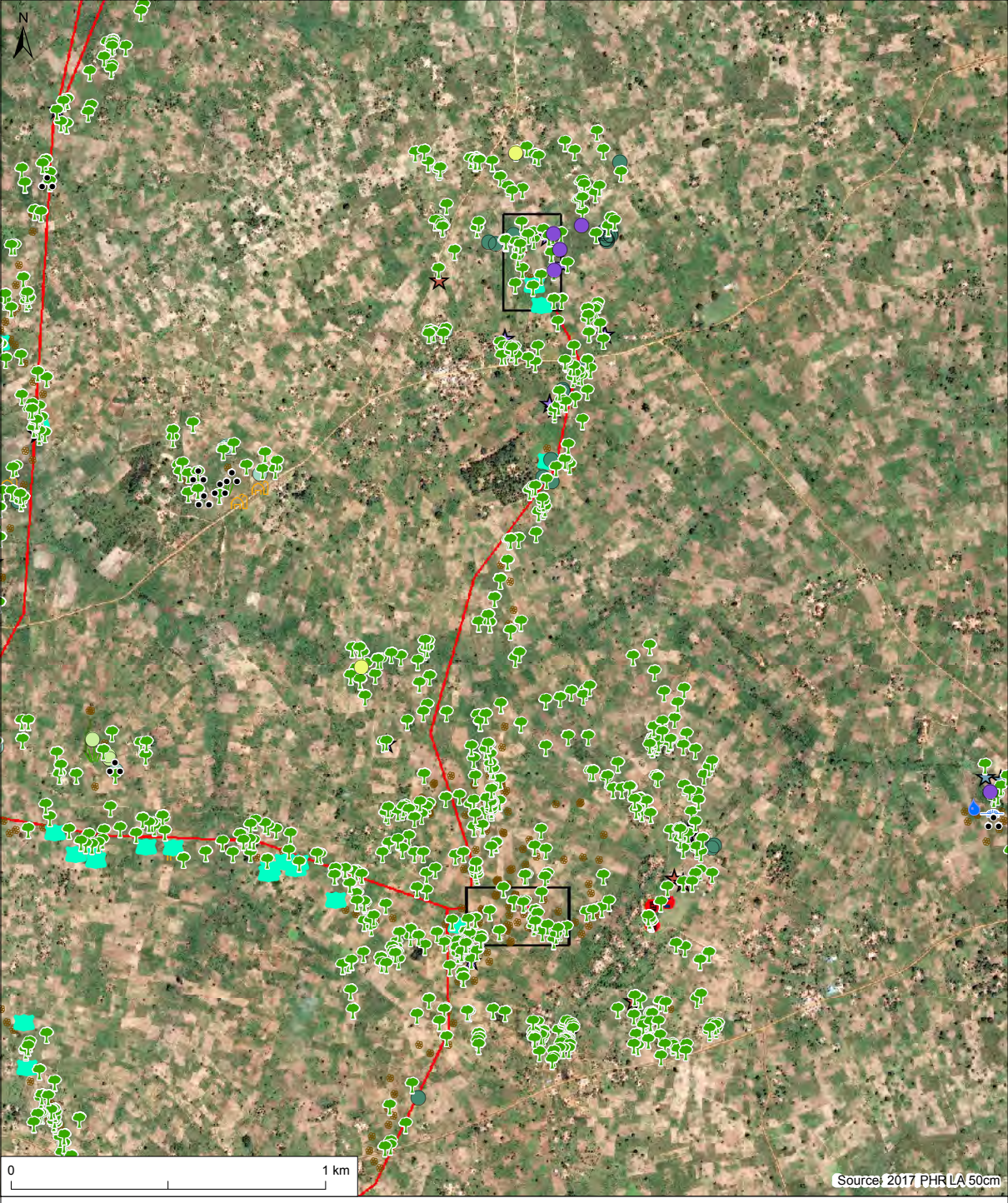


ECOLOGICAL SENSITIVITY MAPPING - GNA-01 to CPF

- Wellpad location
- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



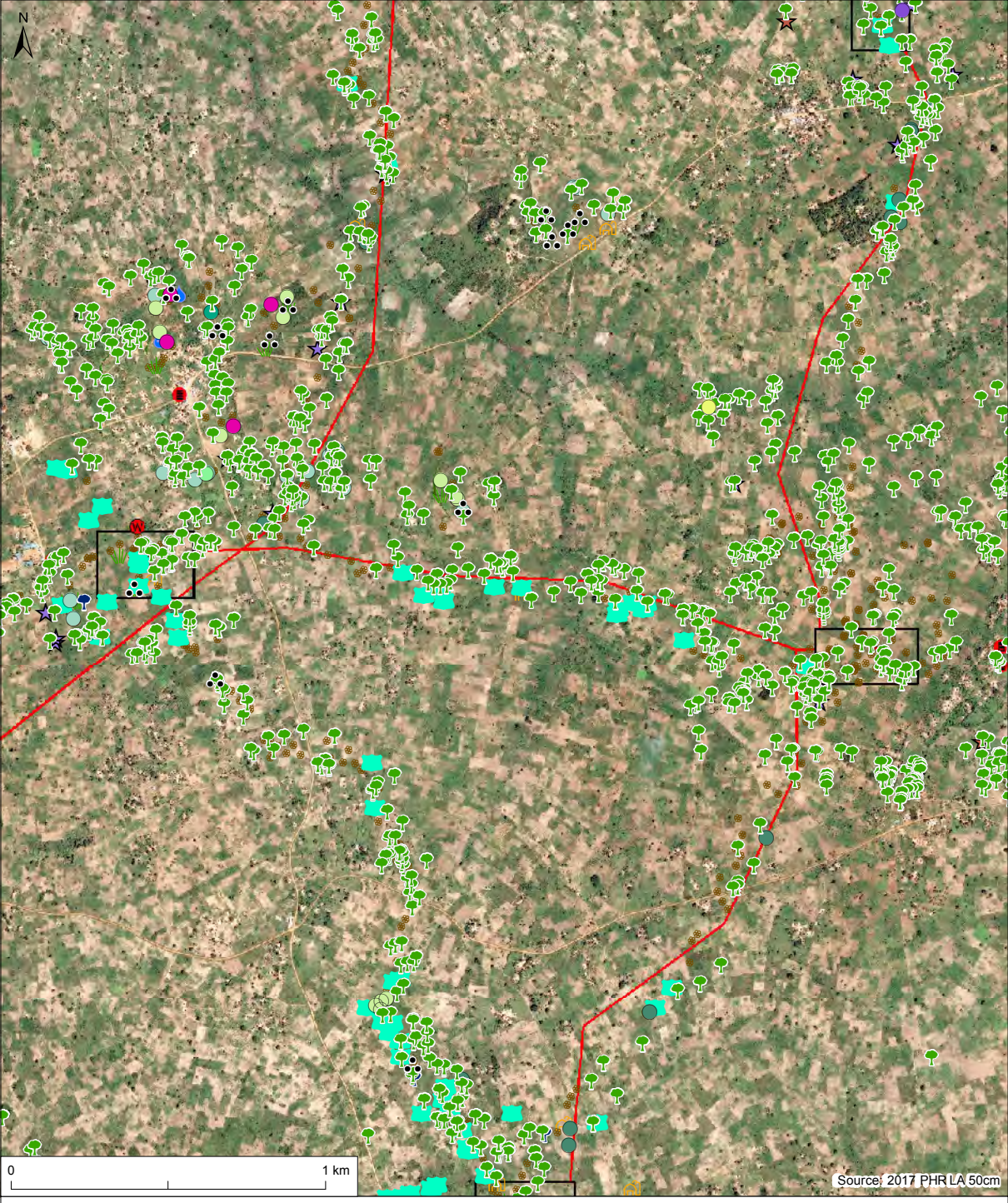
ECOLOGICAL SENSITIVITY MAPPING - GNA-02 to GNA-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

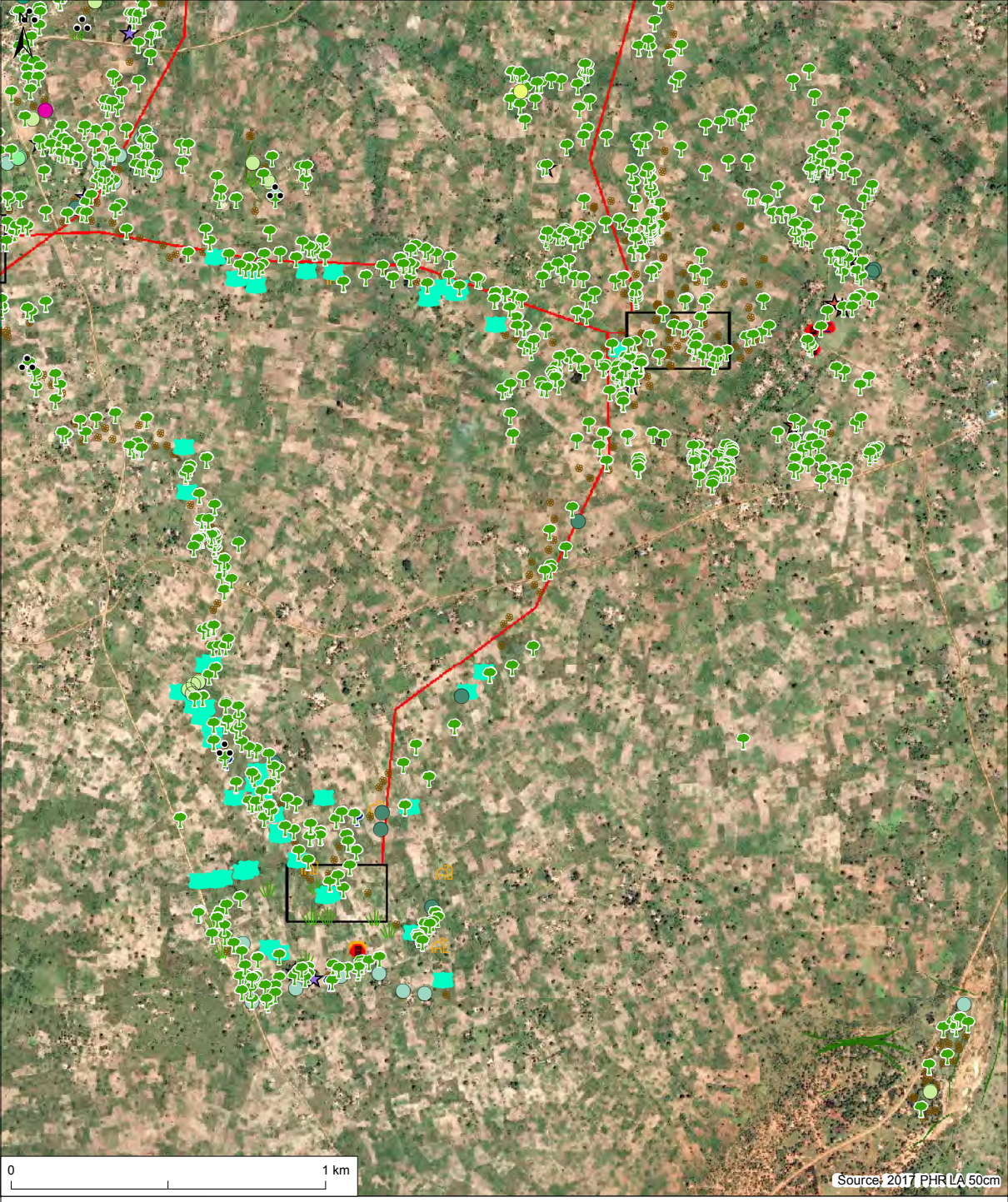


ECOLOGICAL SENSITIVITY MAPPING - GNA-04 to GNA-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

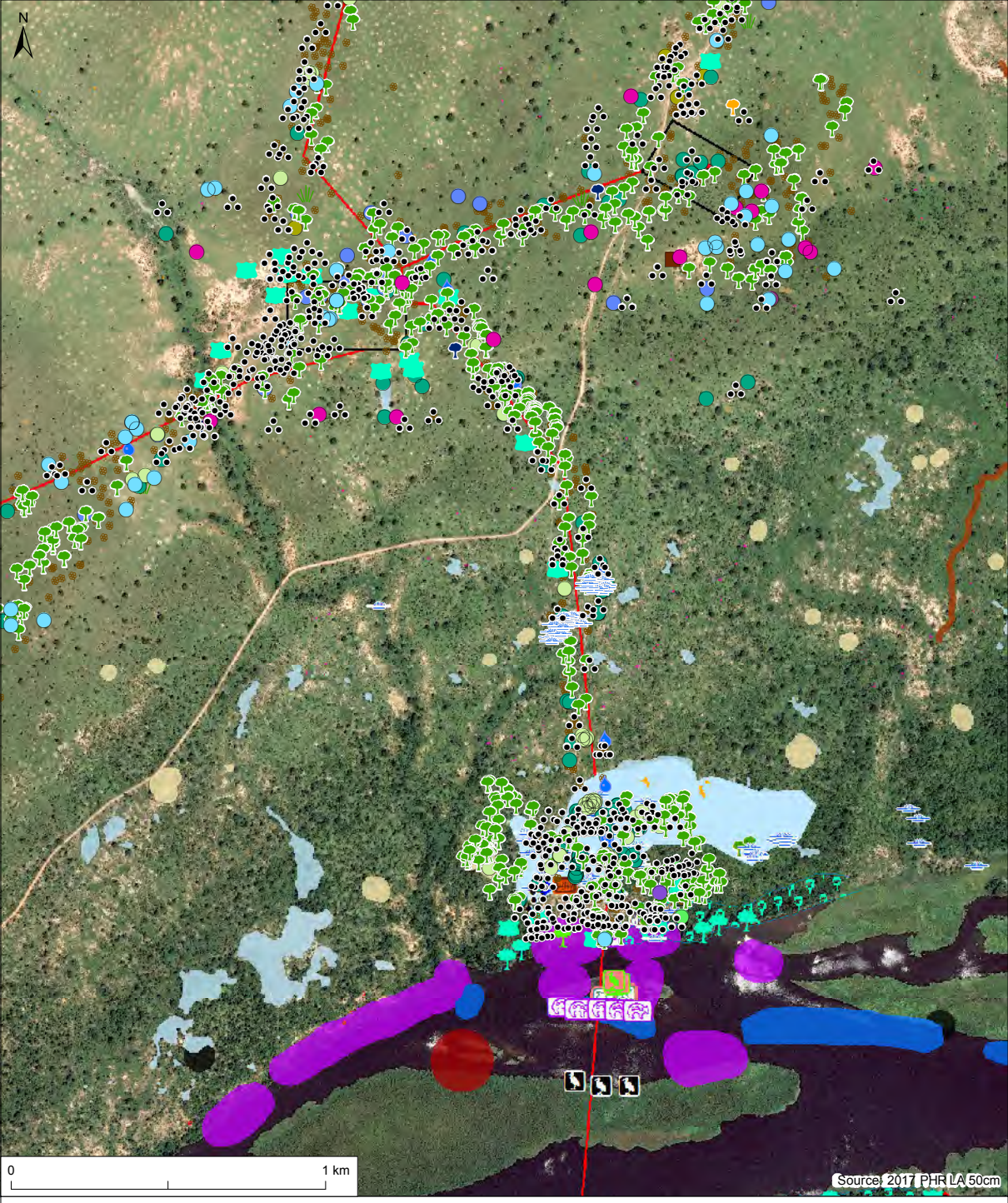


ECOLOGICAL SENSITIVITY MAPPING - GNA-04 to GNA-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

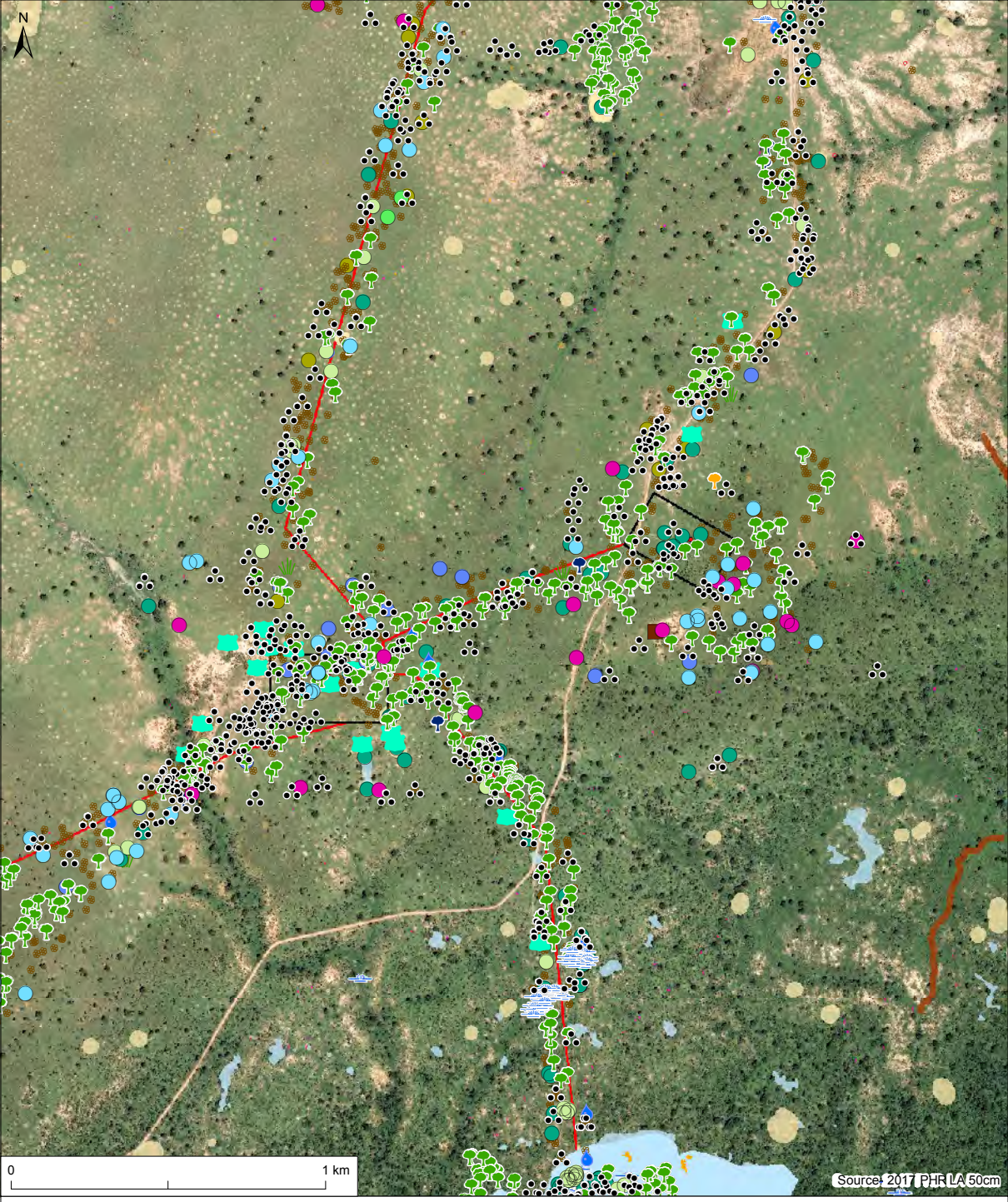


ECOLOGICAL SENSITIVITY MAPPING - JBR-01 to NIV (Option 1)

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 1
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



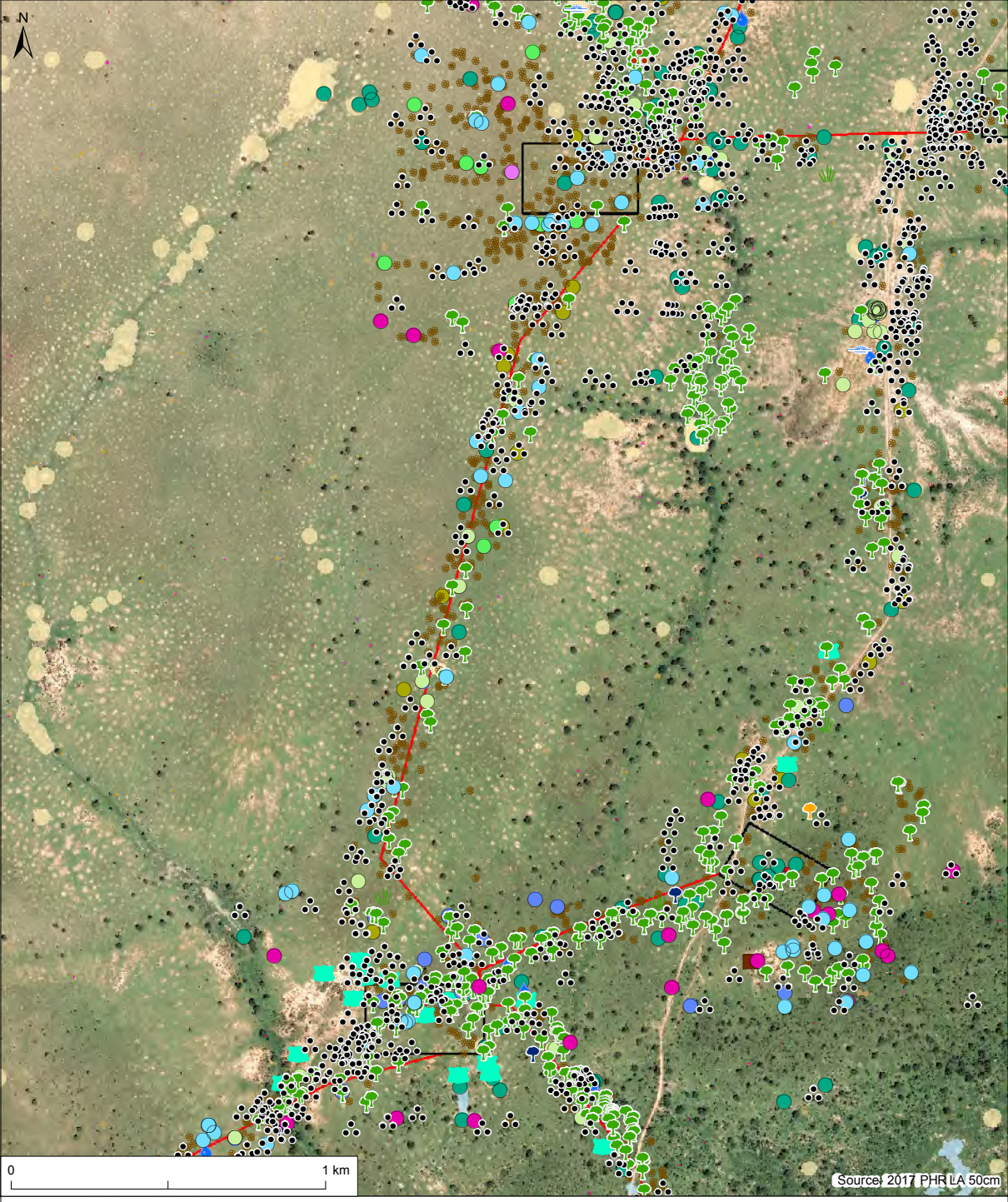
ECOLOGICAL SENSITIVITY MAPPING - JBR-02 to JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



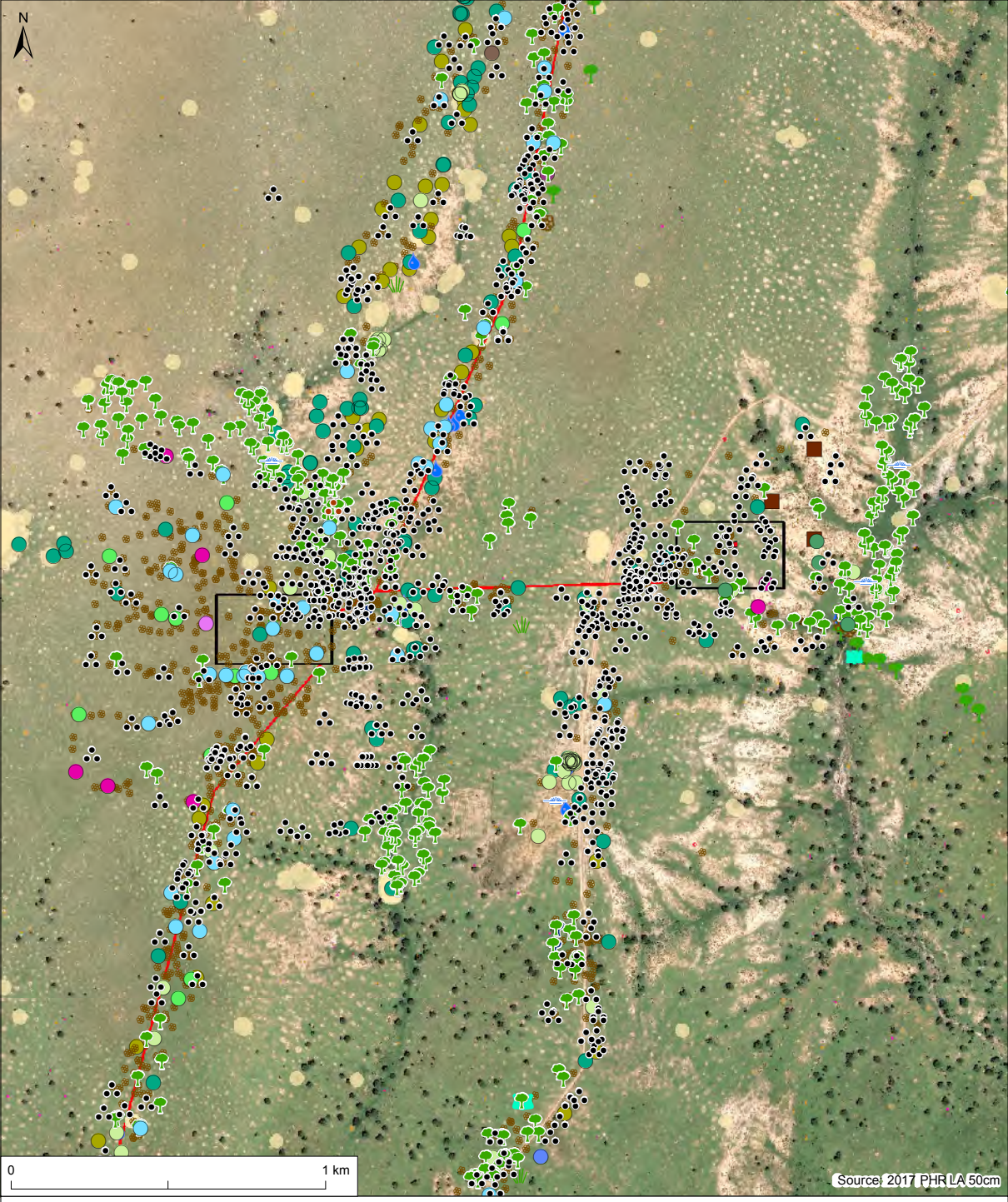
ECOLOGICAL SENSITIVITY MAPPING - JBR-03 to JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



ECOLOGICAL SENSITIVITY MAPPING - JBR-04 to JBR-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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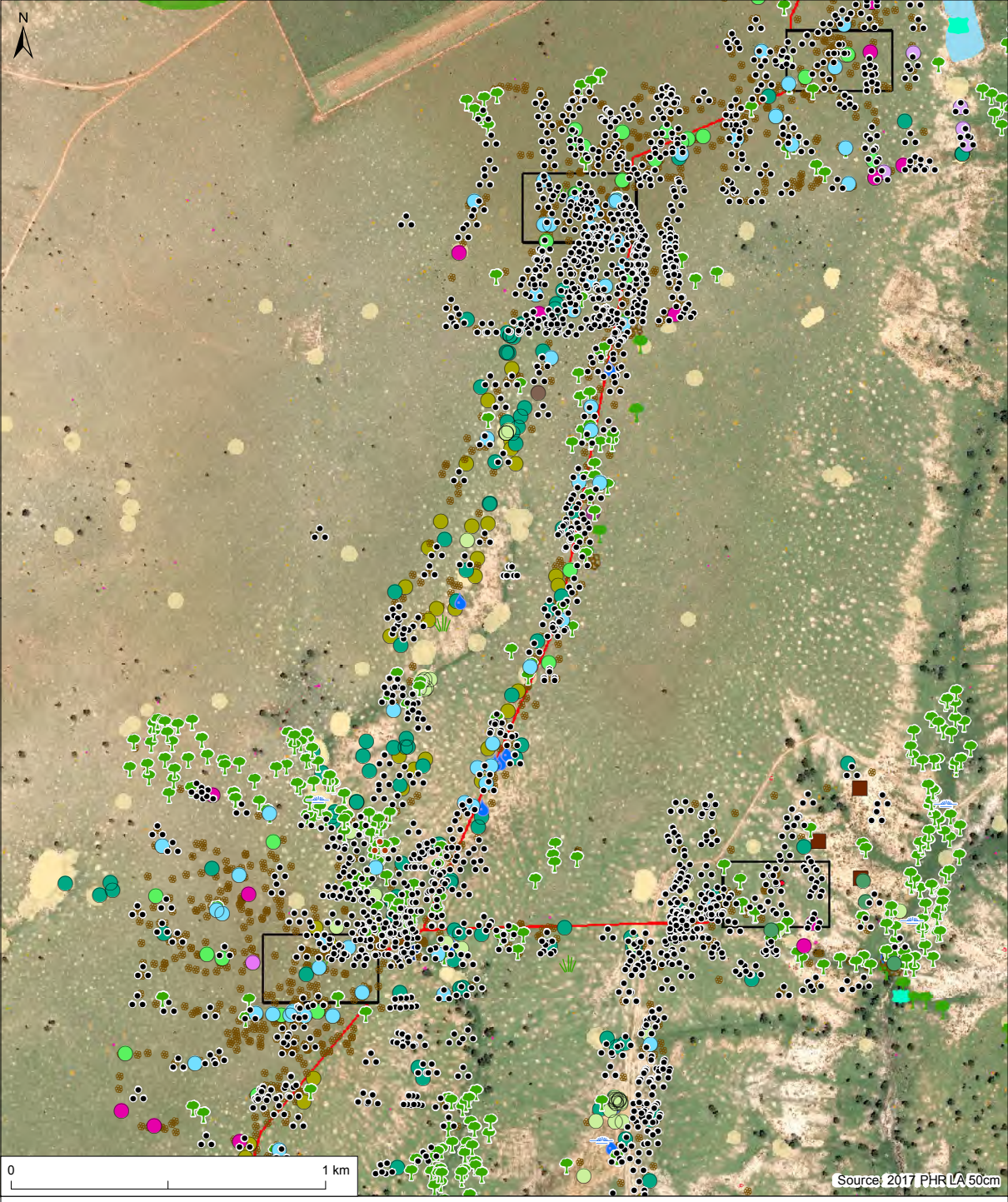

ECOLOGICAL SENSITIVITY MAPPING - JBR-05 to JBR-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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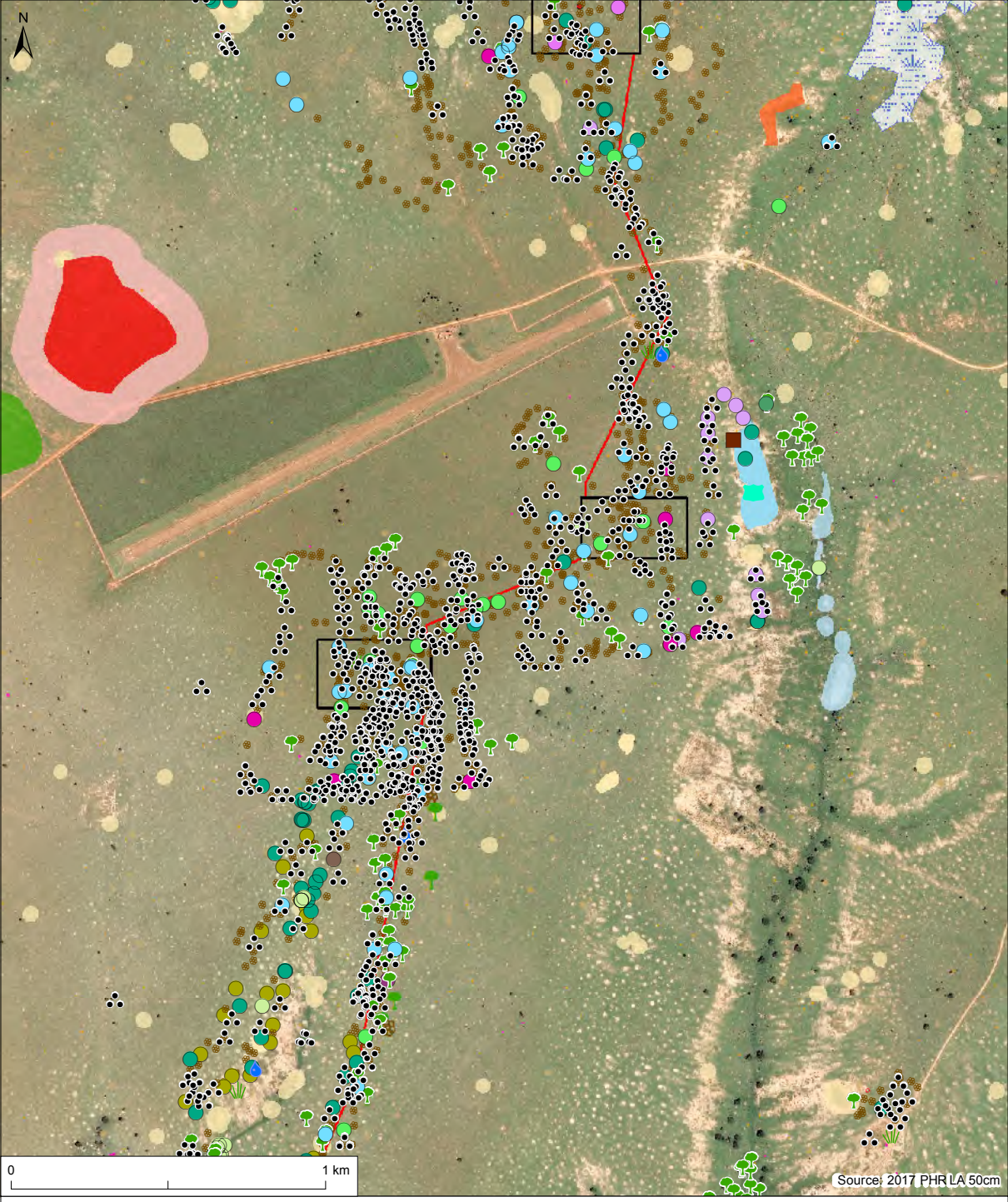

ECOLOGICAL SENSITIVITY MAPPING - JBR-06 to JBR-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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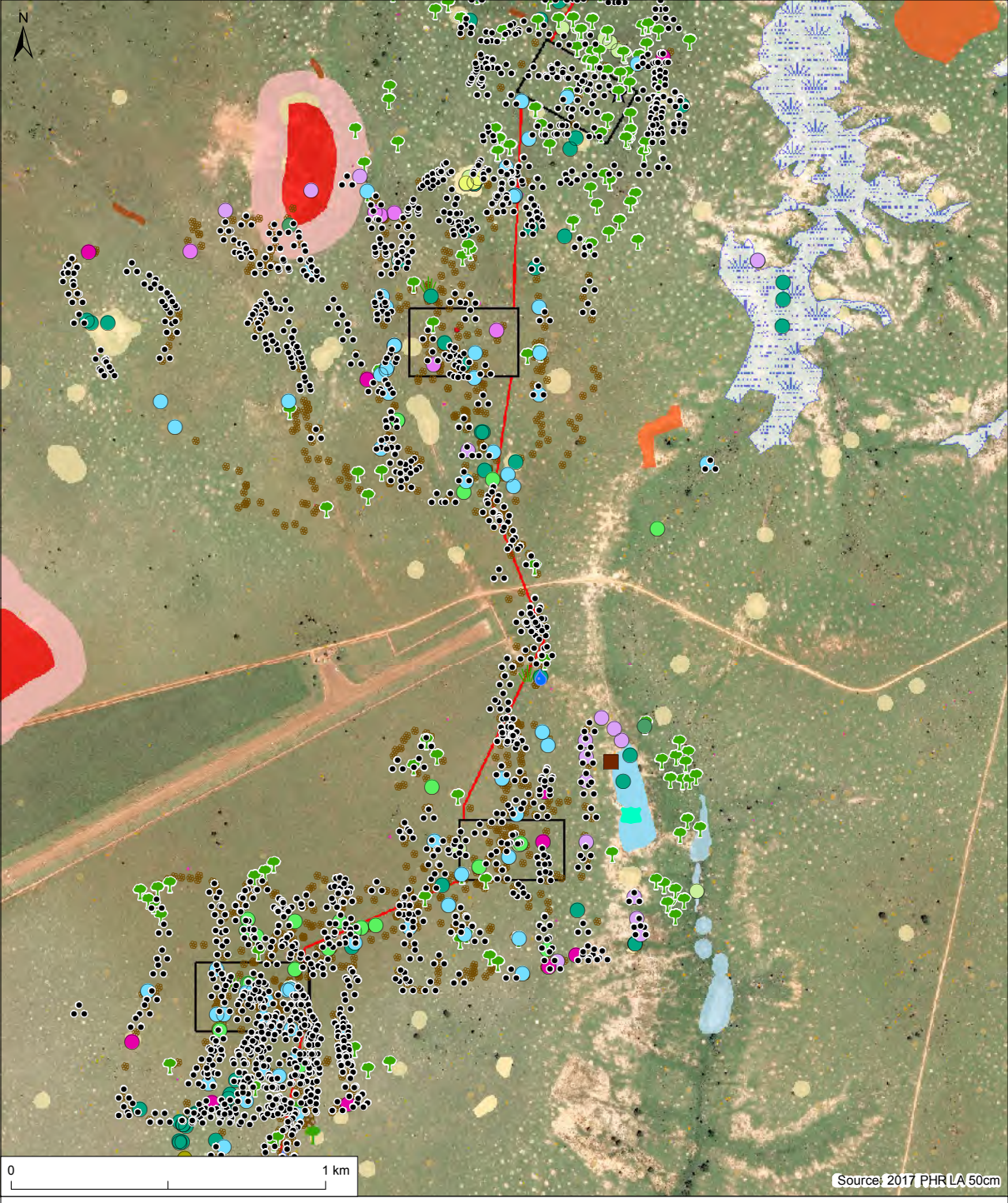

ECOLOGICAL SENSITIVITY MAPPING - JBR-07 to JBR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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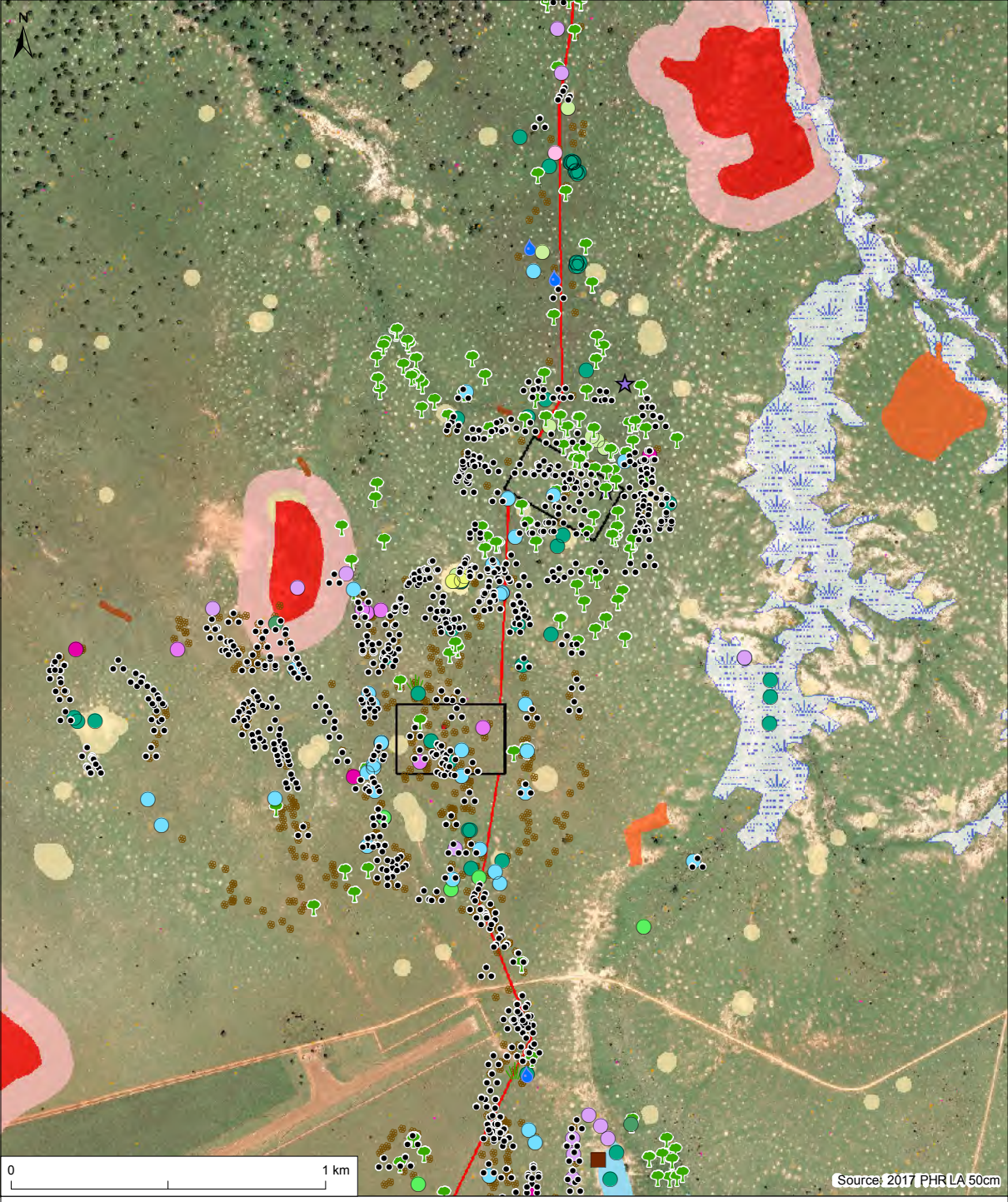

ECOLOGICAL SENSITIVITY MAPPING - JBR-08 to JBR-07

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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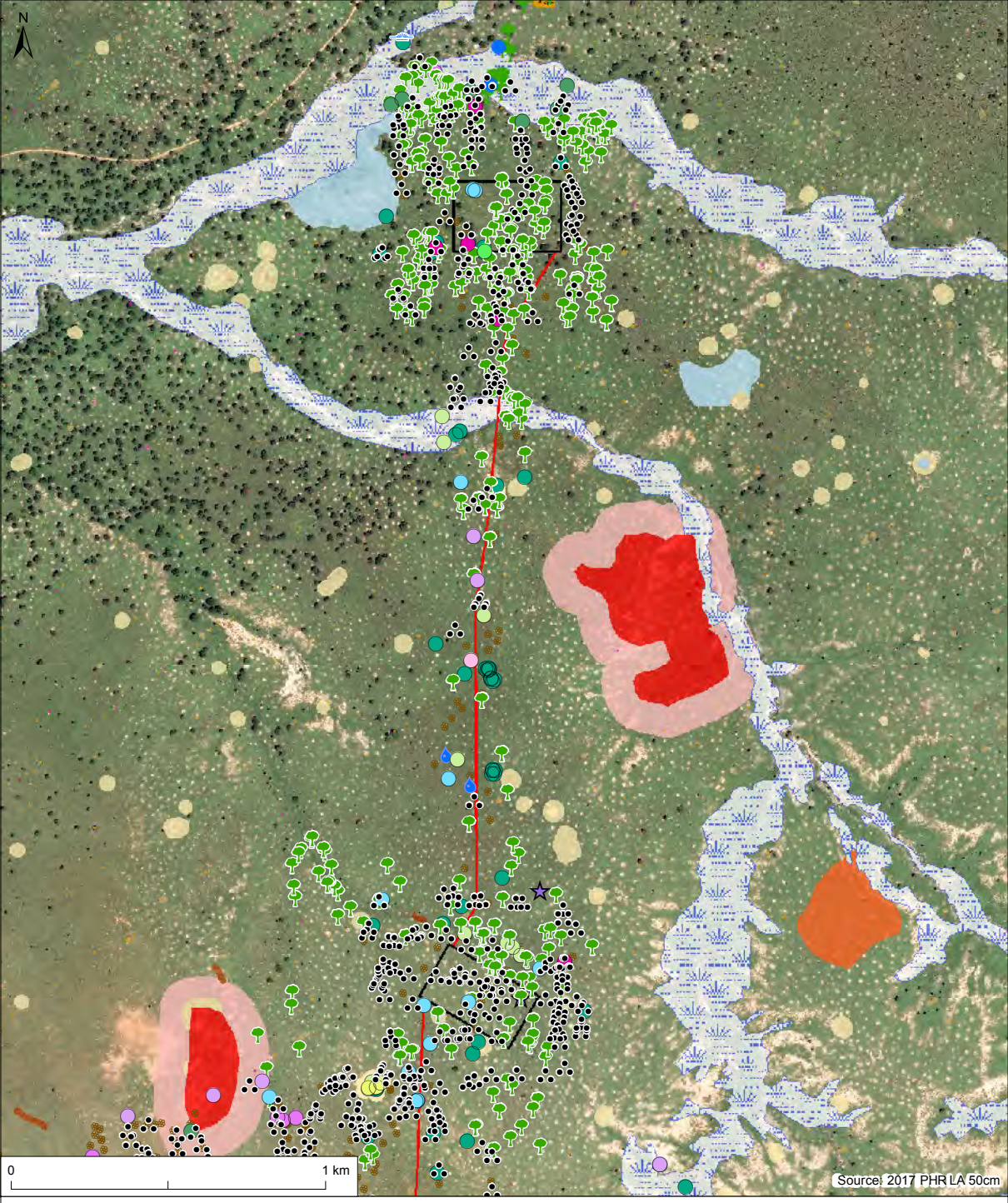


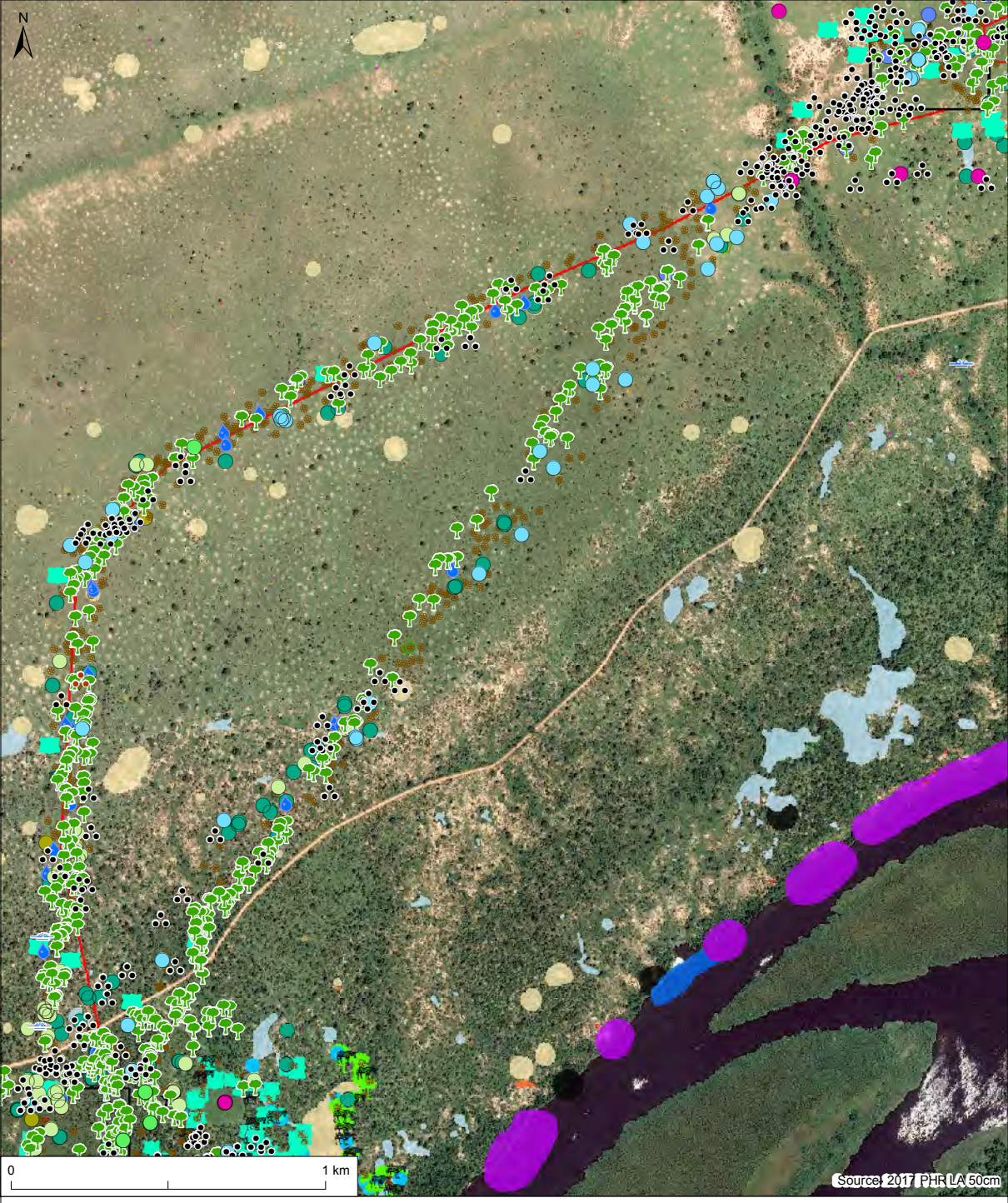
ECOLOGICAL SENSITIVITY MAPPING - JBR-09 to JBR-08

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



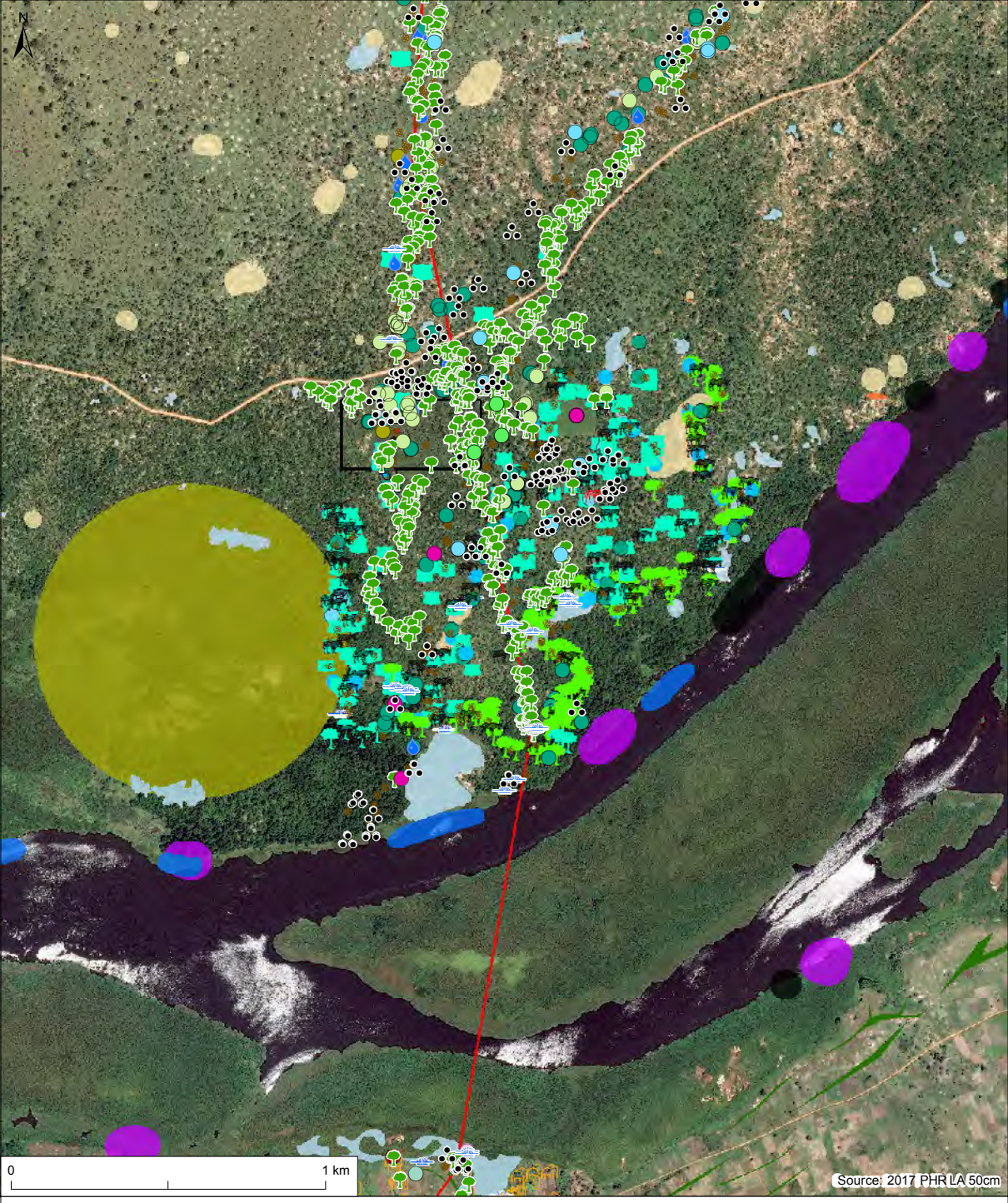
ECOLOGICAL SENSITIVITY MAPPING - JBR-10 to JBR-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



ECOLOGICAL SENSITIVITY MAPPING - JBR-10 to NIV (Option 2)

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 2
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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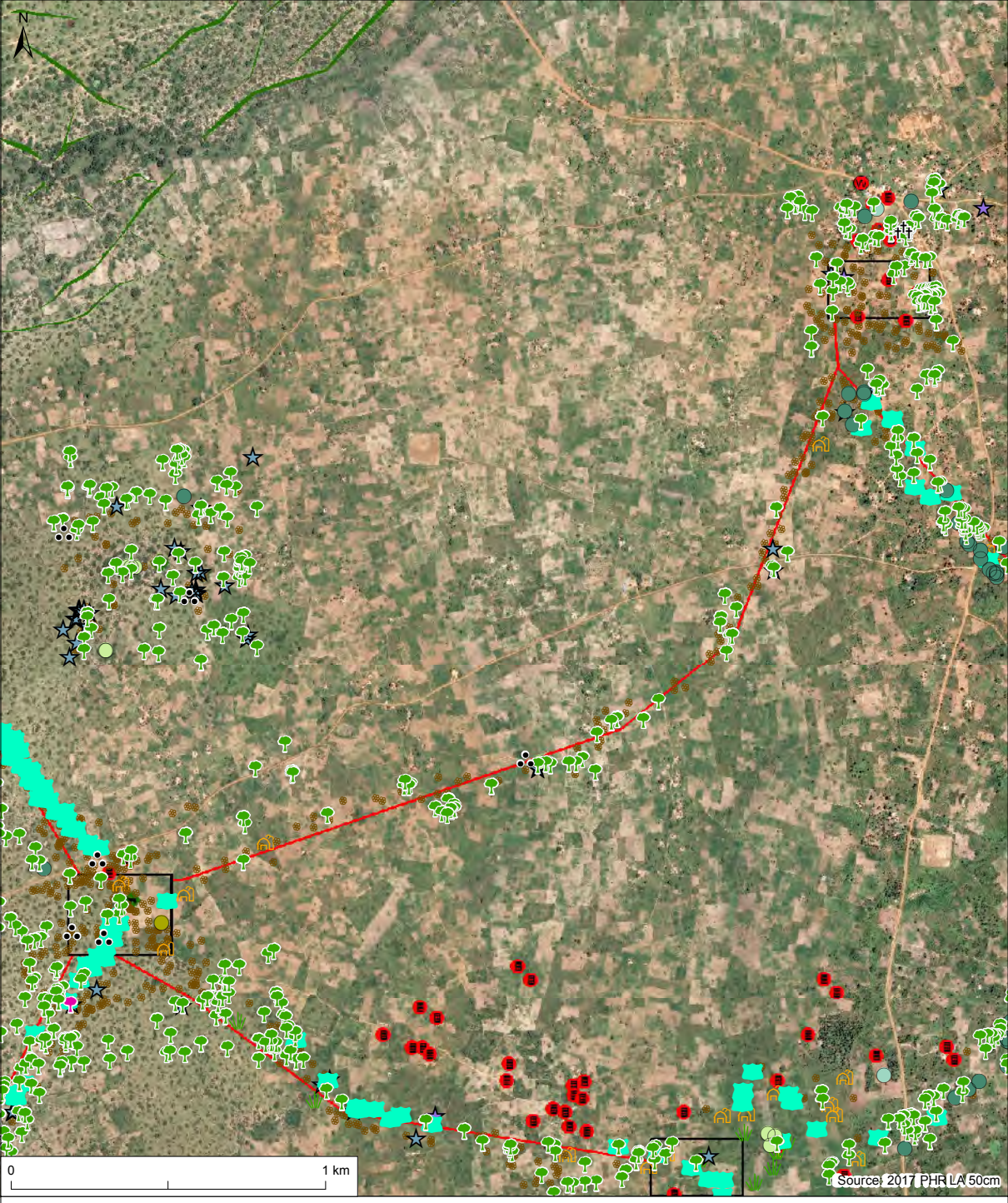

ECOLOGICAL SENSITIVITY MAPPING - KGG-01 to KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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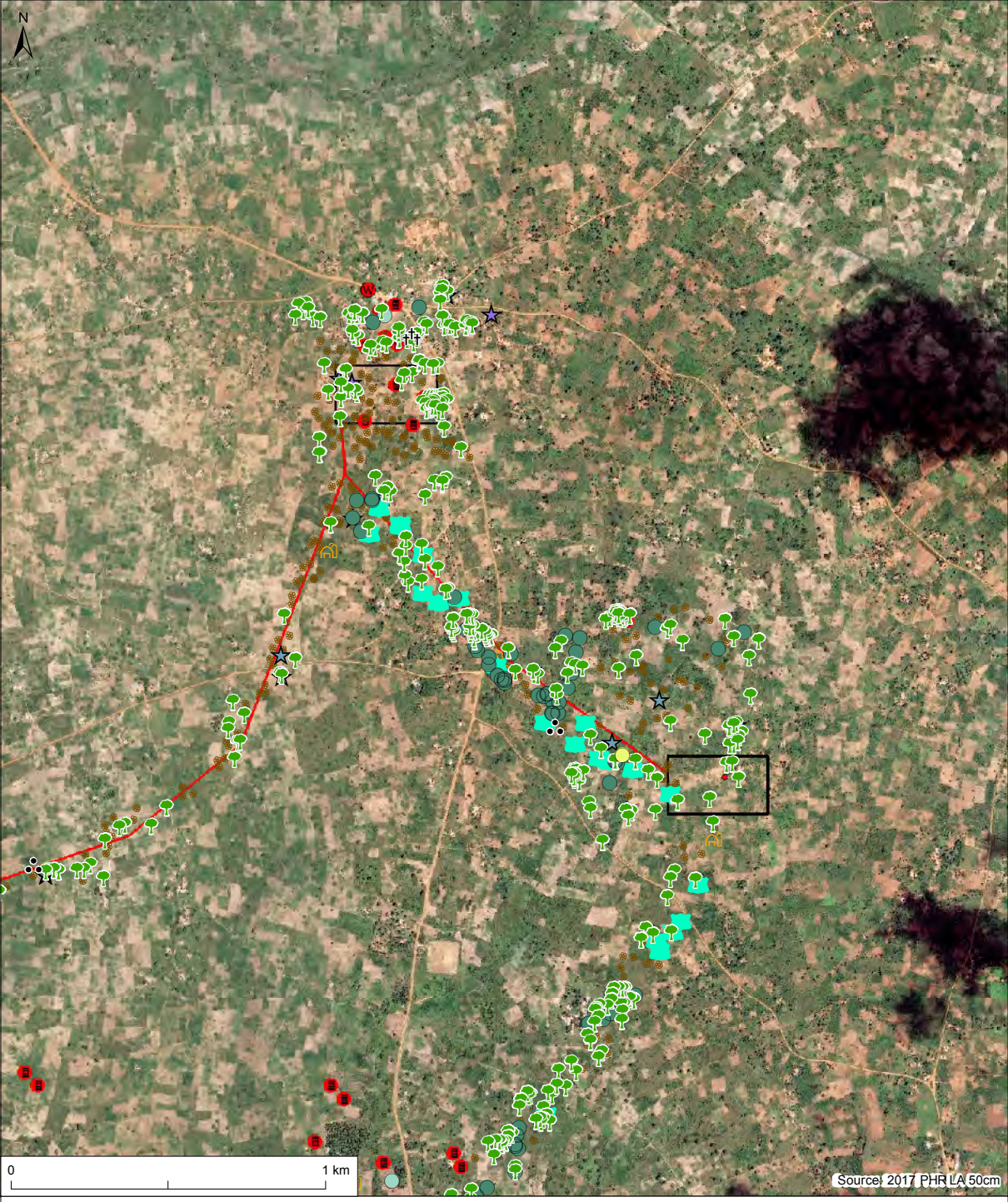

ECOLOGICAL SENSITIVITY MAPPING - KGG-03 to KGG-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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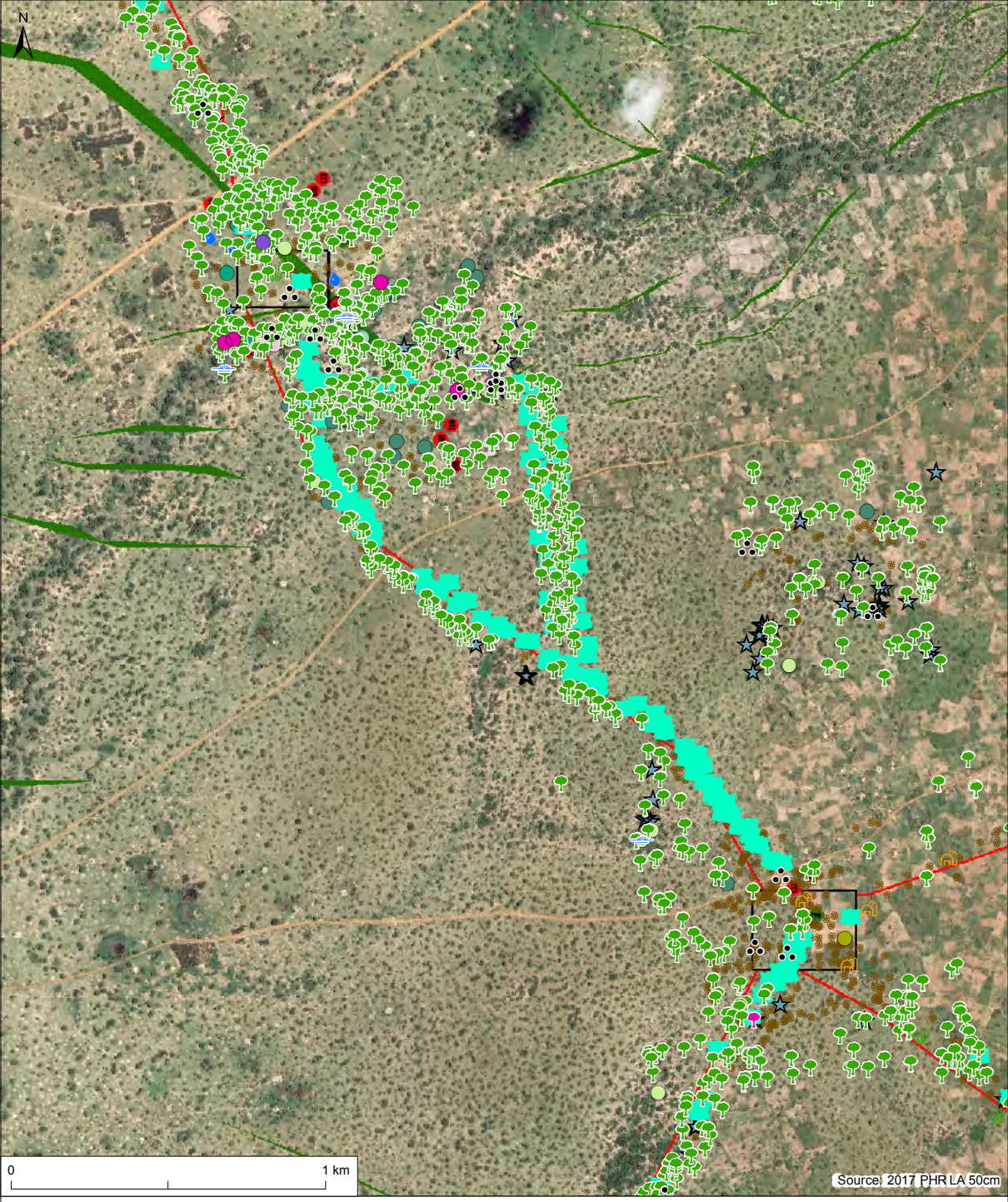
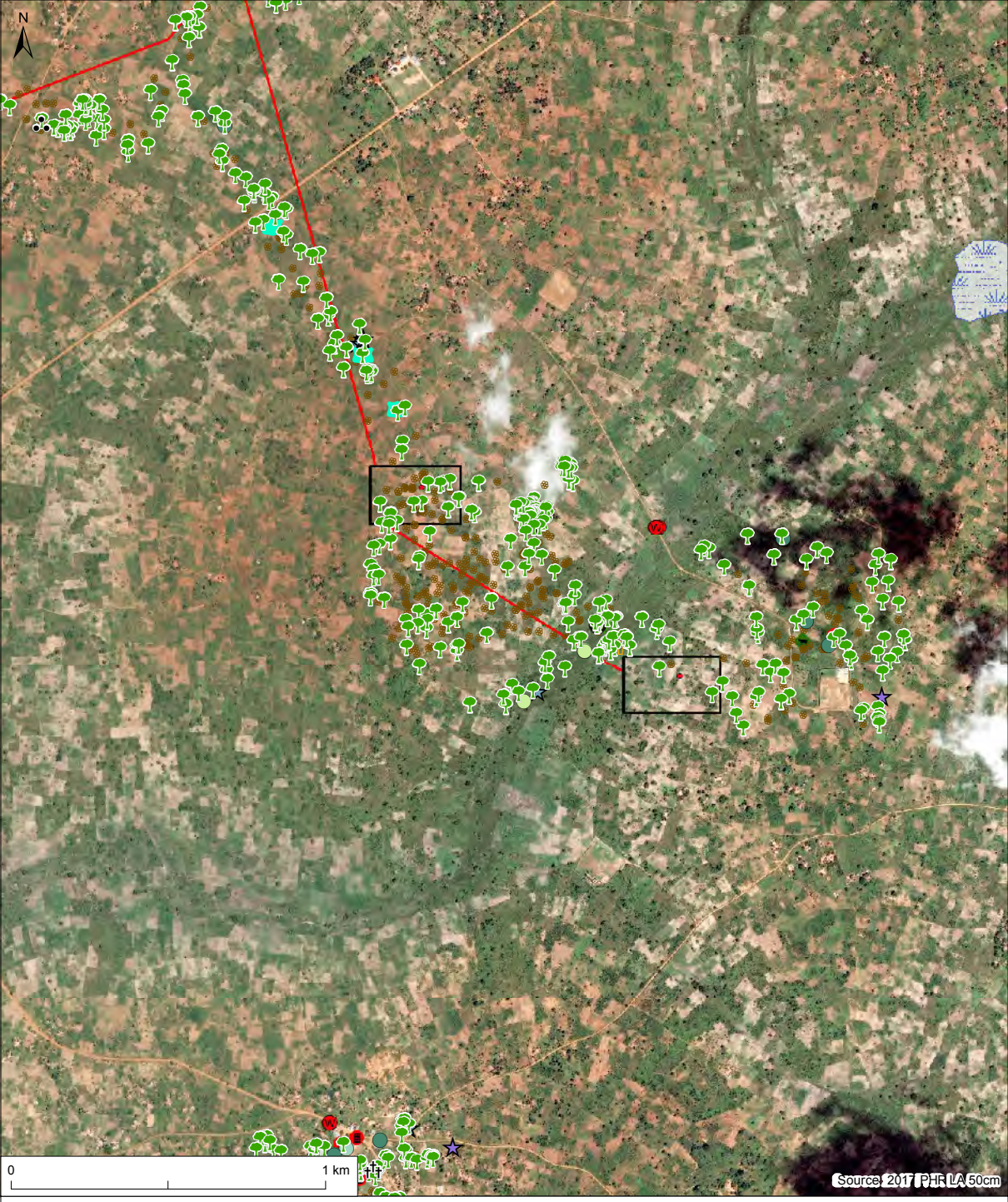


ECOLOGICAL SENSITIVITY MAPPING - KGG-04 to NSO-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

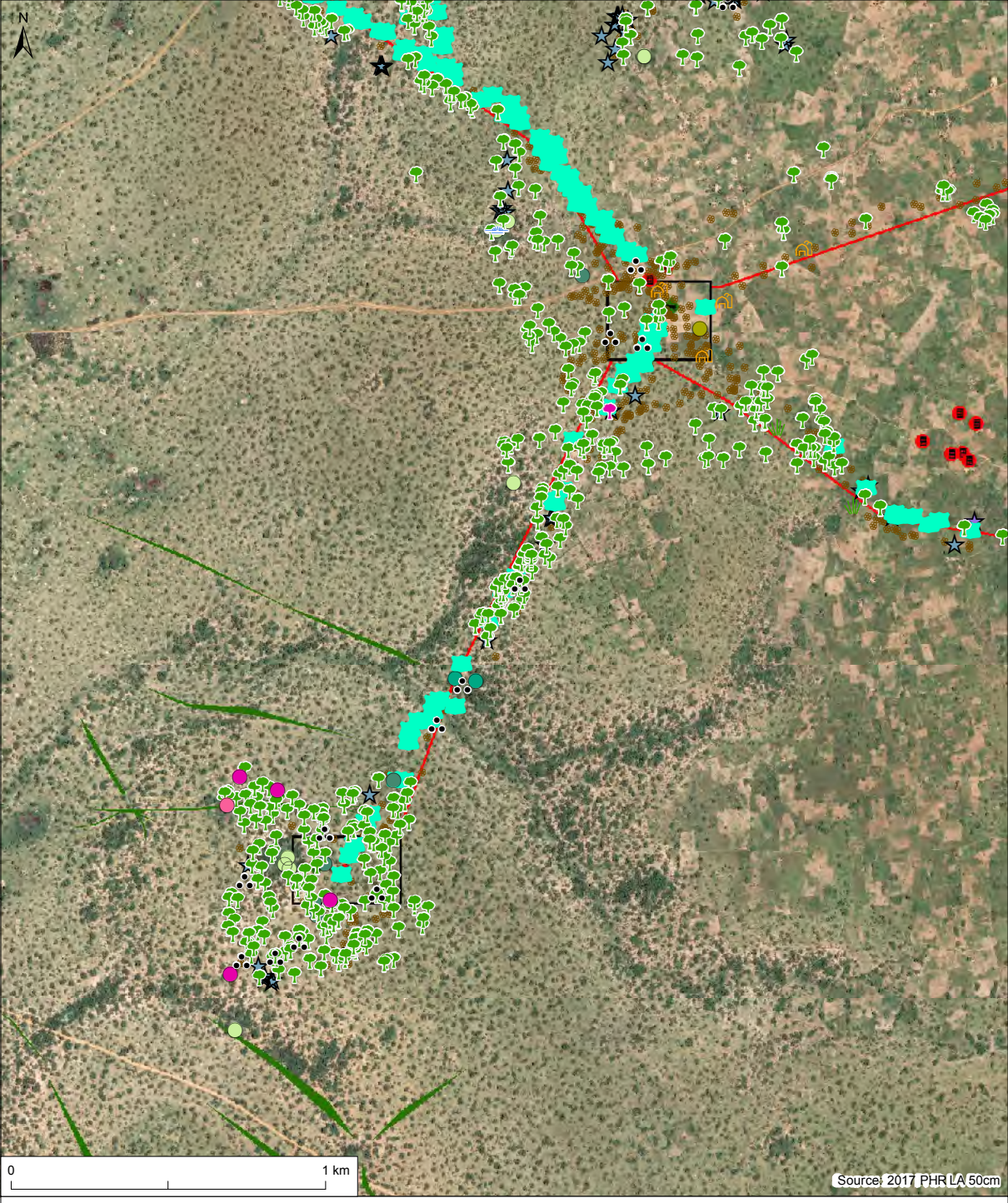


ECOLOGICAL SENSITIVITY MAPPING - KGG-05 to NSO-02

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



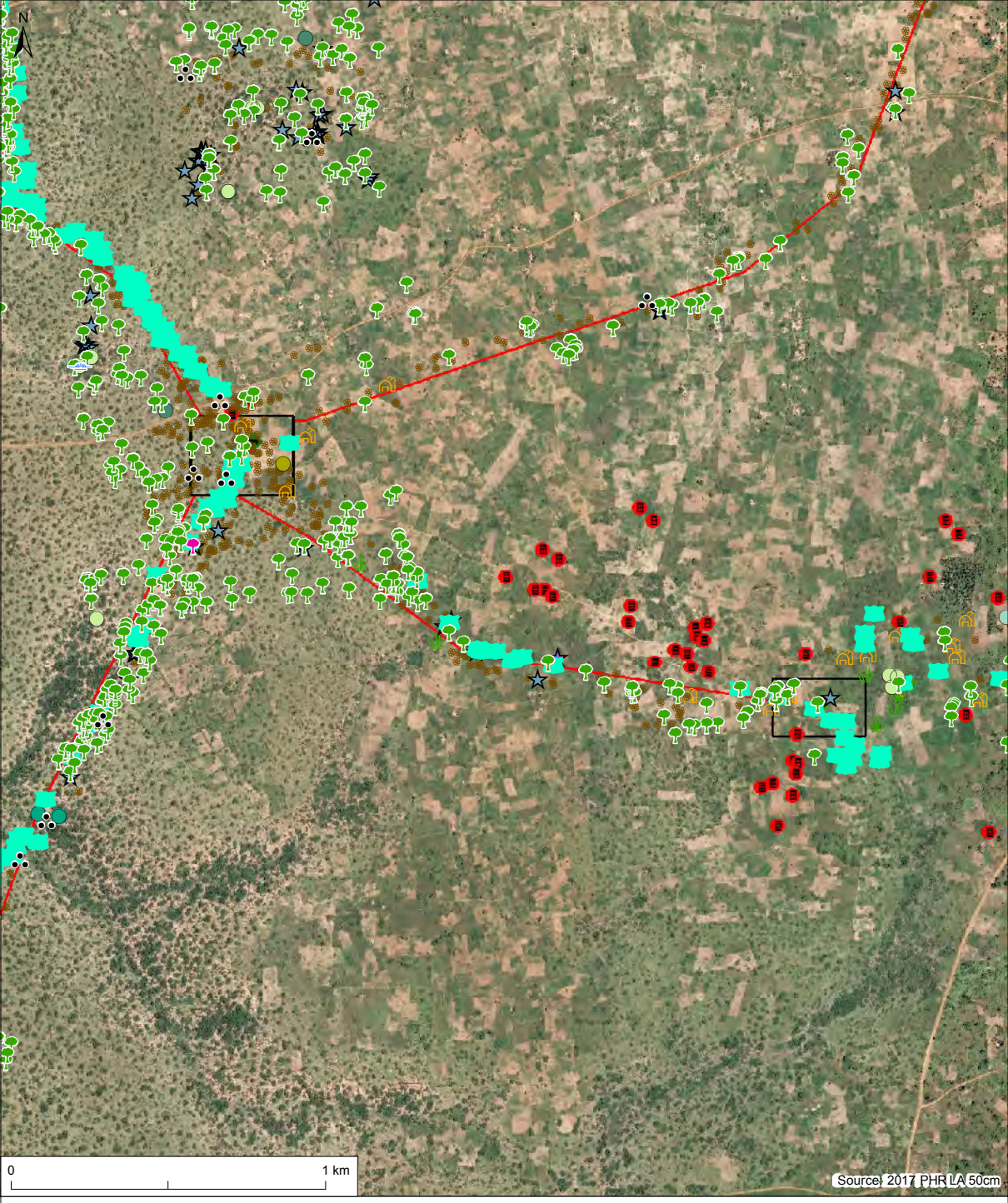
ECOLOGICAL SENSITIVITY MAPPING - KGG-06 to KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM

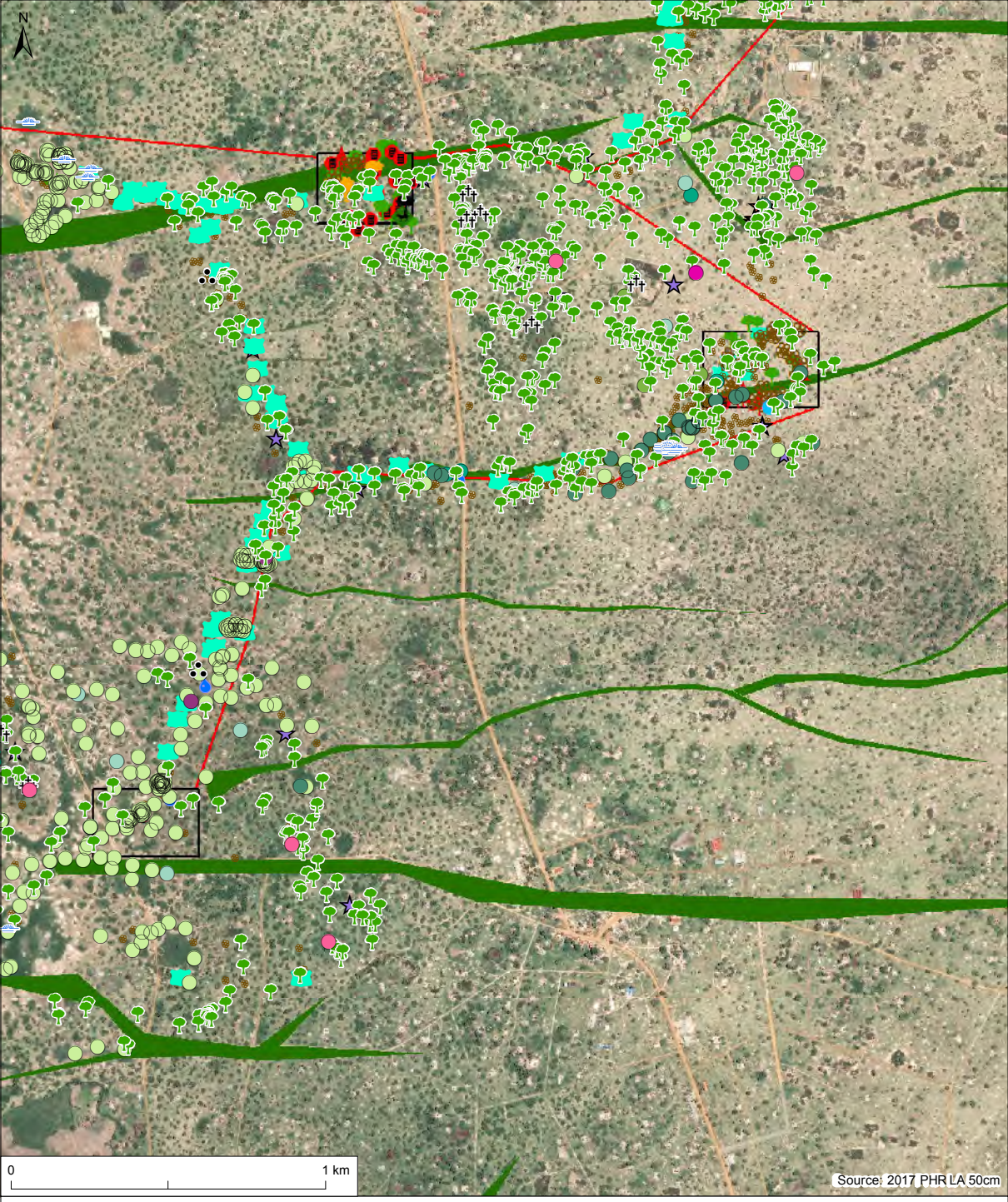


ECOLOGICAL SENSITIVITY MAPPING - KGG-09 to KGG-04

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



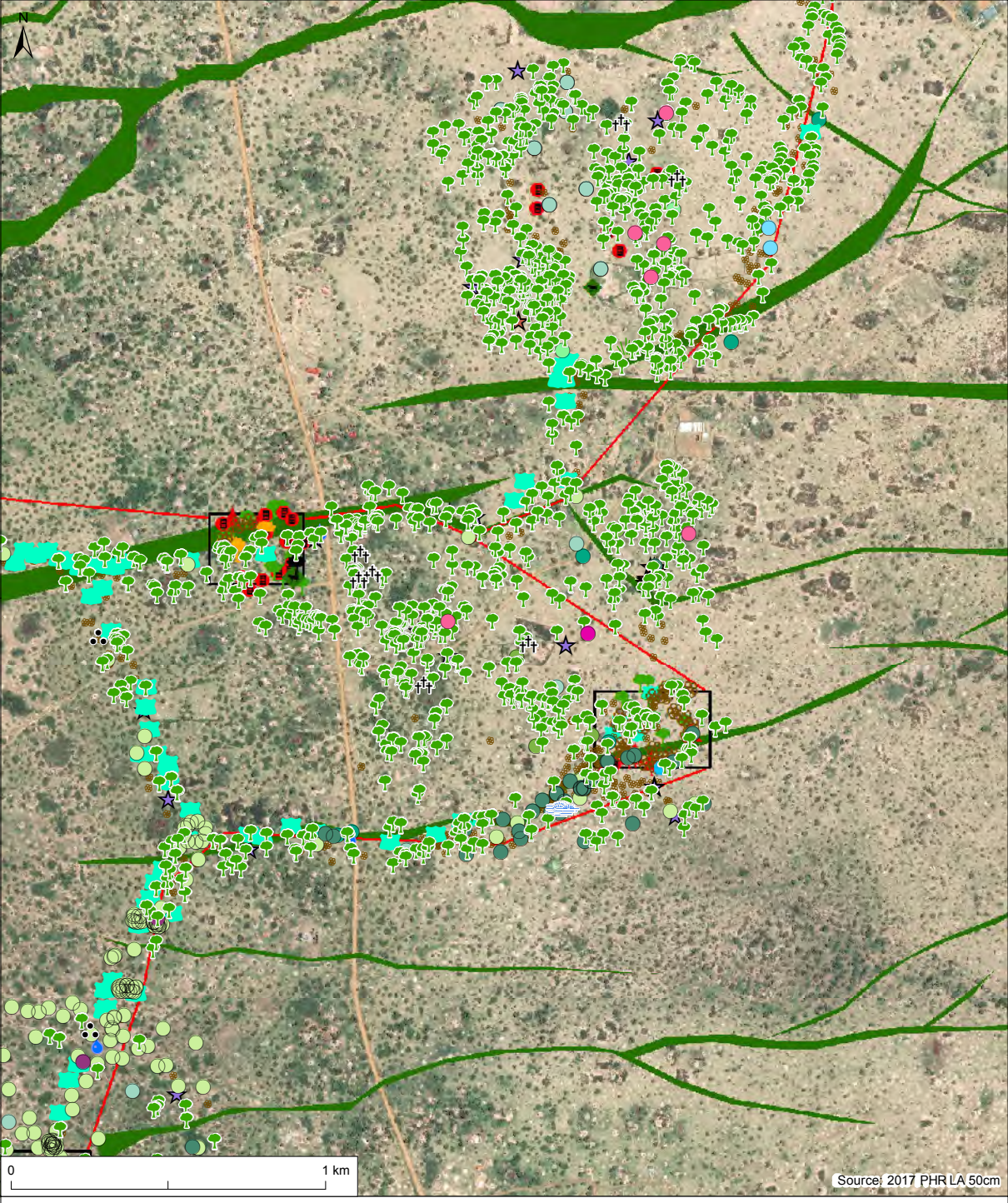
ECOLOGICAL SENSITIVITY MAPPING - KW-01 to KW-02A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

AECOM



ECOLOGICAL SENSITIVITY MAPPING - KW-02A to KW-02B

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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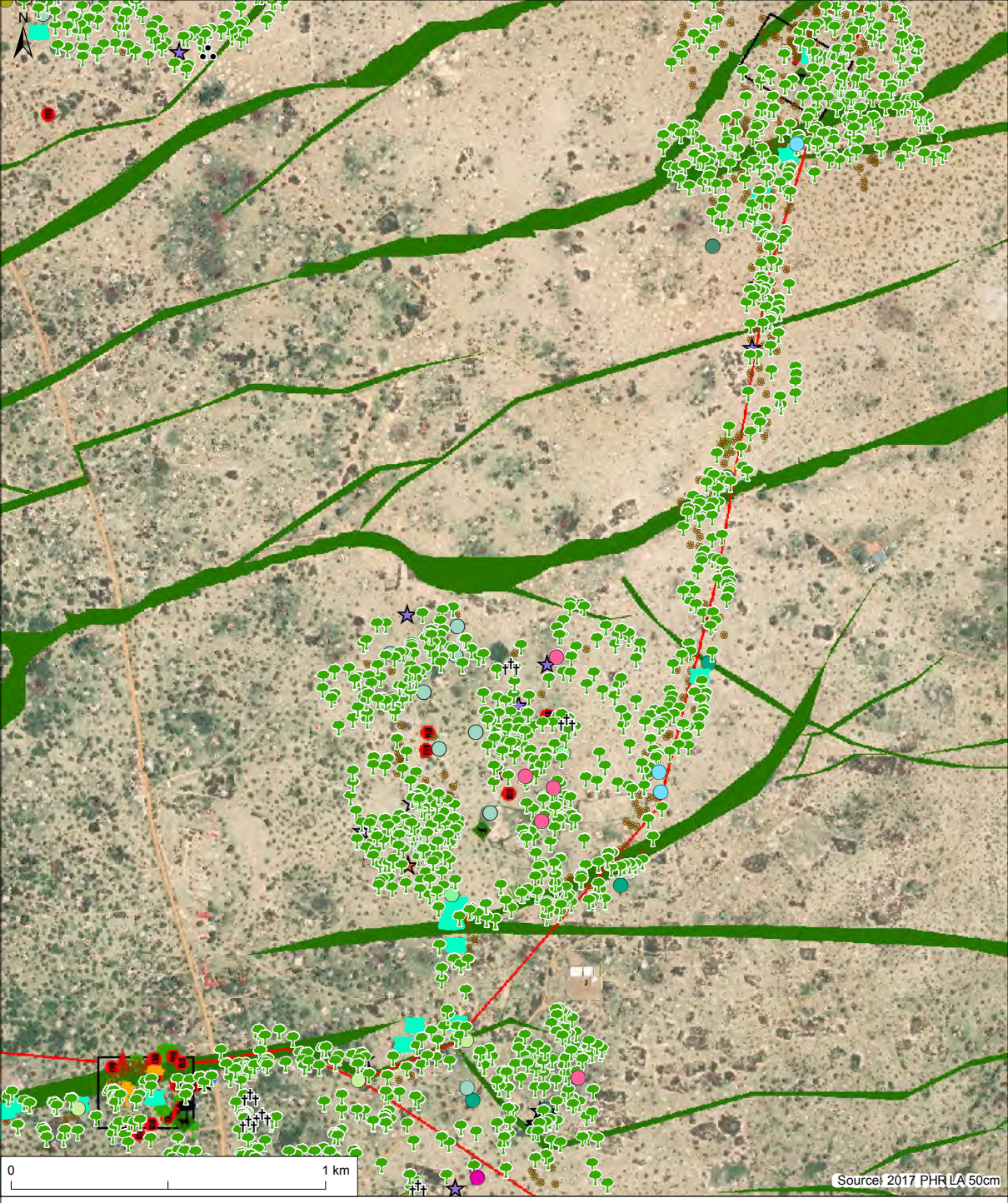
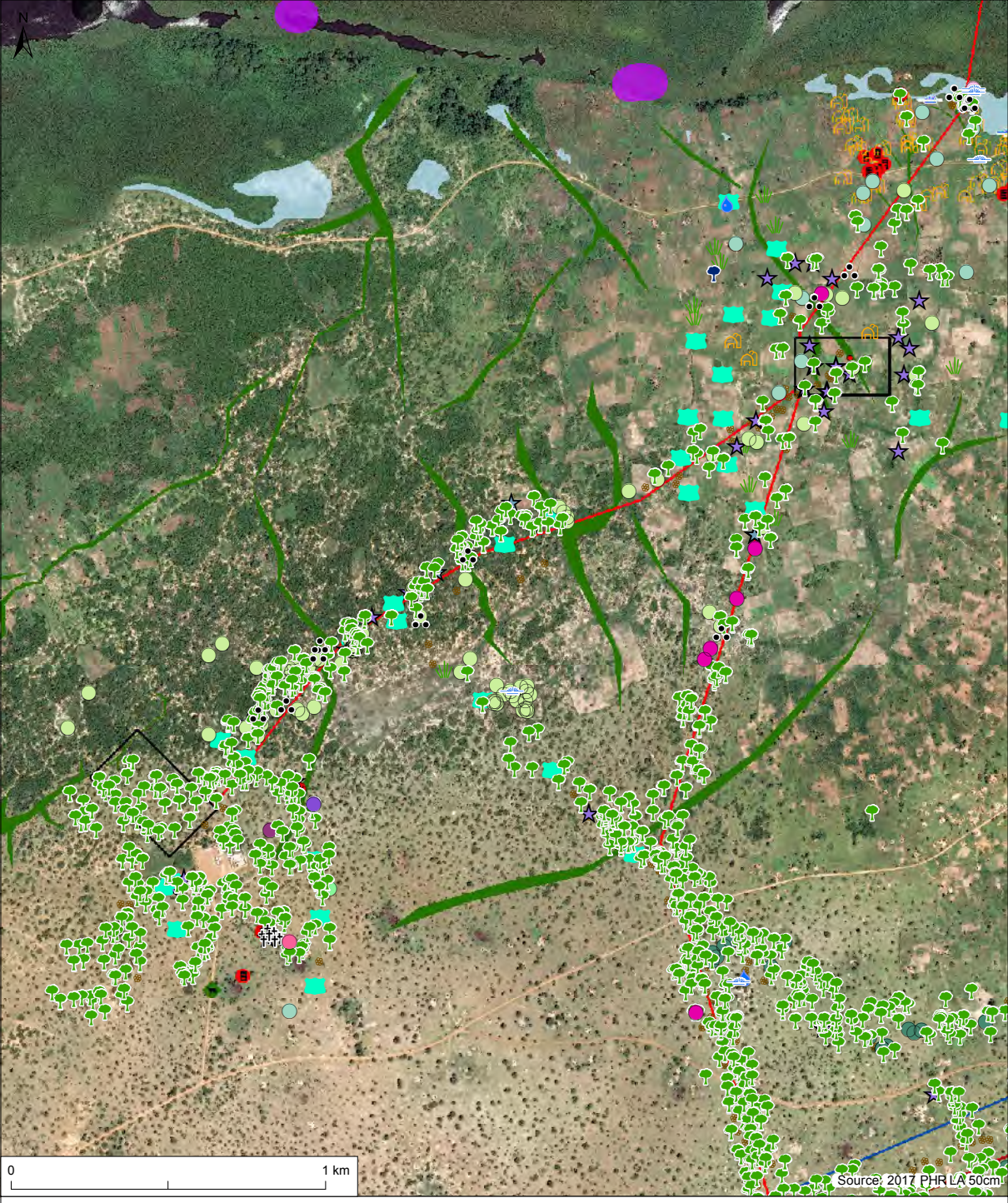


ECOLOGICAL SENSITIVITY MAPPING - KW-02B to NGR-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

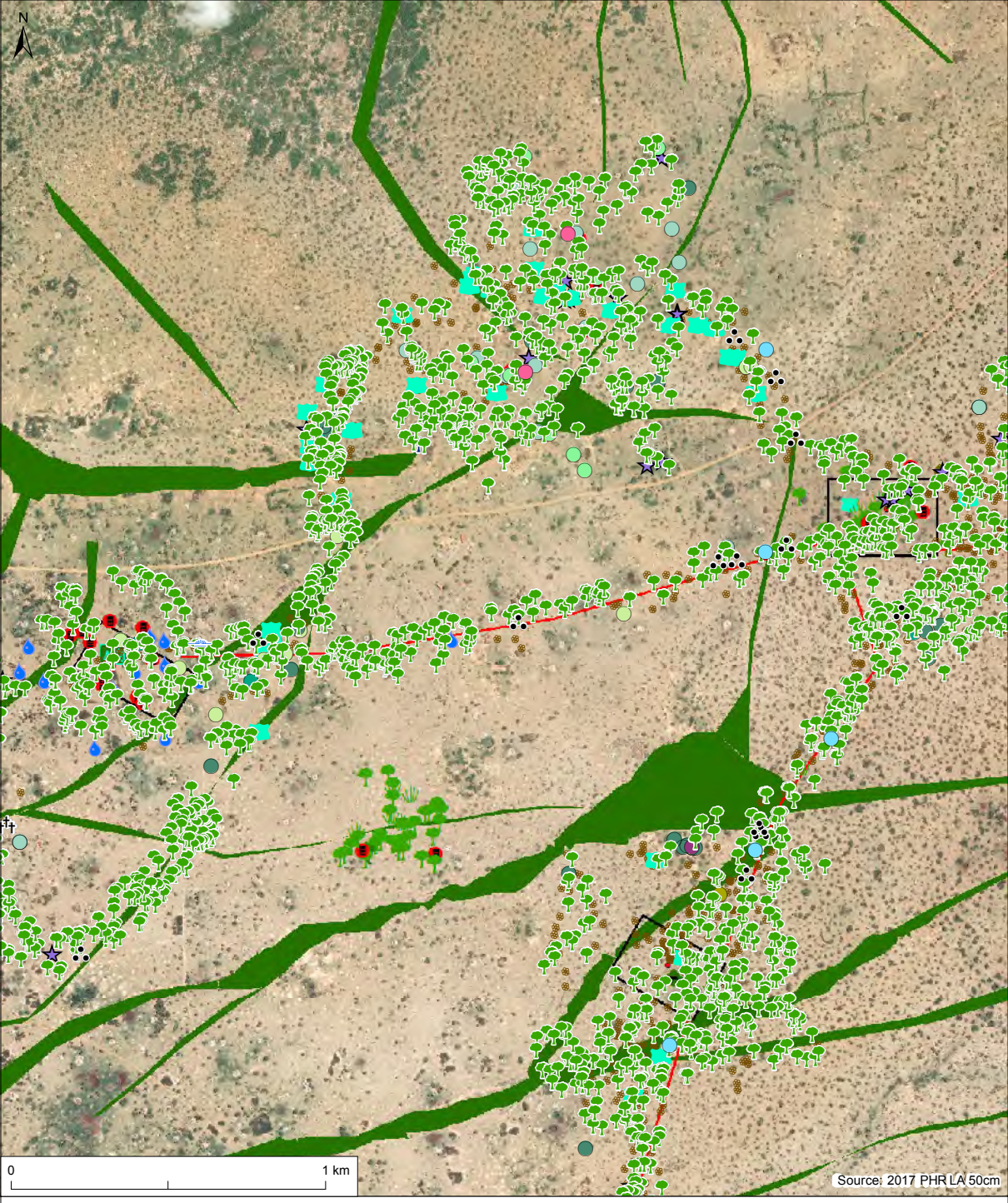


ECOLOGICAL SENSITIVITY MAPPING - NGR-02 to NGR-01

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 2
- Industrial Area
- CPF
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



ECOLOGICAL SENSITIVITY MAPPING - NGR-03A to NGR-05A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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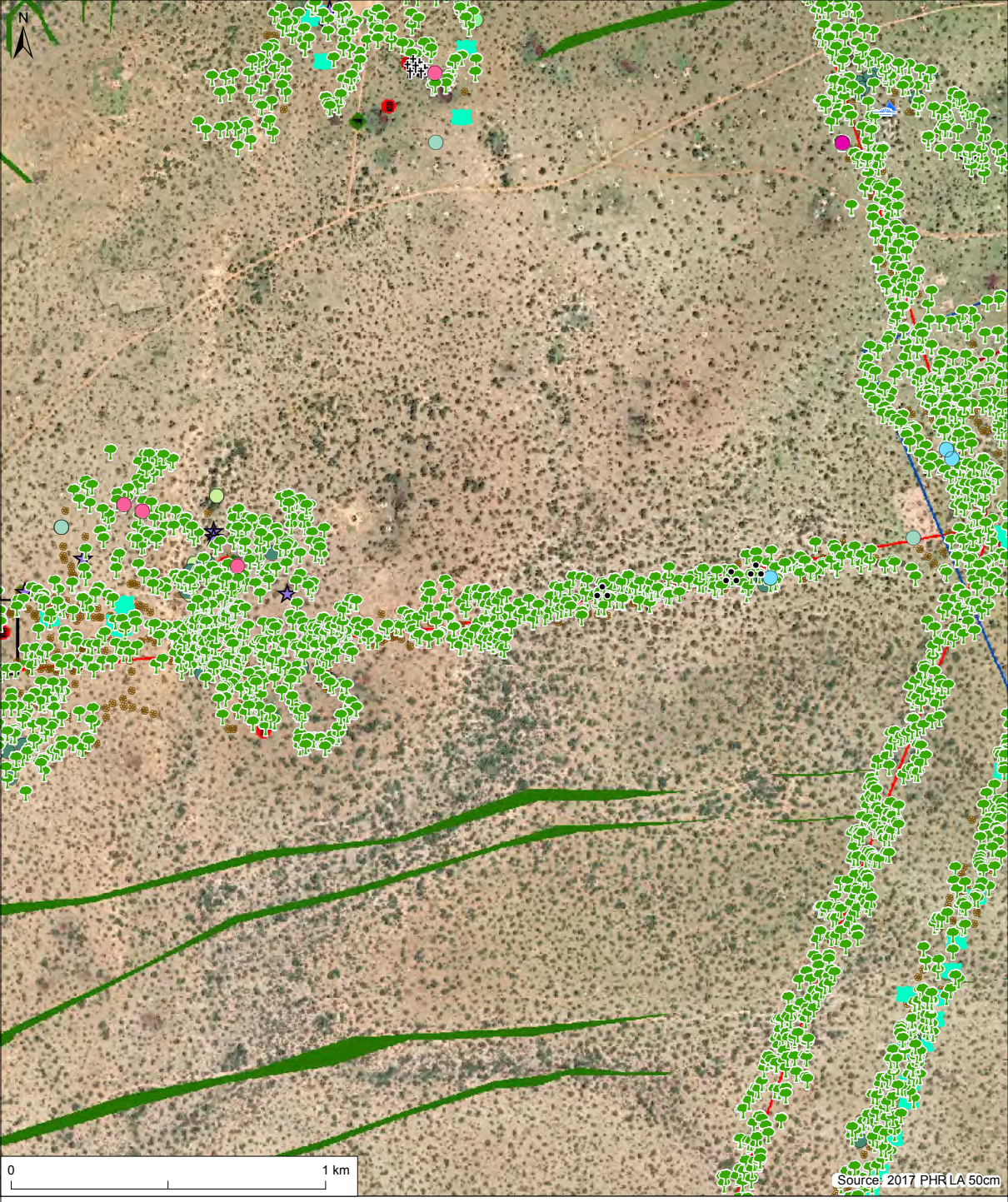

ECOLOGICAL SENSITIVITY MAPPING - NGR-05A to CPF

- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT

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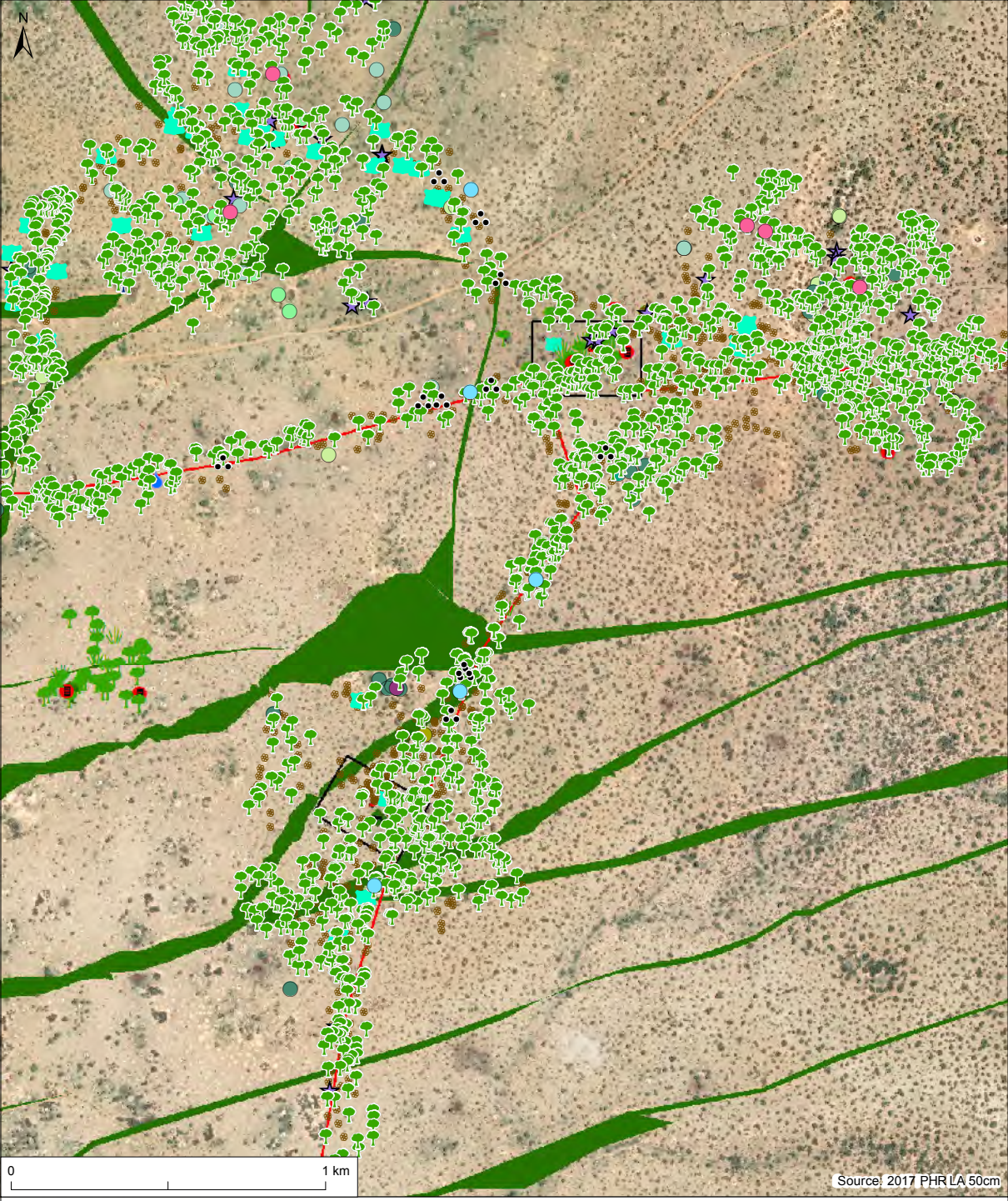

ECOLOGICAL SENSITIVITY MAPPING - NGR-06 to NGR-05A

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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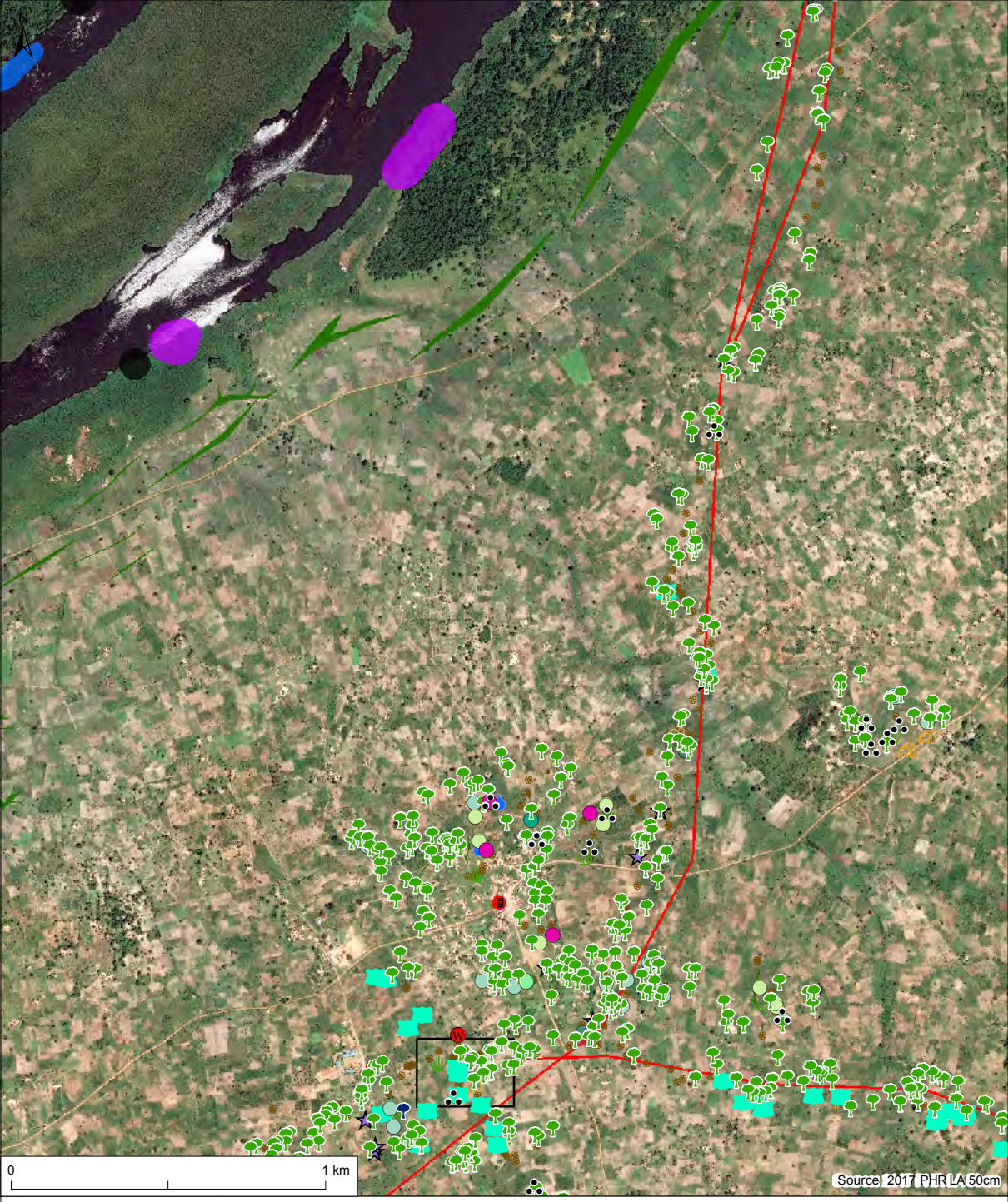

ECOLOGICAL SENSITIVITY MAPPING - NIV (Option 1) to CPF

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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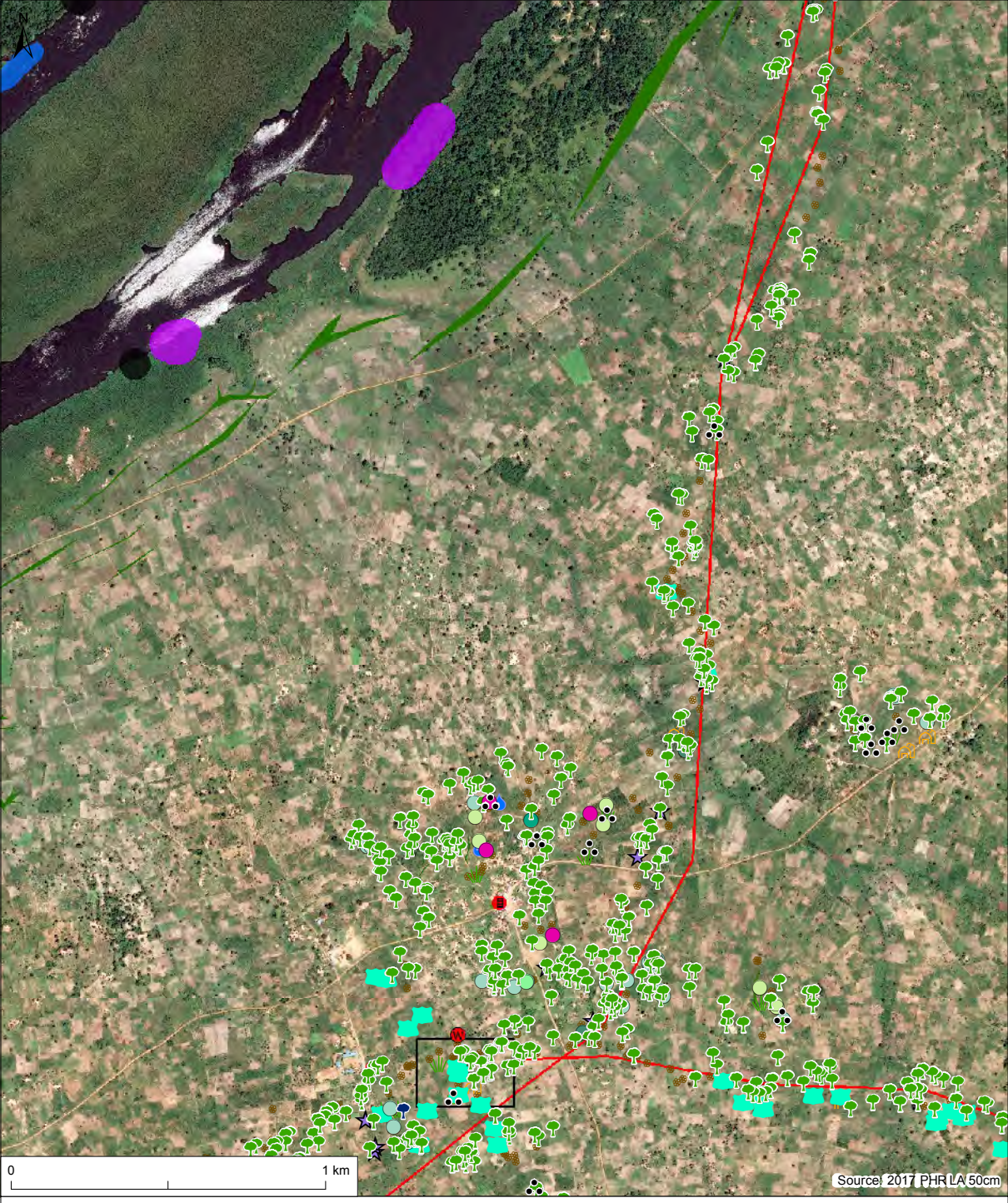

ECOLOGICAL SENSITIVITY MAPPING - NIV (Option 1) to CPF - alt

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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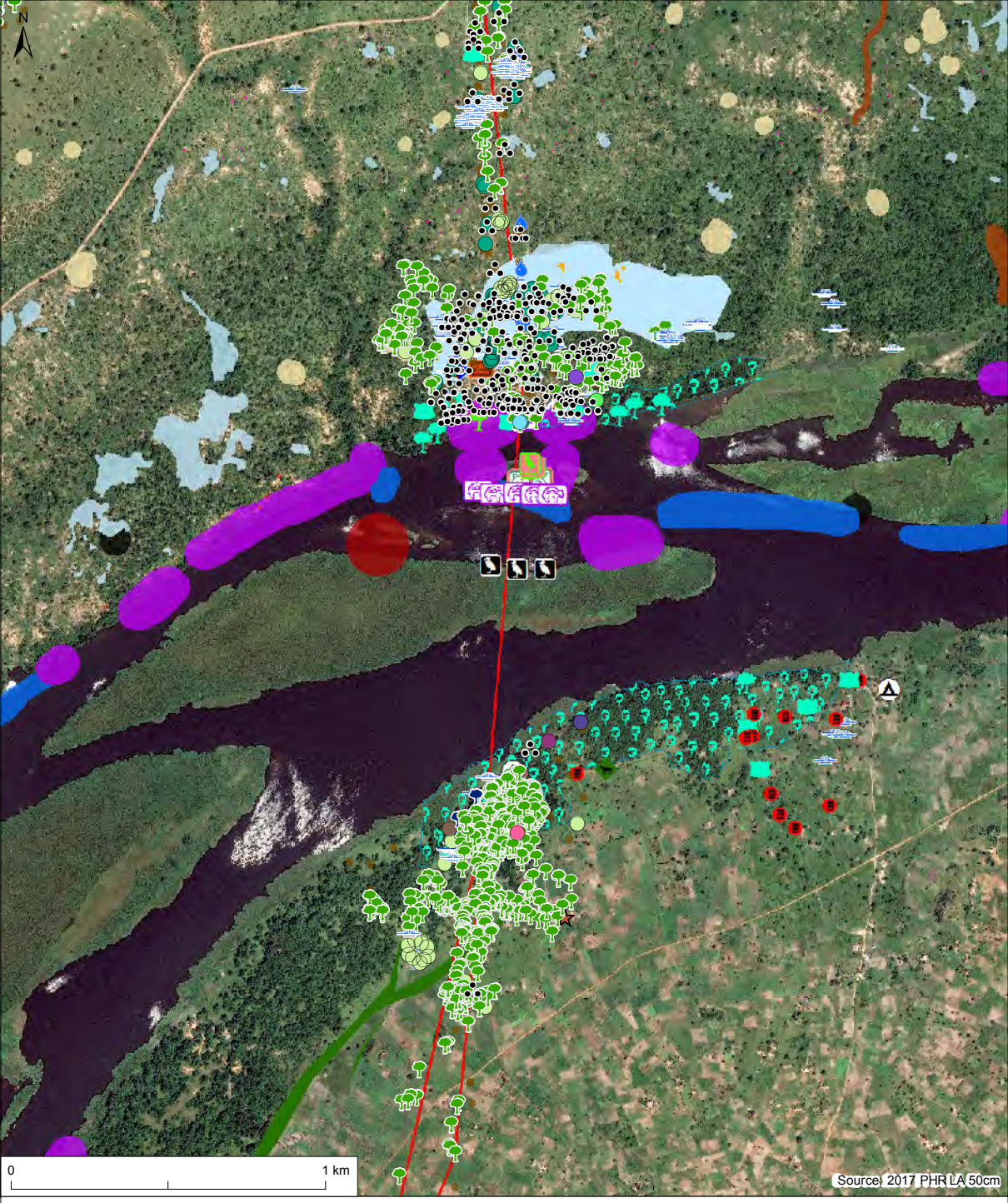

ECOLOGICAL SENSITIVITY MAPPING - NIV (Option 1) to NIV (Option 1)

- Victoria Nile Pipeline HDD Crossing - Option 1
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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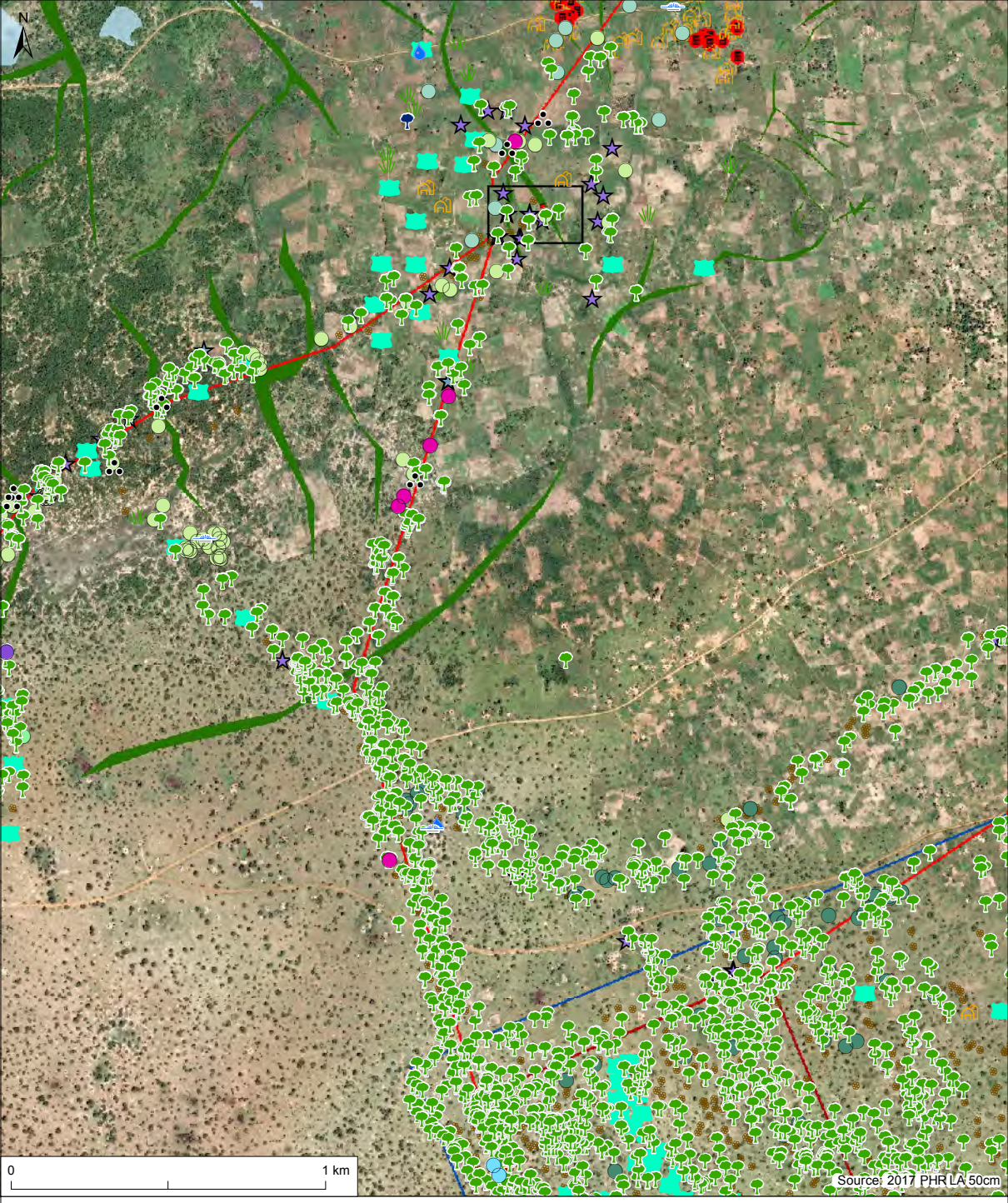

ECOLOGICAL SENSITIVITY MAPPING - NIV (Option 2) to CPF via NGR-01

- Wellpad location
- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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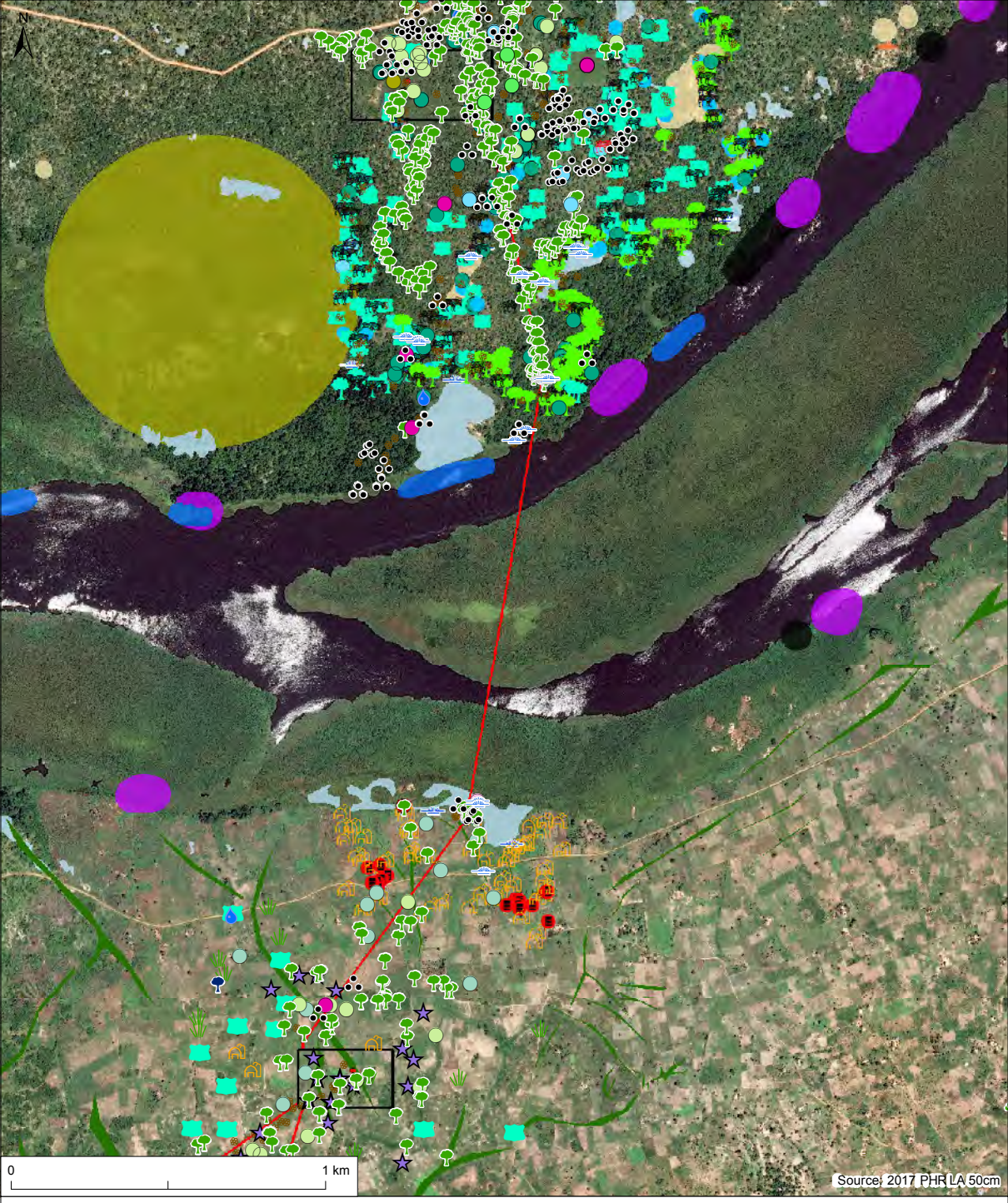

ECOLOGICAL SENSITIVITY MAPPING - NIV (Option 2) to NIV (Option 2)

- Wellpad location
- Wellpad Extent - Maximum
- Victoria Nile Pipeline HDD Crossing - Option 2
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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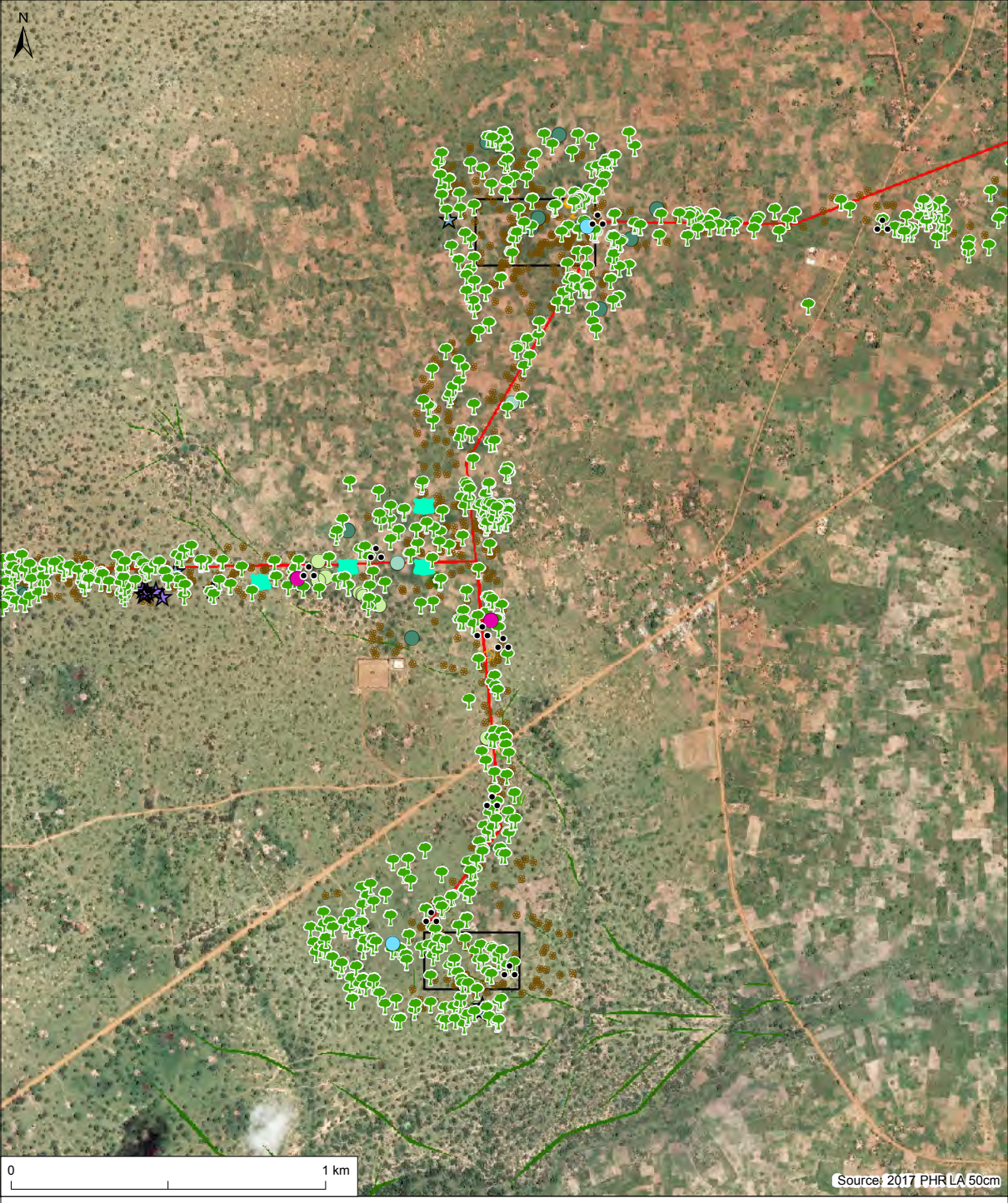
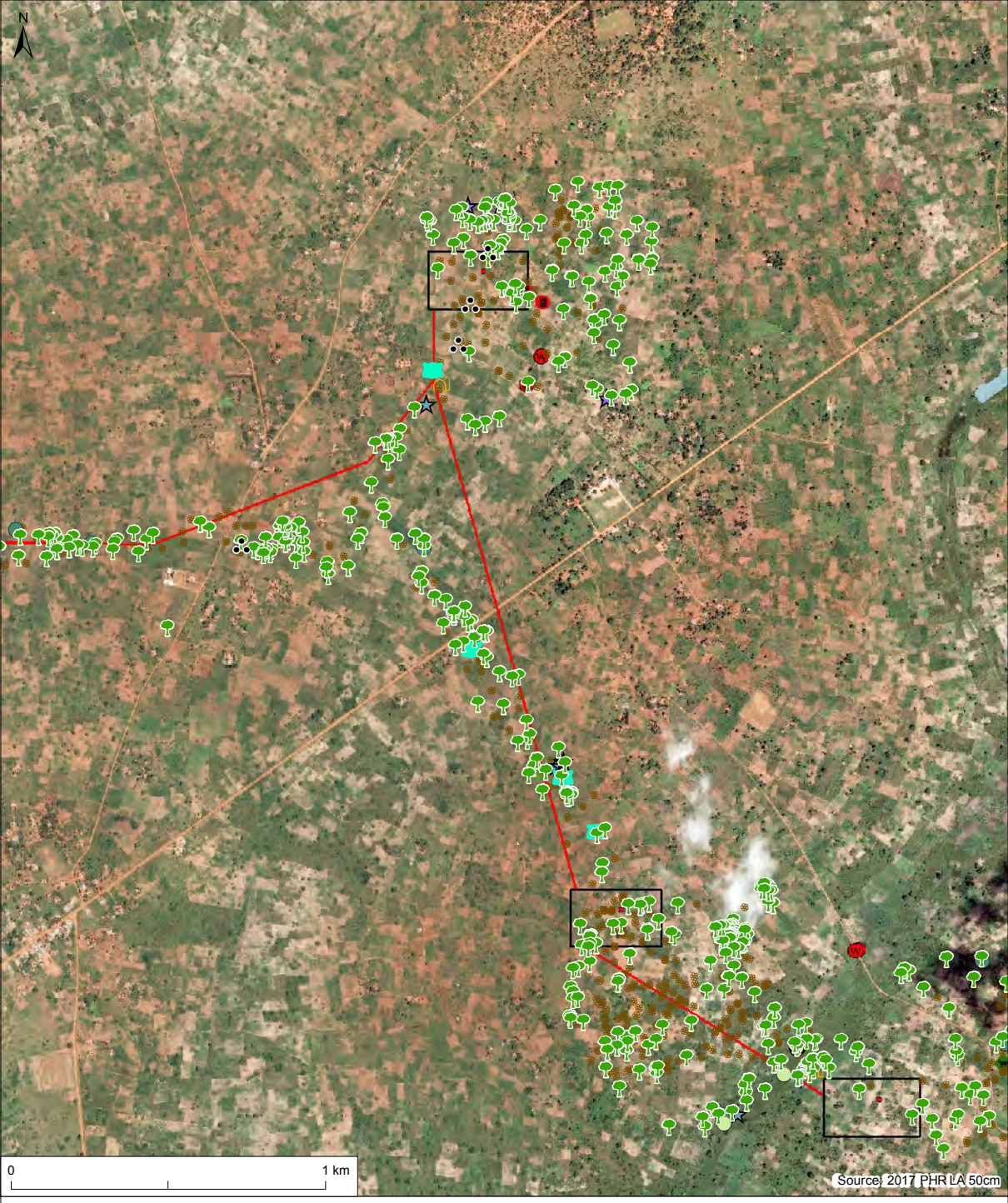


ECOLOGICAL SENSITIVITY MAPPING - NSO-01 to NSO-05

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

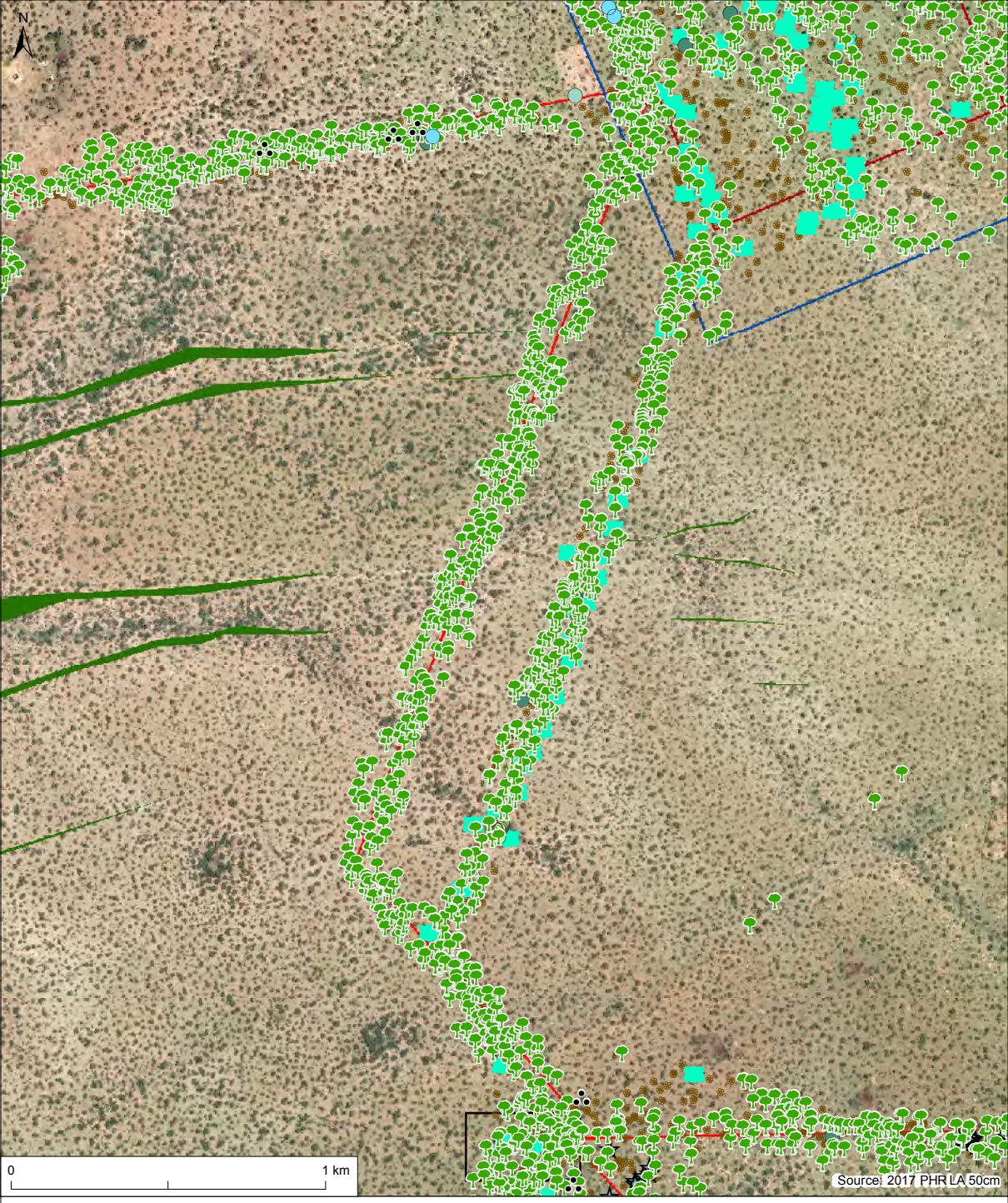


ECOLOGICAL SENSITIVITY MAPPING - NSO-02 to NSO-06

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



ECOLOGICAL SENSITIVITY MAPPING - NSO-03 to CPF

- Wellpad location
- Wellpad Extent - Maximum
- Industrial Area
- CPF
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
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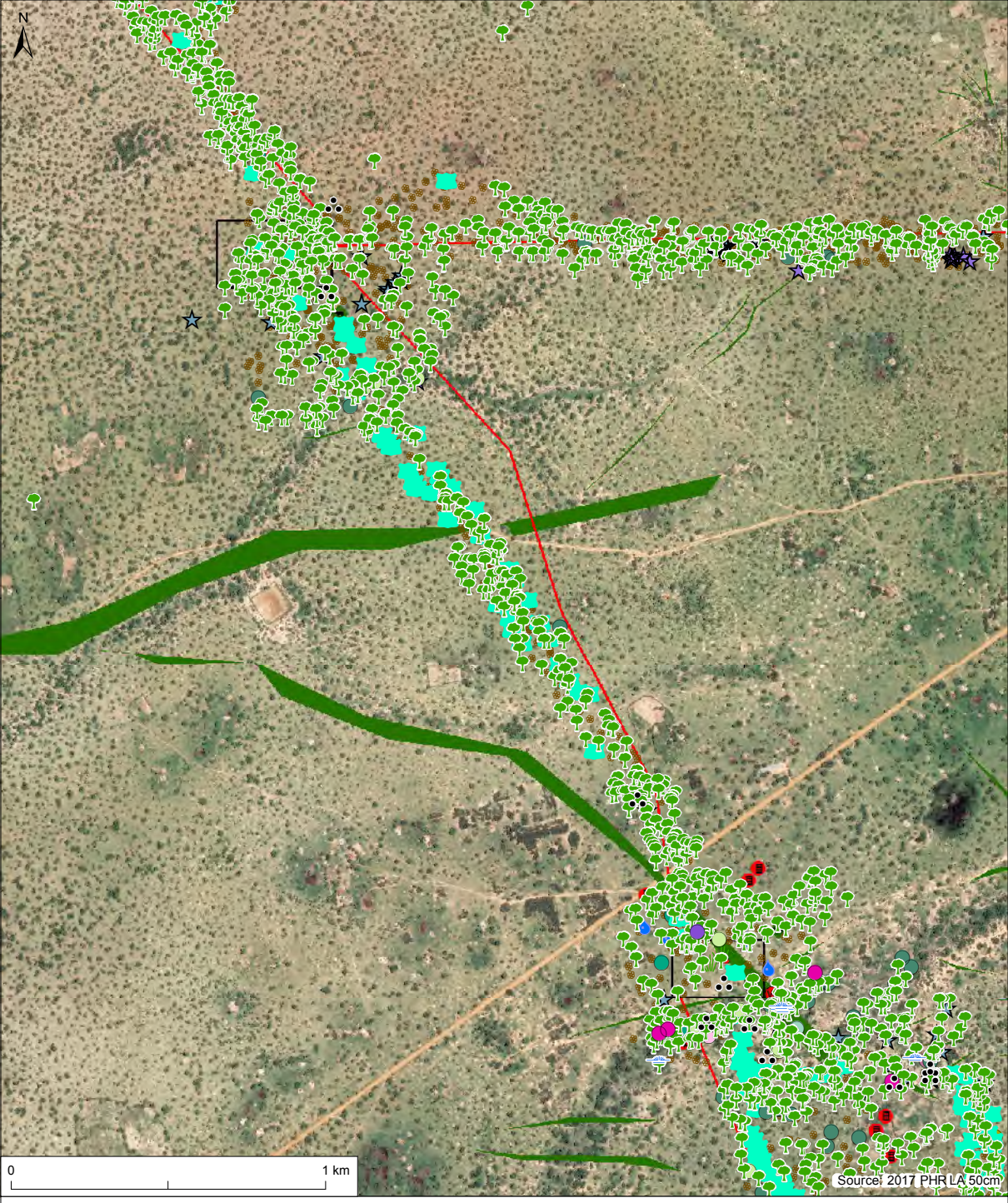
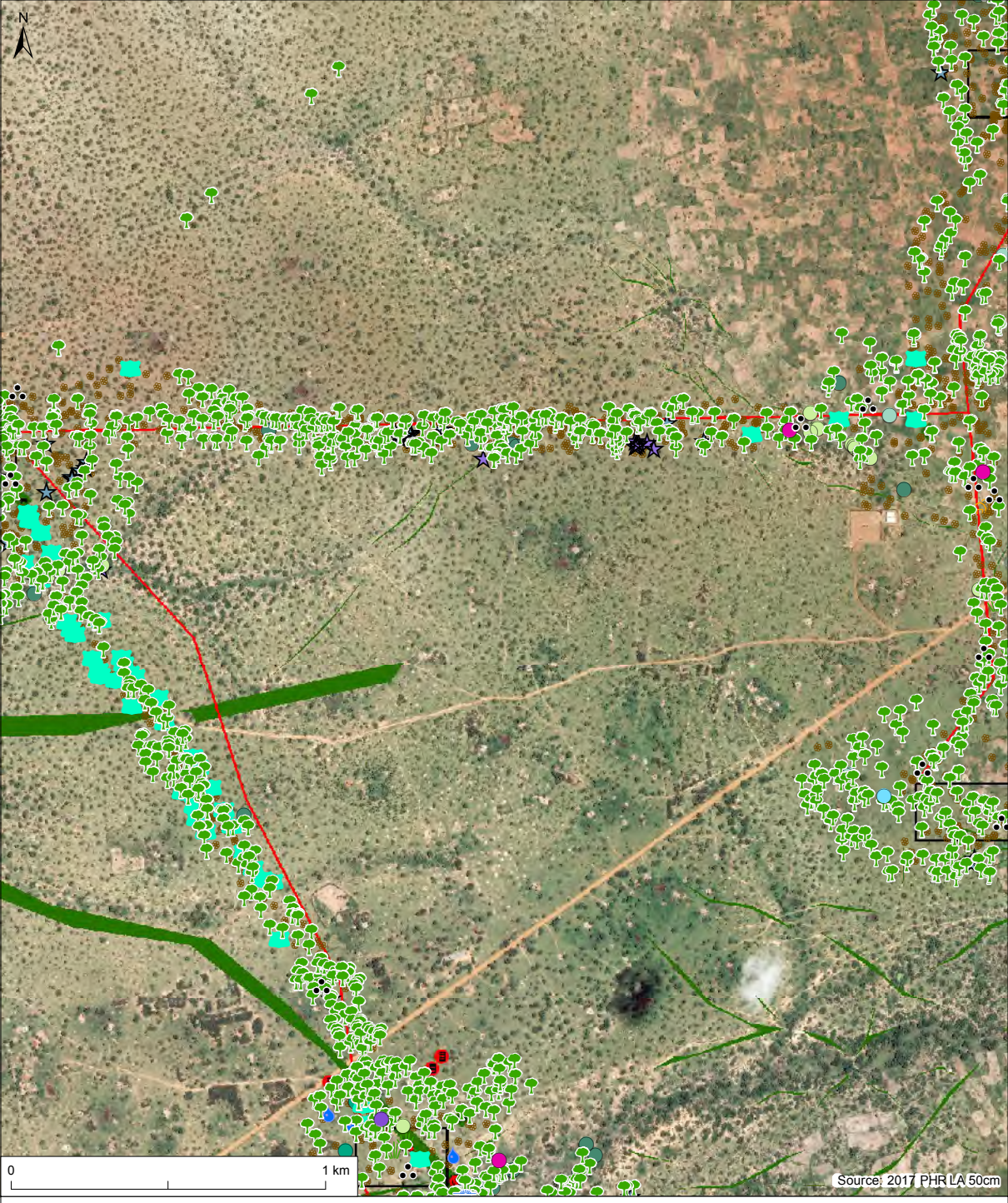


ECOLOGICAL SENSITIVITY MAPPING - NSO-04 to NSO-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

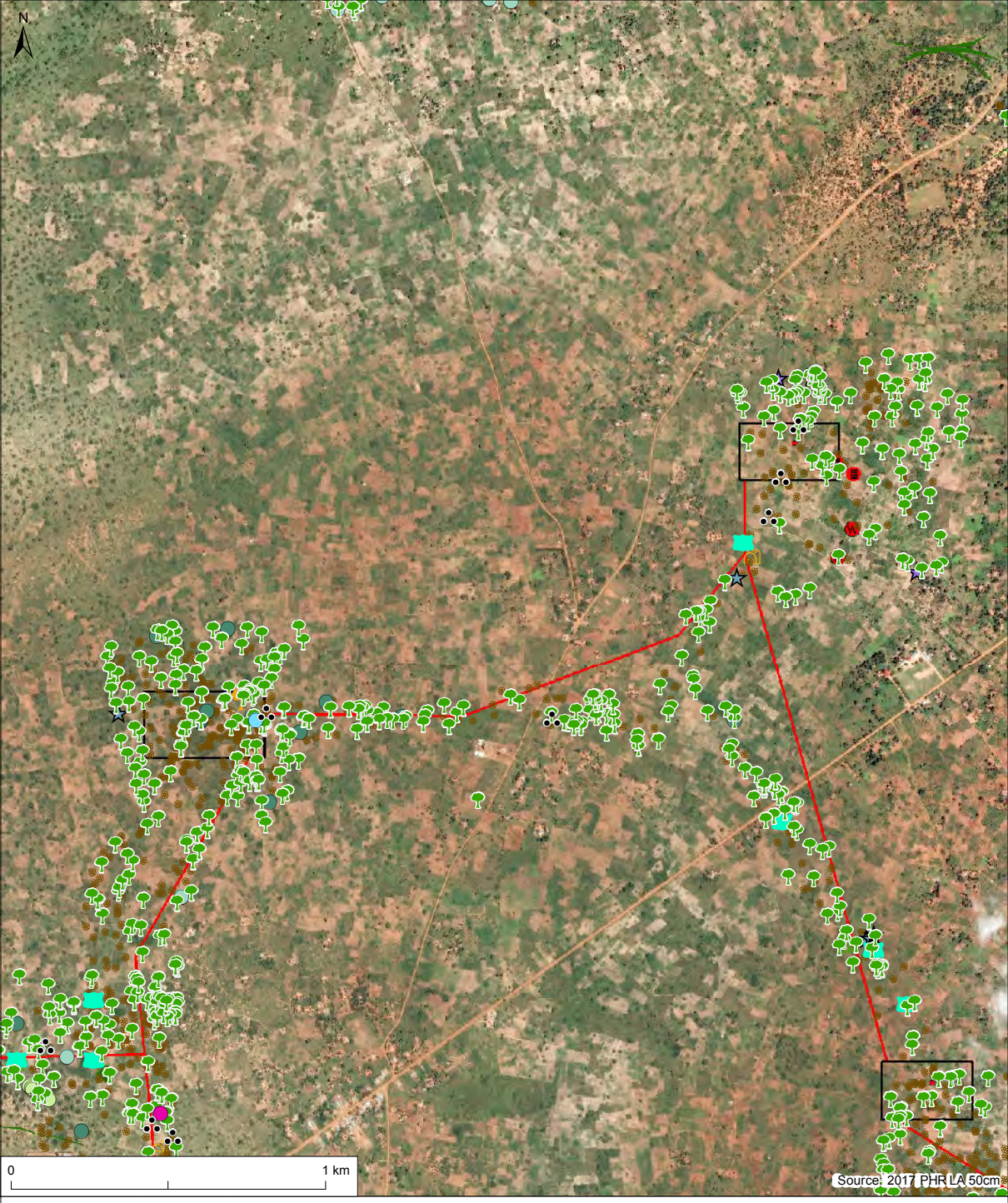


ECOLOGICAL SENSITIVITY MAPPING - NSO-05 to NSO-03

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM

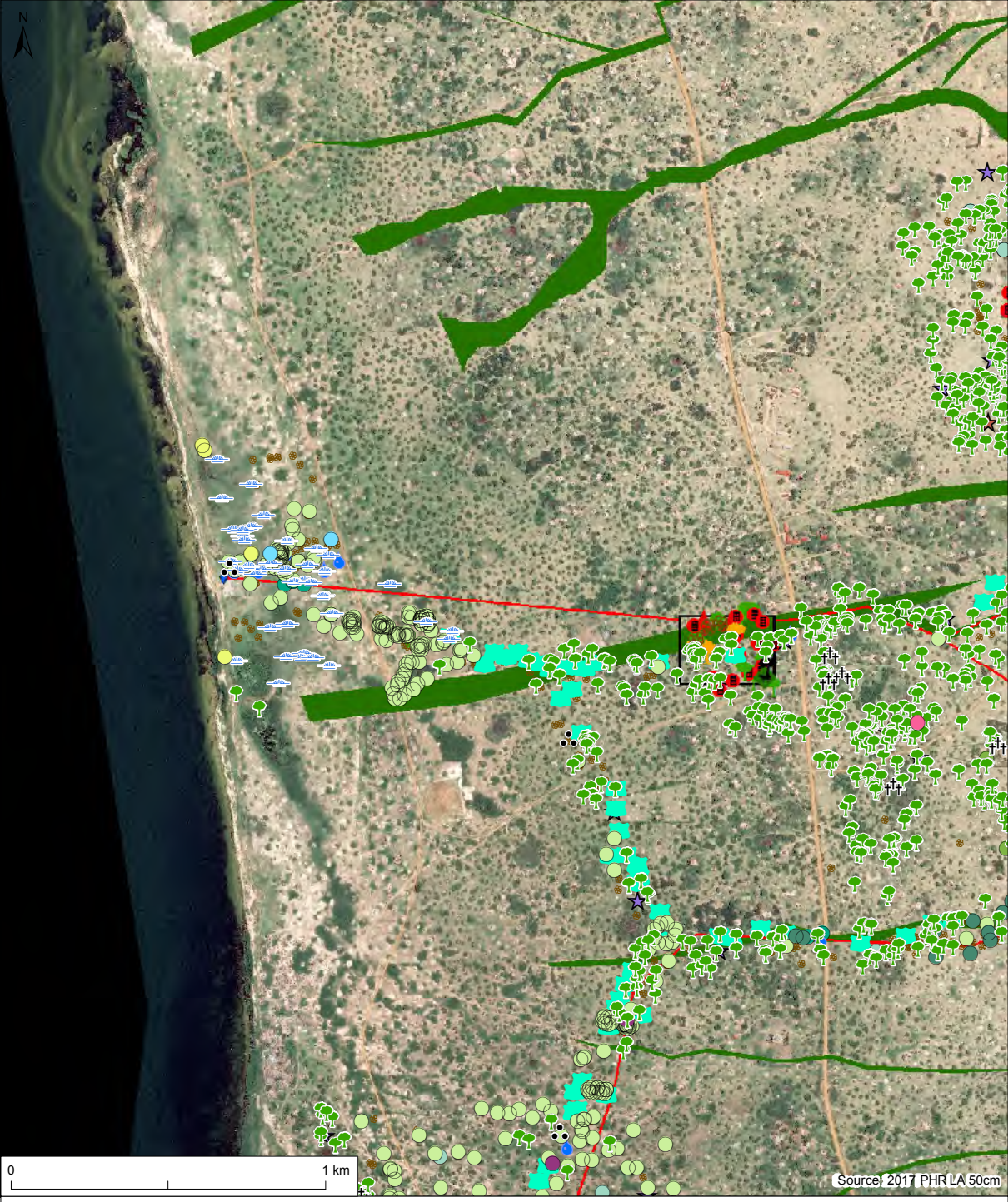


ECOLOGICAL SENSITIVITY MAPPING - NSO-06 to NSO-01

- Wellpad location
- Wellpad Extent - Maximum
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

TILENGA PROJECT
AECOM



ECOLOGICAL SENSITIVITY MAPPING - Water station to KW-02B

- Wellpad location
- Wellpad Extent - Maximum
- Water Abstraction System
- Production and Injection Network

Drawn: LC Checked: GM Approved: MW Date: 06/06/2018 Scale @ A4 1:20,000 Coordinate Reference System: WGS 1984 UTM Zone 36N

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TILENGA PROJECT ESIA - APPENDIX O: Terrestrial Wildlife

May 2018

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O1 – Survey Reports

O2– CHA Summary

O3 – Terrestrial Species Summaries

O4 – TBC Loss Gain Report

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APPENDIX O1

Tilenga Project

TERRESTRIAL WILDLIFE

FIELD SURVEY METHODS AND PRIMARY SURVEY RESULTS

2018

INTRODUCTION

As noted in the conclusions to the Critical Habitat Assessment (WCS, 2016; TBC, 2016), three general types of survey were required to inform the ESIA. These comprise:

- **Targeted surveys** to assess presence and status in and around Project footprint;
- **Baseline population surveys** in suitable habitat across the MFNP
- Surveys to assess **extent, quality and condition of preferred habitat**

Of these survey types, targeted surveys were performed by Tilenga ESIA team. However, the other surveys were also performed, and have informed ESIA when information was available from the survey.

Prior to the targeted surveys, avoidance surveys were performed. These surveys were undertaken at each proposed component site (well pads, Nile pipeline crossing points (North and South), the Water Abstraction Station on Lake Albert, ferry crossing locations (North and South), etc.). It was used primarily to identify avoidance features within and close to the specific footprint of project infrastructure in order to inform FEED design. And the study also served to indicate areas where the subsequent specialist surveys should be focused, thus helping to optimize the detailed surveys.

Below is the detailed description of the Survey methodologies as well as survey results from the targeted surveys done by Tilenga ESIA team. Consolidated baseline information is presented in the **Chapter 14: Terrestrial Wildlife**. Information on habitat characteristics is critical for understanding wildlife behaviour. As such, detailed information on vegetation is provided in **Chapter 13: Terrestrial Vegetation**. **Appendix B: Project Component Factsheets** also provides a summary of the conditions at the various Project sites.

O1.1 Mammals

Survey dates

The first season (dry season) surveys were conducted from 27th March to 13th April 2017; the second season (wet season) survey were conducted from 8th to 24th June 2017.
Information from camera trapping was gathered from August – September 2017

Field Methods

Mammals are a very diverse taxonomic group of animals that range in size from very small ones (shrews and bats weighing about 3-4 gm) to large ones that weigh up to several tons. Some mammals are active during the day and if medium or large sized, can be observed, inventoried or their ecology studied. Most small sized mammals are however quite cryptic and/or nocturnal in habit such that observation based approaches are not good enough for studies of these.

The foregoing therefore means that different approaches are required to document the presence as well as study the ecology of mammals.

To understand the patterns of occurrence of mammals in the different areas we surveyed, the methods used included:

i. **intrusive methods** (use of Sherman trap and Mist netting) for rodents, shrews and bats,

a. Trapping with Sherman traps

Rodent and shrew trapping: The trapping regime we used employed a setting of 30 Sherman traps deployed in any four surveys areas concurrently. Traps were maintained in each of these locations for a total of 3 nights to attain a total of 90 trap nights trapping effort for each survey locations in each survey campaign. For the two survey campaigns therefore each of the survey areas had a total trap effort of 180 trap nights. A trap night is equivalent to a trap set each trapping day, hence 30 traps for a day represent 30 trap nights.

Traps were set randomly in the proposed well pad areas only in locations that had some cover in which traps could be hidden. We avoided placing traps in open areas where they could easily get trampled by the large mammals in the area.

In the first survey campaign, all survey areas in the North Nile section of CA-1 were quite dry without much ground level vegetation cover to hide traps in. In the second survey campaign, although the area had received some rain and vegetation had started growing back still, the cover away from the thickets was still not dense enough to deploy traps away from the thickets. In both surveys campaigns therefore traps were deployed in or around locations with thickets in the different survey areas.

At the Bugungu airstrip survey area, the general landscape was covered in dense grass in both the early and later survey campaigns. Here, traps were set spread through the survey area but with effort take to ensure traps were near a base of tree.

Bait (comprising a mixture of peanut butter, ripe bananas, margarine, dry fish powder and maize flour) was used in all the traps. Traps set were checked and rebaited every morning of the trapping days and captured small mammals retrieved for examination.

Mist netting: To survey bats, surveys for these were done between any two pad sites that were nearest to each other, or on either of them. In either case, locations that presented the most opportunity to capture bats (mostly locations that had surface water in them) were selected because surface water tends to draw bats which forage for insects that fly over the water but also to drink.

6 to 8 nets were set in each of the locations surveyed, and nets were monitored from dusk to at the latest 9 pm.

Bats captured were recovered from the nets and identified in the field.

ii. **Non-intrusive methods**

Several non-intrusive methods were used to survey different groups of mammals.

a. Acoustic detection methods for bats

At every location where we netted for bats, an SM2 bat detector was deployed for the same length of time spent actively monitoring the net-lines. Acoustic detection of bats has the advantage that it detects even bats that may fly over or avoid the nets. Collected calls from acoustic detection were analyzed using the program Sonobat (Wildlife Acoustics Inc) to identify bats that were active in the survey area for the recording period.

b. Camera trapping

From three to five camera traps were set in each of the general survey areas representing the proposed well pad locations. Camera traps were set in the first survey campaign (dry season) in March-April 2017 and left in place until September 2017. Camera trap data was recovered from the in-camera storage SD cards, from which the photo metadata was recovered to analyze for species presence and activity patterns of different species in different survey areas.

At the starts of the surveys a total of 62 trap cameras were placed with a deployment strategy of at least 4 camera traps at each of the proposed well pads areas at JBR-01 – JBR-10. In addition, 5 traps were set in the general vicinity of Victoria Nile HDD Crossing (North) while only 2 trap cameras were set at the Victoria Nile Ferry Crossing (South).

Table M3 presents some details of camera trap locations in the different survey areas.

c. Transect walks for medium to large sized mammals

Transect walks were conducted starting at one end of 2 adjacent proposed well pad sites and walked diagonally through the two pads. The transects were designed to start 100m from the perimeter of the 500x500 buffer areas of one of the proposed pads and to end at least 100m from the other. The transect walks were used to record presence of ungulates in the area traversed by observing actual individuals present. In addition, field signs of species that are not usually as numerous or visible as antelopes (such as lions, leopard, aardvark among others) were searched for to record evidence of presence and/or land area use.

Pad locations JBR-09, JBR-10 as well as Victoria Nile HDD Crossing (North) and Bugungu Airstip Extension were walked independently since they are not in very close proximity to any other survey location.

d. Opportunistic observations

In addition to physical and photographic trapping and walking of formal transects, incidental opportunistic observations of species were recorded, for example whilst driving between survey sites.

Together, the combination of approaches allowed for the documentation of representative samples of mammal fauna in the different survey areas.

Results

Land cover characteristics defining the mammal habitats in the survey period

Throughout the survey period, the land cover did not change considerably to produce a dense vegetation cover which would encourage small mammals to build up populations. In the dry season surveys the herbaceous cover (grass and forbs) were generally very low such that the ground was exposed in most survey areas except at the Bugungu Airstrip. JBR-10 and the Victoria Nile HDD Crossing (North) site were also in general more different than all other survey areas JBR 01 – 09 as they were characterised by a series of bushes and thickets that provided more ground cover than was the case in JBR 01 to JBR 09.

Therefore, although the vegetation in JBR-10 and Victoria Nile HDD Crossing (North) site was scrubbier in nature, it provided more suitable areas for small mammals. In the wet season, a wider growth of new grass which provided forage for the ungulates was observed, but was not sufficient cover for the small mammals.

Overall the land cover had attributes were favourable for the ranging and foraging of ungulates but not so much for the small mammals.

Small mammals

Table 1 to Table 3 summarise small mammals capture results from the two survey campaigns. In the dry survey campaign 1 species of shrews was recorded, 8 species of bats and 9 species of rodents (Table 1).

Table 2 and Table 3 summarise results for the wet season capture surveys, from which it is evident that several more species were recorded than in the dry season surveys. A total of 20 species of bats were recorded in the wet season survey campaign – 12 more species that those recorded in the dry season survey.

Table 1: Summary of first survey campaign (Dry season) small mammals (bats, rodents and shrews) captures

Order	Species	JBR -01	JBR -02	JBR-03	JBR -04	JBR-05	JBR -06	JBR-07	JBR -08	JBR -09	JBR 10	HDD Crossing (N)
Insectivora	*Crocidura parvipes*		1		1					1		
Chiroptera	*Nycteris hispida*										1	
	Gluconycteris argentata								6			
	Neoromicia nanullus									1		
	Nycticeinops schlieffeni									1		
	Pipistrellus nanulus				2							
	Scotoecus hirundo				1				10	2		
	Scotophillus nigritellus									1		
	Mops ansorgei				2				1			
Rodentia	*Aethomys kaiseri*	1										
	Arvicanthus niloticus										2	
	Lemniscomys barbarus	4	6									
	Lemniscomys striatus										6	
	Mastomys hildebrandtii	1	7		3					1	23	9
	Mus mahomet									2		
	Mus sorella				1		1					
	Myomyscus fumatus		1								6	10
	Taterillus emini				1							
	Species recorded	**3**	**3**	**0**	**6**	**0**	**1**	**0**	**3**	**6**	**4**	**2**

Table 2: Summary of second survey campaign (wet season) small mammal (bats) captures

Order	***Species***	**Bugungu Airstrip**	**JBR-01**	**JBR-10**	**JBR-03**	**JBR-06**	**JBR-08**	**JBR-09**	HDD Crossing (N)
Megachiroptera	*Epomophorus labiatus*		1						
	Micropteropus pusilus	1							
Microchiroptera	*Chaerophon ansorgei*	1		1	1		1	9	
	Glauconycteris argentata							8	
	Glauconycteris variegate				1				
	Lavia frons	P	1	1	P	P	P	P	1
	Mops condylurus		2				2		
	Mops demonstratus		1						
	Neoromicia capensis	4	1						
	Nycteris hispida			1					

Order	***Species***	**Bugungu Airstrip**	**JBR-01**	**JBR-10**	**JBR-03**	**JBR-06**	**JBR-08**	**JBR-09**	HDD Crossing (N)
	Nycteris major			1					
	Nycticeinops schliefeni				1				
	Pipistrellus nanulus							1	
	Neoromicia nanus	1							
	Pipistrellus tenuipinis		1						
	Scotoecus albofuscus				1	1			
	Scotoecus hirundo	1	1		6		2	2	
	Scotophillus nigrilettus	2						5	
	Scotopilus nux							1	
	Total numbers of species	**7**	**7**	**4**	**5**	**1**	**3**	**6**	

Table 3: Summary of second survey campaign (wet season) small mammals (shrews and rodents) capture

Order	*Species*	Bugungu Airstrip	JBR-1	JBR-10	JBR-2	JBR-4	JBR-5	JBR-6	JBR-9	HDD Crossing (N)
Insectivora	*Crocidura parvipes*		2	1		2				2
Rodentia	*Aethomys hindei*									1
	Lemniscomys barbarus				1					
	Lemniscomys striatus		3	6	1	3			6	6
	Mastomys natalensis	3	4	17	1	2	1			4
	Mus masculoides	1		1						
	Myomyscus fumatus					2			2	
	Taterillus eminii						1	1		
Total numbers of species		**2**	**3**	**4**	**3**	**4**	**2**	**1**	**2**	**3**

Observations showed many more bats congregated over locations with standing water than at dry areas (including dry wallow). This indicates that water points, which are also used for drinking and /or eventually as wallows by large mammals, are important locations for bats.

In the dry season survey, 2 more species of rodents than in the wet season surveys were recorded.

In the second survey campaign (wet season), more locations that had water were found, and therefore also recorded many more species of bats. Bugungu Airstrip, JBR-01 and JBR-09 returned more species of bats than the others. Surveys for bats in all of the locations lasted until 21:00hrs due to safety restrictions.

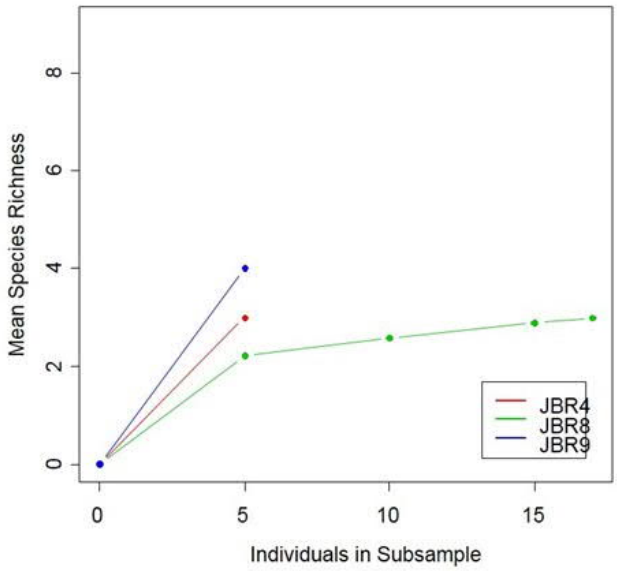


Figure 1: Rarefaction curves for dry season small mammals (bats) records

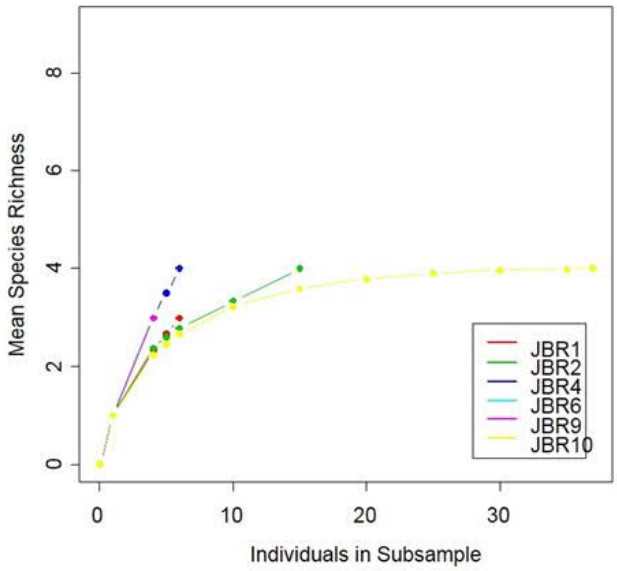


Figure 2: Rarefaction curves for dry season small mammals (rodent and shrews) records

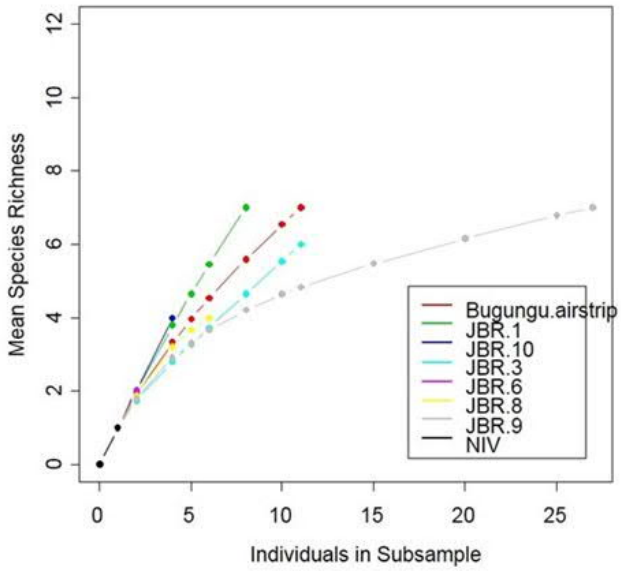


Figure 3: Rarefaction curves for Wet season small mammals (bats) records

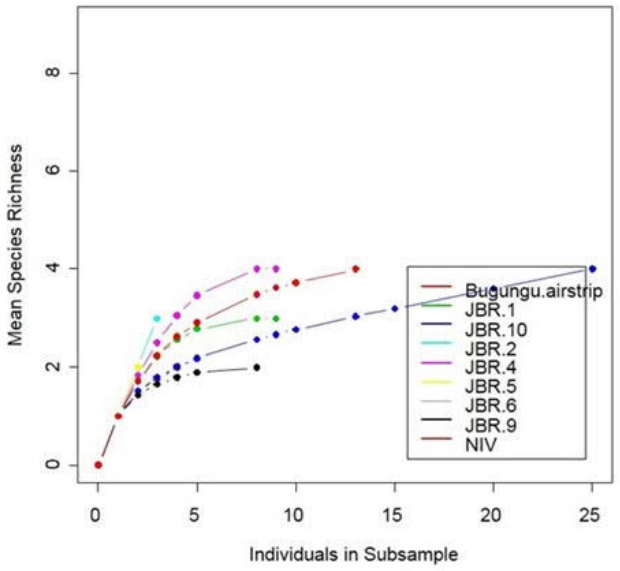


Figure 4: Rarefaction curves for wet season small mammals (rodent and shrews) records

Figure 1to Figure 4suggest that for all survey areas for both volant (bats) and non – volant (rodents and shrews), the species records are far from complete. Each of the survey areas could therefore have produced more species in a longer more sustained effort, or indeed in a different season with the vegetation cover much more different.

In JBR- 03, 07 and 08 no rodents and shrews were recorded - the vegetation cover in these appeared not to provide sufficient cover for the small mammals. From Table 1 to Table 3, it can be seen that some species were recorded in many of the survey areas, while some were only from one or just a few of the survey areas.

Large mammals

Transect walks were conducted through two adjacent proposed well pads (hence JBR 01 – 02, JBR 03 – 04, JBR 05 – 06, JBR 07 - 08) or at some sites through a given survey area where it would be quite long to run a transect between any two (hence JBR-09, JBR-10, Victoria Nile HDD Crossing (North) and Victoria Nile Ferry crossing points). Table 4 summarises occurrence records for mammals observed, or whose signs were observed along the transect walks.

Table 4: Presence absence records for mammals in the different surveys areas

Species	JBR-01/ JBR-02	JBR-04/ JBR-03	JBR-05/ JBR-06	JBR-07/ JBR-08	JBR-09	JBR-10	HDD Crossing (N)	NCP	SCP	Bugungu Airstrip
Ungulates (grazers and browsers)										
Buffalo	p	p	p	p	p		p			p
Bush Duiker		p								
Bushbuck	p				p	p	p			
Giraffe	p	p	p	p		p				
Hippo	p					p	p	P	p	
Lelwel Hartebeest	p	p	p	p	p		p			p
Oribi	p	p	p	p	p					p
Reedbuck				p						
Uganda Kob	p	p	p	p	p		p			p
Warthog	p	p	p	p	p			P	p	p
Waterbuck	p	p	p	p	p	p				
Carnivores (predatory mammals)										
Banded Mongoose					p					
Dwarf Mongoose	p									
Hyena	p	p	p	p		p				
Large Grey Mongoose		p								
Leopard	p				p					
Lion	p	p					p			
Marsh Mongoose			p							
Side-Stripped Jackal		p								
Slender Mongoose				p	p					
White Tailed Mongoose					p					
Monkeys										
Olive Baboon	p	p			p		p	P	p	p

Species	JBR-01/ JBR-02	JBR-04/ JBR-03	JBR-05/ JBR-06	JBR-07/ JBR-08	JBR-09	JBR-10	HDD Crossing (N)	NCP	SCP	Bugungu Airstrip
Black & White Colobus								P		
Elephants										
Elephant		p		p	p	p	p	p	p	
Rodents										
Cane Rat					p					
Crested Porcupine	p	p	p	p	p					
Stripped Ground squirrel	p				p					
Ant eaters										
Aardvark	p					p	p			
Total numbers of species	**17**	**15**	**10**	**12**	**16**	**7**	**9**	**5**	**4**	**6**

Table 5: Example of numerical abundance of species of mammals recorded on a transect count from JBR-01 to JBR-02 (12 June 2017)

Coordinates (UTM 36 N)	Baboon	Buffalo	Bushbuck	Elephant	Giraffe	Lelwel hartebeest	Oribi	Slender mangose	Uganda Kob	warthogs
331496 251395		1			29	21	6		9	
331764 251309		400			4	4				
331894 251375						3			5	
332085 251423						5	1		11	
332304 251429						2				
332665 251535								1		
332668 251548				1						
332729 251550	27				14	6				
332871 251592			1							
333031 251625						2				
333431 251646			2							1

A total of 27 species of medium and large sized mammals and/or mammal signs were recorded along transect walks in the dry season survey campaign. Mammals or mammal signs observed along the different transect ranged from as few as 4 species in Victoria Nile Ferry Crossing (South) to 17 in JBR-01 –JBR-02 (Table 4).

Overall the grazers/browsers were widely occurring in the different areas of Contract Area CA-1 that were surveyed. This may be because of their herding behaviour and a largely diurnal activity pattern and not being secretive as are most carnivores. Signs of occurrence of Hyena, Leopard and Lion were also widely occurring which shouldn't be surprising as they will tend to associate with the occurrence of their prey animals.

Table 4 and Table 5 show results of a transect counts running between or through different survey areas and specifically a transect running from JBR-01 to JBR-02 in June 2017. Table 4 includes both actual mammal observations as well as signs of occurrence of some species. Because both actual mammals and also their signs were recorded in the dry season, Table 4 only shows presence absence data. These tables demonstrate the temporal nature of mammal species occurrence. In the dry season surveys much fewer individuals were recorded although for example in the case of JBR 01 – JBR 02 more species were recorded in the dry season survey than in the wet season surveys. This just goes to emphasize that absence of a record of a species in an area in one survey campaign does not mean that the species does not utilise such an area.

Camera trapping results (highlights)

Of the 62 trap cameras that were set, only 55 were still in place by the time the surveys were completed (August – September 2017). In the recording period 38,076 incidents of medium and large mammal presence were captured on camera (Table 6). This table also shows the relative prevalence of the mammals in the different general surveys areas. Table 6 provides results from a combination of all camera traps that were set in each of the proposed well pad areas. Different camera trap stations had different encounter rates, with JBR-06 recording many more mammals than the others and the proposed Bugungu Airstrip had the lowest encounter rates. The general trend is that the areas of much more open savannah had many more mammals than the areas that have a higher proportion of woodland.

Table 6: Overall mammal incidence captures on camera and species richness in the different survey areas

Survey area	Mammal encounters	% encounters	Species richness
Bugungu	106	0.278391	8
JBR-01	4154	10.90976	17
JBR-02	2740	7.196134	20
JBR-03	4686	12.30697	16
JBR-04	5089	13.36537	20
JBR-05	2300	6.04055	17
JBR-06	5820	15.28522	17
JBR-07	2786	7.316945	20
JBR-08	2234	5.867213	12
JBR-09	3004	7.889484	13
JBR-10	851	2.235004	14
Victoria Nile HDD Crossing (North)	1129	2.965122	19
Victoria Nile Ferry Crossing (South)	3177	8.343839	11
Total individual encounters	**38076**		

At least 30 mammal species were recorded in the area surveyed with camera traps. These comprise 12 species of Artiodactyls (the grazers and browsers), 11 species of carnivores (including of the large carnivores Lion, Leopard, and Spotted Hyena), 3 species of primates and one or two species each for four other orders (Table 7).

The group artiodactyls - of the grazers and browsers, has some of the most widely occurring species with up to 7 species (Buffalo, Giraffe, Lelwel Hartebeest, Oribi, Uganda Kob, Warthog, Waterbuck) recorded in most of the survey areas except in a few cases missing in 1 – 3 survey areas (Table 7). Besides being widely occurring in the survey area, these species also occurred in reasonably large numbers where they were recorded. Over all Uganda Kob were the most numerous species and most frequent in JBR-03 and JBR-06.

Table 7: Overall medium and large mammal species and numbers recorded in the different survey areas

Order	Row Labels	Bugungu	JBR-01	JBR-02	JBR-03	JBR-04	JBR-05	JBR-06	JBR-07	JBR-08	JBR-09	JBR-10	HDD Crossing (North)	Ferry Crossing (South)	Grand Total
Artiodactyla	Bohor Reedbuck		2			1	3	5	2	4					17
	Buffalo		413	167	629	427	78	199	218	261	173	11	8	1120	3704
	Bush Duiker			3		4									7
	Bushbuck	6		5		14		4			17	24	46	51	167
	Bushpig	9										4	22		35
	Giraffe		856	859	422	564	143	314	23	130	31	58	86		3486
	Hippopotamus			3		1	1		15			54	148	209	431
	Lelwel Hartebeest	2	1164	929	826	1460	764	2003	207	410	591	7	33		8396
	Oribi		184	23	467	188	129	585	118	157	206		1		2058
	Uganda Kob	60	1	316	1680	1208	1009	1774	1422	964	1503	1	8	7	10989
	Warthog	5		88	328	712	119	576	561	187	149	207	108	773	4057
	Waterbuck			122	42	202	1	2	74	51	217	154	398	61	1406
Carnivora	Banded Mongoose							1	1						2
	Genet									1					1
	Leopard	1	5	2	4	1			1				1		15
	Lion		1		2		2				1	2			8
	Marsh Mongoose												1	1	2
	Mongoose		4	1		22	5		3		3		2		40
	Serval Cat												1		1
	Side-striped Jackal					4	8	101							113
	Slender Mongoose		1												1
	Spotted Hyena		54	3	12	8	8	40	6			7			138
	White tailed Mongoose					1		2	3						8
Pholidota	Long-tailed Pangolin								1						1
Primates	Olive Baboon	18	55	51	35	19			12	2	13	120	84	931	1340
	Patas Monkey		3	5	35	147	9	31	11	11	17		4		273

Order	Row Labels	Bugungu	JBR-01	JBR-02	JBR-03	JBR-04	JBR-05	JBR-06	JBR-07	JBR-08	JBR-09	JBR-10	HDD Crossing (North)	Ferry Crossing (South)	Grand Total
	Vervet Monkey													11	11
Proboscidea	Elephant		31	153	194	102	7	91	65	52	83	202	174		1154
Rodentia	Crested Porcupine		6	9	3		11	70	11				3	8	121
Tubulidentata	Aardvark	5	10		7	4	3	22	32	4			1	5	93
	Total individuals captured on camera	**106**	**2790**	**2740**	**4686**	**5089**	**2300**	**5820**	**2786**	**2234**	**3004**	**851**	**1129**	**3177**	**38076**
	Total number of species	**8**	**17**	**20**	**16**	**20**	**17**	**17**	**20**	**12**	**13**	**14**	**19**	**11**	

Hippopotami, not surprisingly, were more common in survey areas that were much closer to the River Nile (Ferry Crossing (South), Victoria Nile HDD Crossing (North) and JBR-10) and only occasional visitors in areas further inland.

Elephants were as equally widely occurring as the other grazers and/or browsers occurring largely in the same areas. Their numbers however cannot be expected to be as high as for the more numerous artiodactyls.

Encounters for the medium to large sized carnivores were infrequent for Lion and Leopard recorded on camera less than 20 times each (in 5 and 7 locations respectively out of the 13 areas surveyed). The Spotted Hyena was on the other hand more frequently recorded (more sightings) in 8 of the 13 survey locations. The side-striped Jackal in large measure seems to overlap mostly with spotted Hyenas, and most of their numbers were from areas that were also frequented by this species.

Based on the numbers recorded it could be concluded that most of the areas that were monitored for large mammals are more important for the occurrence and ranging of the major angulates as well as elephants in the CA-1 survey area.

The Bugungu Airstrip proposed area of extension returned the least species richness in comparison to all other survey areas. In addition, the species recorded here occurred in low levels of abundance as inferred from the incidence on camera trap (Table 6).

The areas around JBR-02, JBR-04 and JBR-07 had the highest number of species, each with 20 species. Table 7 summarizes occurrence of mammal species over the five months monitoring period in the different survey areas.

For angulates, surveys areas JBR-03, JBR-04 and JBR-06 have more species in common as did the Victoria Nile HDD Crossing North, JBR-10 and Bugungu areas. Three species (Uganda Kob, Lelwel Hartebeest and Oribi) seemed to overlap significantly in levels of occurrence, as they were frequently observed in the same general areas.

It should be noted however that both the, Lelwel Hartebeest and Oribi do not occur in as high numbers as is the case for Uganda Kob. Although Giraffe had a wide occurrence in the areas of CA-1, they were more frequently observed in JBR-01 and JBR-02 both of which are in an area with a higher woody covers but also with good open grassy areas.

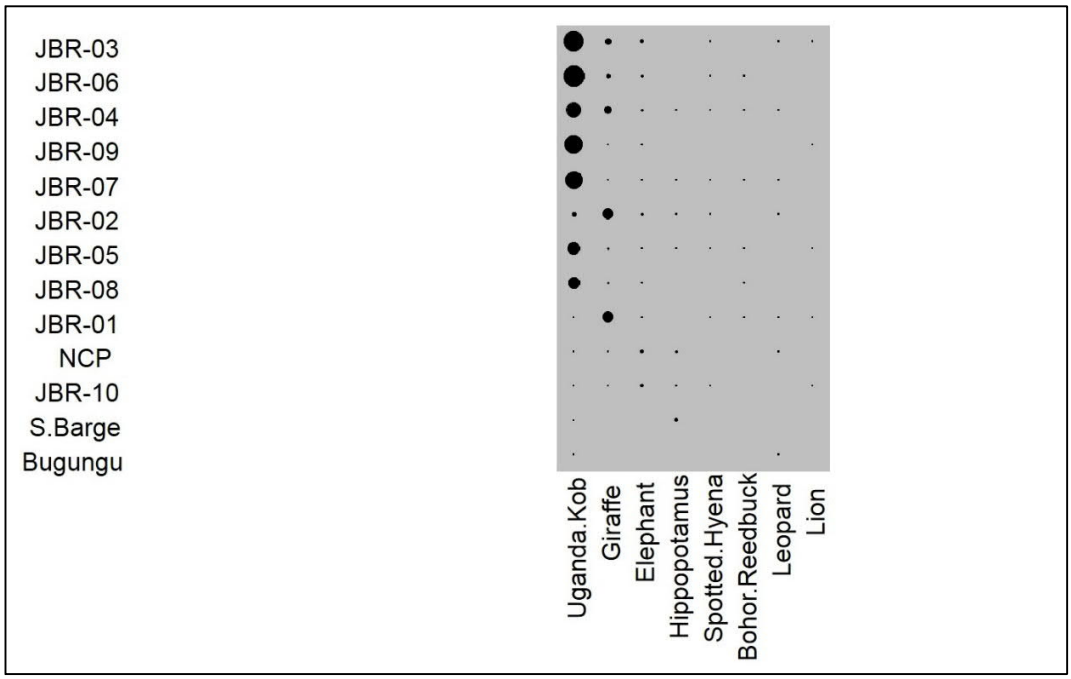


Figure 5: Occurrence matrix for the red-listed species of Uganda recorded in the survey areas

Figure 5 plots the relative occurrence of the Uganda red listed species- the sizes of the circle are indicative of relative numbers recorded. Except for the Lion, the other species were fairly widely occurring. Of all the species, only Uganda Kob occurred in large numbers.

Species of conservation concern

The species of mammals recorded are generally widely occurring in the park, with the only exception being the Bohor Reedbuck that seems to be restricted in open grassland areas along the Buligi track. Whereas some of the areas surveyed may be more important for some species of mammals than others, none of the species of mammals is restricted to any one area, suggesting that operations in any such area would not have irreversible implications for the species.

Table 8 lists 12 species of mammals, four of which are Data Deficient (DD) at country level to enable assessment using the IUCN Criteria while the rest are either listed Globally by IUCN or by Uganda using IUCN Criteria or both as endangered species.

Table 8: IUCN listed species of mammals for Uganda also recorded in the Project area

Order	Species	IUCN GLOBAL STATUS	National Threat status
Artiodactyla	Rothschild's Giraffe *Giraffa rothschildi*	EN	EN B1ac(iv)
	Hippopotamus *Hippopotamus amphibius*	VU	VU B2b(iii)c(iv)
	Bohor Reedbuck *Redunca redunca*	LC	EN C1
Proposcidea	African Elephant *Loxodanta africana*	VU	CR A4a
Carnivora	Spotted Hyena *Crocuta crocuta*	LC	CR C1
	Lion *Panthera leo*	VU	CR C1+2a(i)
	Leopard *Panthera pardus*	NT	VU C1+2(i)
Chiroptera	Silvered Butterfly Bat *Glauconycteris argentata*	LC	DD
	Light winged Lesser House Bat *Scotoecus albofuscus*	DD	DD
Rodentia	Mahomet Mouse *Mus mahomet*	LC	DD
Rodentia	Peters' Pygmy Mouse *Mus setulosus*	LC	DD
Pholidota	Ground Pangolin *Smutsia temminckii*	VU	VU A2d

O1.2 Birds

Introduction

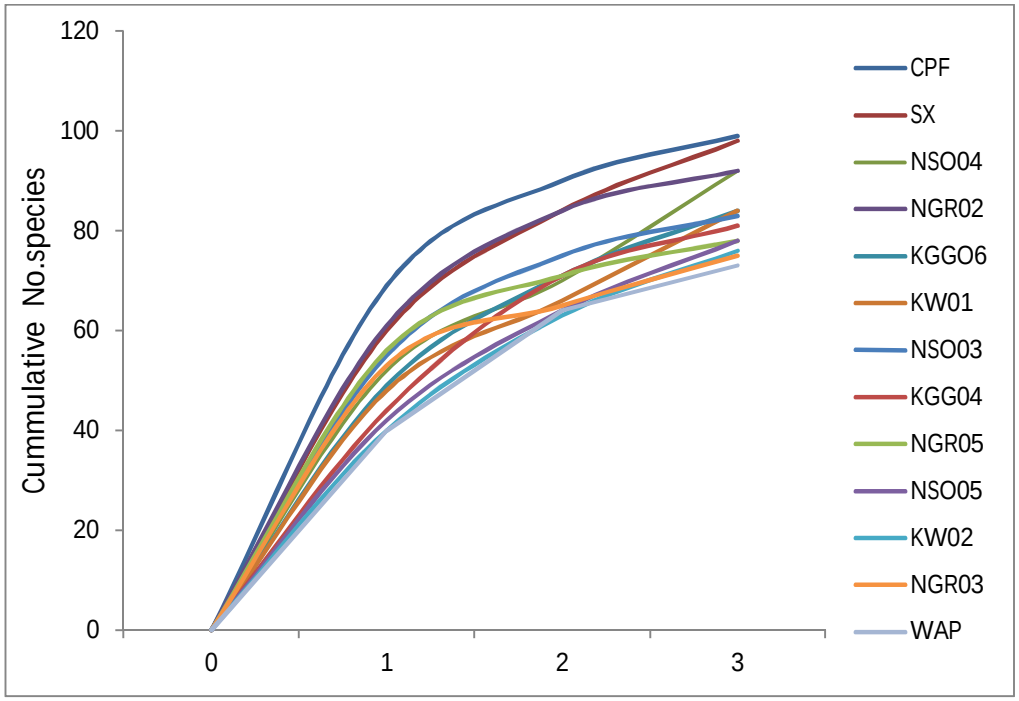
The first fieldwork took place between 23 January and 05 February 2017, with very hot, dry conditions and well over half the areas burnt, both within MFNP and outside. The second period, from 08 – 21 June 2017, was a little cooler and much greener. However, both in the park (North Nile) and in the south of Nile, grass was very short, and many cattle (of which there are far too many) had died. Flowers, important to many insects as well as those that feed on them, and to sunbirds, were still scarce in June.

This first period saw the presence of many migrant bird species, both Palearctic and Afrotropical, most of which had left by June, whilst a few other Afrotropicals, such as Grey-headed Kingfisher, were then common. Although the rather hot conditions did not appear to reduce the numbers of birds recorded (see below), it is likely that some of those usually recorded by sound will have remained silent, and thus have been missed.

The importance of the Albertine Rift and its flanking forests is well-documented (e.g. Plumptre et al, 2013), and the MFCA is one of the most important savanna sites within the rift. As we shall show, the areas south of the Nile, are almost as important for birds (and, by proxy) biodiversity, as the park – except, of course, for large mammals.

Methods

Within the park, we carried out standard 2km transects at the ten proposed well sites and at the point where the flow line will cross under the Victoria Nile, which we refer to as Victoria Nile HDD Crossing North. Each transect passed through, or close to, the proposed well or construction site. In January, two of the seven sites (since JBR-01/02, JBR-03/04, JBR- 05/06 and JBR-07/08 were each treated as single sites) had three counts, the others two. In June, the numbers of counts at all seven sites was made up to five, with JBR-05/06 and JBR-10 having a sixth, in order to further explore species accumulation rates, as shown in Figure 6.



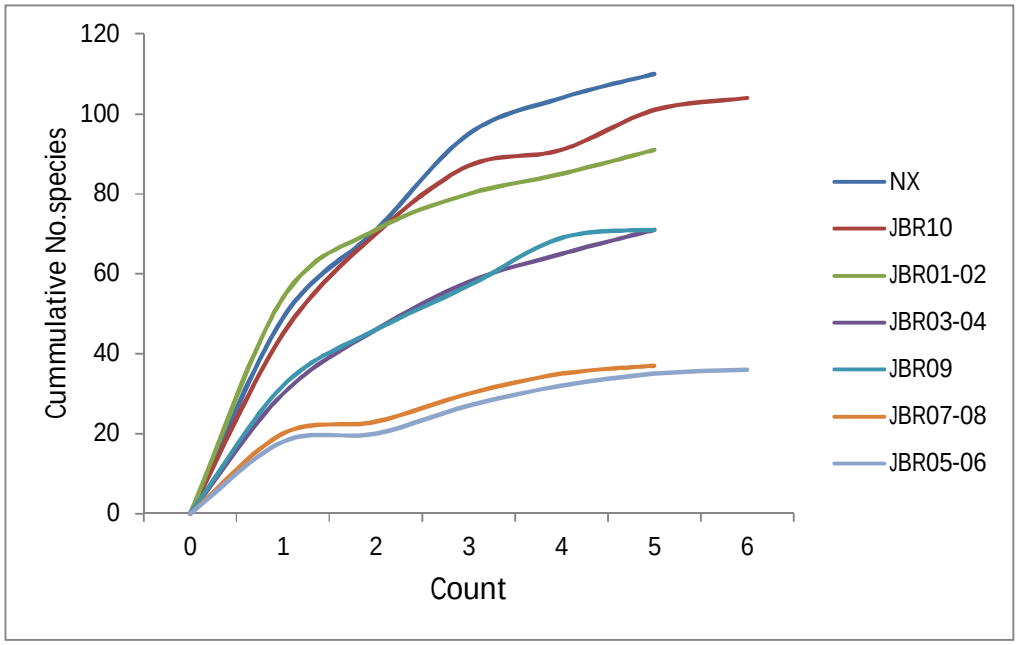


Figure 6: Species accumulation curves from bird sites in Bulisa (above) and Murchison Falls National Park (below)

In January-February, almost all sites had some degree of burning. Rains in 2017 year had been below average, so that although by June everywhere was green, the grass was universally short, typically only a few centimeters high. Birds were recorded separately for each 200m section of each transect, and in January vegetation was recorded at each mid-section (see below). Each 200m point was geo-

referenced. Some well sites had moved a short distance by June, but we considered it better not to change the transect routes (which could have complicated interpretation), since in each case, the habitat type was more widespread than the surveyed areas.

South of the Nile 13 sites were selected, of which three were the Water Abstraction Point (WAP)), Central Processing Facility (CPF) and Victoria Nile HDD Crossing South (SX), as well as the other ten were well sites. Here, because of the larger number of sites, we used the quicker semi-quantitative method of Timed Species Counts (TSC) (Freeman et al, 2003). As with transects, the TSC walks passed close to each proposed well or construction site, as can be seen from the GPS data, with way-points at the end of each ten minutes. However, unlike transects, TSC routes are not fixed and the routes of repeat counts differed from the first to some extent (although still in the same general area and habitat). Three sites had some cultivated land, but otherwise all sites were savanna, with varying amounts of thickets and trees. In January-February, five sites had two counts, the remainder only one. In June, the number of counts at all sites was brought up to three, again to see at least the beginning of a species-accumulation curve for each site (Figure 6).

Vegetation cover was recorded at each site in January-February, based upon estimates at the mid-point of the ten sections of transects and at intermediate points in the six sections of TSCs. Cover at each point was estimated for non-woody and woody vegetation, both natural and planted, at height bands of 0-1, 1-3, 3-8 and >8metres (Pomeroy 1992). In summarizing the data, woody vegetation >3m was considered to be trees, and vegetation lower than that as shrubs and thickets. Also recorded for each site, on a 0 to 5 scale, were the amounts of cultivation, fallow land, fire, tree cutting, grazing, and numbers of people and homesteads. Broad categories such as woodland, bushland and grassland (and combinations thereof) follow the well-established categories of Pratt and Gwynne (1977).

Water Abstraction Station lakeside counts were of two kinds. In January, at an opening in the 3m high lakeside vegetation, all water birds seen were recorded in a ten-minute period. By June, the WAP (WAS) site had been changed to an open shore site, and in both seasons we walked along the edge of the vegetation (Jan-Feb) or shoreline (June) for 300m, again recording all birds, whether seen or heard (in both cases, only species, not numbers, were noted.

Nightjar counts were made at three sites. In the north, we drove about 20km of road, from east of the Pakuba Airstrip to Pakuba Lodge; in June, we also included the Pakuba airstrip. In the south, a drive of similar length used the Waiga Road from the Waiga River to the Buliisa Camp. The third count was from Paraa to the Bugungu airstrip, followed by a count on the airstrip itself. This last provides a basis for comparisons, as January and July counts have been made on these routes annually since 2003. The peak time for displaying nightjars is 20-30 minutes after sunset (Pomeroy et al 2013), and each count was begun at such a time as to reach its mid-point at that time, which in late January was 1920-1930, and a little later in June.

The birds: an overview

From the survey, it was clear that the more open sites, especially those in the park, support fewer species than the more wooded areas: but the open areas are more important for globally-threatened species, especially vultures, as seen in Table 10 and Table 11.

Table 10 shows species accumulation curves for all sites. It is apparent that the richest sites, both within and outside the park, were continuing to add significant numbers of additional species, and might well compare with a nearby national site, Waiga South, where 161 species had been recorded after 17 TSC counts (National Biodiversity Data Bank, unpublished).

A total of 132 species were recorded in the four more open sites in the park, and 161 species in the three more wooded sites. South of the Nile, there were 205 species recorded from the more wooded sites and 162 from those that were less wooded. In addition, 36 water birds were seen at the lake shore.

Overall therefore, more species were recorded in the south than in the park, and in both land-bird areas, species richness in some sites reached levels comparable to the highest found in the national set of about 70 standard transect sites, all over Uganda. In general, numbers were higher in areas with more woody vegetation, as is often the case (e.g. Douglas et al 2013). But despite lower numbers, the more open areas are particularly important for large raptors, including the all-important vultures.

In transect counts, the numbers of individual birds were about what would be expected; where they are highest, this is often because of flocks of species such as Piapiac, Cattle Egret and Bronze Mannikin.

Migratory birds

During January-February, seventeen species of Palearctic migrant were recorded in the park, and 21 in the south. Interestingly, a European White Stork, previously not recorded in Uganda in June (Carswell et al, 2005), was present on two successive days in June. There were also 15 and 18 Afrotropical migrants, respectively, in January-February, and 15 each, north and south, in June.

Amongst the Palearctic migrants, both Northern Wheatear and Whinchat were common and widespread, both north and south of the Nile, and these areas are evidently important for them. Notable Afrotropical migrants in January-February were Abdim's Stork and Swallow-tailed Bee-eater, although the storks were in relatively small numbers in the park. Earlier in the season, there had been thousands of storks (G Kaphu, pers comm). In June, the bee-eaters were still quite common, although they are most commonly recorded between August and February (Carswell et al 2005). Carmine Bee-eaters had also appeared, in small numbers, whilst Grey-headed Kingfishers and Violet-Backed Starlings were common.

Water birds

In January-February 2017, the shoreline at the WAP site had swamp vegetation about 3m high, but by June, the WAP (WAS) location had been moved northwards to an area with completely open shores. With few exceptions, all water bird records came from our two January-February count sites at the then planned WAP (WAS) site, and brief though the periods of observation were (less than an hour in total), a considerable variety of birds, including, with the June count, 31 specialists, were recorded, all of which could have been expected. Five of the species were red-listed, and nine were Palearctic migrants (coded PM).

There have been no detailed studies of the water birds of Lake Albert, but our few counts during this survey suggest that for the lake as a whole, the total numbers of both species and individuals are nationally – and potentially internationally – important.

Nightjars and owls were searched for along roads and on airstrips (Table 9). Within the park, we surveyed some 20km of road, which was mainly open in the earlier stages, but became increasingly bushed with more trees in the later sections. However, no nightjar or owl were seen (or heard) in either January or June. The June count also included two runs on the Pakuba Airstrip, for comparison with the Bugungu strip, but there were also none there (but some do occur there at other times of year (G Kaphu, pers comm)). In the south, a 20km stretch, mainly on Waiga road, produced a male Long-tailed and two Plain Nightjars in January. In contrast, the standard count from Paraa to the Bugungu Airstrip, and the airstrip itself, yielded 11 male and 10 female Standard-winged, and two each of male and female Long-tailed Nightjars.

Table 9: Summary of Nightjar counts along roads and airstrips

	PA	Length (km)	Date 2017	Standard-winged			Pennant-winged			Long-tailed		Plain
				M	F		M	F		M	F	
E of Pakuba Airstrip to Pakuba Lodge[a]	MFNP	14.7	28 Jan	0	0		0	0		0	0	0
			13 June	0	0		0	0		0	0	0
Paraa to Bugungu Airstrip	MFNP	11.5	01 Feb	0	0		0	0		0	0	0
			16 June	0	0		1	2		0	0	1
Bugungu Airstrip – highest run total	MFNP	-	01 Feb	11	10		0	0		2	2	0
			16 June	0	0		7	2		0	0	0
Waiga road from bridge to Bulisa camp	-	22.9	07 Feb	0	0		0	0		1	0	2
			17 June	0	0		0	0		2	0	1

Note: a Includes the ruins of Pakuba Airstrip

Table 10: Numbers of species in various Categories of conservation concern at sites in Murchison Falls National Park

Sites				JBR01-02	JBR03-04	JBR05-06	JBR07-08	JBR09	JBR10	HDD Crossing (North)
Target species					1	1	4	4		1
Red-list Species	Globally	Critically	G-CR		2	1	1	2	1	
		Endangered	G-EN		1	1	2	2	1	1
		Vulnerable	G-VU			1	2			1
		Near- threatened	G-NT	2		2	1		1	
	Regionally	Endangered	R-EN	1						
		Vulnerable	R-Vu	2	1	1	1	2	1	2
		Near- threatened	R-NT	5	3	5	5	8	3	6
		Regional responsibility	R-RR	2	1				2	2
	Uganda	Critically	U-CR	1						
		Endangered	U-EN		2	3	2	3	1	1
		Vulnerable	U-VU			2	2	1		2
		Near- threatened	U-NT	2	1	1	1	1		
Ecological feature	Forest specialist		FF	1						
	Forest generalist		F	2	4	1	3	3	8	7
	Tree species		f	24	12	3	3	12	23	28
	Wetland specialists		W	2	3	1	1	11	7	10
	Wetland visitor		w	12	7	3	5	10	9	12
	Grassland specialists		G	9	13	11	11	14	9	9
Migrants	Palearctic		P	8	8	6	7	3	5	5
	Afrotropical		A	11	6	4	5	8	11	11

Table 11: Numbers of species in various Categories of conservation concern South of the River Nile

Sites				KGG4	KGG06	KW01	KW02	NGR02	NGR03	NGR05	NS03	NS04	NS05	CPF	HDD CROSSING (South)	WAP*
Target species													1		1	2
Red-list Species	Globally	Critically	G-CR													
		Endangered	G-EN										1	1		1
		Vulnerable	G-VU					1	1	1					1	2
		Near- threatened	G-NT													
	Regionally	Endangered	R-EN													
		Vulnerable	R-Vu			1		1	1	1				1	1	3
		Near- threatened	R-NT	1	1	4	1	3	2	1	2	4	2	5	3	5
		Regional responsibility	R-RR	2	1	2	2	1	2	2	1	2		2	2	1
	Uganda	Endangered	U-EN										1	1	1	1
		Vulnerable	U-VU			1		1					1	1		2
		Near- threatened	U-NT	1								1				1
Ecological feature	Forest specialist		FF													
	Forest generalist		F	5	4	2	2	3	2	5	2	4	3	3	8	4
	Tree species		f	18	23	14	20	23	22	27	22	25	22	25	33	19
	Wetland specialists		W	1	3	6	4	2	1	2	1	3	3	2	5	21
	Wetland visitor		w	9	8	15	10	7	9	8	9	11	9	7	12	15
	Grassland specialists		G	10	4	15	6	6	6	c5	2	6	12	10	9	11
Migrants	Palearctic		P	3	3	9	8	6	5	7	6	10	2	5	7	13
	Afrotropical		A	7	6	8	8	10	8	9	7	7	5	9	10	8
		* Includes waterbirds along the shoreline														

In June, the highest count was of nine Pennant-winged Nightjars. Both Standard-winged and Pennant-winged Nightjars are passage migrants in northern Uganda. These figures are lower than the January and July annual counts in the five previous years, for which the average for Standard-winged and Pennant-winged Nightjars on the Bugungu Airstrip have been 30 and 23 birds respectively (unpublished data). In earlier years, numbers had several times exceeded 50 (Pomeroy et al. 2013). On this last section, we also saw one Spotted Eagle Owl in January, perched on the road.

Eight species of owls have been recorded from the park, and the Spotted Eagle Owl is often seen on the roads we use during the regular twice-yearly counts, but none was seen in June. The other owls are all specialists of various kinds, and require special methods and much time, which we did not have. But we did record four of the six nightjar species known from the park (the two missing being Eurasian (occasionally recorded in January) and Gabon).

Species of conservation concern

Numbers of birds of conservation concern are listed in Table 10 and Table 11 . Only a few of WCS's Target species were recorded, but many of them are water or forest birds, such as Shoebill and Forest Wood-hoopoe, which would not have been expected from any of our sites. And like most Globally-listed Red Data species the Target Species are rare and thus not often recorded even in areas where they sometimes occur. The two most important sites for Red Data species are JBR-05/06 and JBR-07/08 in the north, which are relatively open grasslands. There were far fewer Red Data species in the south; the highest numbers recorded being for the WAP (WAS) site(s), which are near to the lake.

The park is clearly more important for bird species that need trees, since in the south trees are being cut for charcoal and other purposes. Nevertheless, the south, as a whole, is as important as the park for grassland species and migrants.

Discussion

January and February were hot and dry, with temperatures during counts of up to 37 degrees Celsius, and extensive areas having been burnt. Fire is particularly important for grassland birds (category G) (Little et al 2012). It was therefore surprising that the large numbers of birds recorded, including many migrant species from the Palearctic region, and some Afrotropical migrants too. In June, it was surprising to record, on two successive days, a European White Stork, when other Palearctic migrants had long since gone. Temperatures were a little lower than in the earlier period, and everywhere was green.

It has long been known that the Albertine Rift is a biodiversity hot spot (Plumptre et al 2003), and important for migrants (e.g., Pearson 1988). Within the actual valley, Murchison Falls National Park and its two adjacent Wildlife Reserves are of high importance. Surprisingly, however, the total numbers of species – and of both Palearctic and Afrotropical migrants – were higher (substantially so for total species) in the south than in the park. The only clear difference in favour of the park is for large raptors, especially vultures, for which the park is crucial. Largely because of them, the park scores highly for Red Data species, although the globally endangered Grey Crowned Crane, doubly important as Uganda's National Bird, was recorded at several sites in the south.

The importance of Murchison Falls Conservation Area (MFCA) for the Critically Endangered vultures was documented by Pomeroy et al (2015), and it is notable that none were recorded south of the Nile, although they probably occur on occasion. Several other Red-listed species are however found in both north and south (Tables 1 and 2).

The majority of the Target Species are either water-birds or forest species, which explains the fact that only a few were recorded in the surveys. Thus the major conservation importance of these areas is in their support for migrants and Red Data species, and in the high levels of species richness (an important point with the many visiting birders, who particularly want long lists, with plenty of rarities (Booth et al 2012)).

These high species numbers are remarkable for two reasons. Firstly, at least half of the land, both north and south, had been burnt in December, with most bushes and some trees having none or only brown leaves. Further, the resident species are joined by significant numbers of migrants, both large e.g. (Secretary Bird) and small (e.g. Willow Warbler) suggesting that added competition may well occur (Ivande and Cresswell 2016).

Pastoral areas in the south are very good for birds, and probably for most other things too – except large wild mammals. From previous studies, birds also have importance in the farmed areas, as pollinators, seed dispersers and consumers of insect pests.

O1.3 Herpetiles

Survey Objectives and Methods

Dates of surveys

The first season (dry season) surveys were conducted in April 2017; The second season (wet season) survey were conducted in June 2017.

Objectives

i. The main objective of the herpetiles surveys was to identify and document amphibian and reptilian species present within and around the project footprint areas within the MFNP and South of the Nile.

ii. To determine presence and where possible distribution and habitat use of species encountered and relationships to habitats in the survey area. This approach was taken because it is found not practical to undertake dedicated studies of a wide range of individual species as part of the ESIA surveys due to the considerable effort in terms of time and resources it would take for detailed surveys.

iii. Identify the occurrence of species of conservation concern (rare, endemic, restricted range, IUCN listed in the area) in line with IFC PS 6 and as identified in the recent CHA, bearing in mind that many species are under-recorded and their status may not be accurately reflected in the IUCN listing.

Methods

Field surveys were undertaken in order to identify locations of reptiles and amphibians within the project foot print and the kind of species present. This was mainly based on Visual Encounter Surveys (VES) within 500 metres around a pre-geo-referenced point and setting of pitfall traps within the perimeter of this point in some select sites. Dip netting was also undertaken for amphibians where deep waters were encountered. The photographic presentation of the habitats is in Table 17.

Targeted Surveys

Field surveys at and around each of the survey locations would be undertaken. These recorded all amphibians and reptiles observed with particular emphasis on species of conservation concern, and those species specifically identified as CH trigger species in the CHA reports (WCS 2016, TBC 2016).

- Amphibia and reptilia are two distinct classes of vertebrates that are for study purposes often grouped together and named herpetiles (study = herpetology).
- Herpetological surveys provide information on habitat quality and the environmental variables that control species diversity of the target taxa.
- The activity involved the survey of amphibians and reptiles in their representative habitats within and close to the Project locations (Table 12).
- The surveys took into account seasonality – surveys were done in two seasons i.e. dry and wet seasons.
- Three methods were applied in these studies and their choice was determined by the behaviour of the target species and the nature of the habitat. However; their effectiveness depends much on the weather conditions and the time of the day:

- o Visual Encounter Surveys (VES),
- o Pitfall Trapping and
- o Dip Netting.

Table 12: Methods used for herprtile surveys

Taxa	Method	Timing
Reptiles	VES & Pitfall traps	Day and Night
Amphibians	VES & Pitfall traps & Dip Netting	Day and Night

Ground-truthing: Habitat stratification

Key amphibian and reptilian habitats were stratified for ease of sampling. The key habitats for amphibians which were focused on for the purposes of the surveys include lentic habitats and vegetated wetlands, particularly those identified in any previously identified features. Use was made of previous avoidance mapping developed by the Project Proponents and was ground-truthed during the field surveys.

Suitable habitats for reptiles included rocky outcrops and woodlands. Where relevant, edges of roads were carefully monitored for any sun-basking reptiles. The surveys in these habitats were repeated in dry and wet seasons to capture seasonality data.

As with the other field surveys the surveys focused on the Project footprint including 500m buffer around well-pads, the Nile crossing points, etc. In addition, pipeline and road routes within the MFNP were subjected to VES. In areas south of Nile surveys were confined to well-pads, the Industrial Area/CPF and the area around the water abstraction station (WAS) on Lake Albert.

Visual Encounter Surveys (VES)

VES are a well-known and robust method for surveying herpetofauna. VES is similar to the Timed Constrained Count (TCC) method described by Heyer et al., (1994). VES are used to document presence of amphibians and are effective in most habitats and for most species that tend to breed in lentic habitats. They generate encounter rates of species in their habitats in a unit hour.

The method comprises moving through a habitat, turning logs or stones, inspecting retreats and watching out for and recording surface-active species. The data gathered using this procedure provide information on species richness of the habitat. For amphibian fauna, the best results are achieved when the surveys take place after dusk in the evenings between **18:00** and **21:00** hours as this is when most amphibians are active, preceded by a daylight reconnaissance to check for hazards and other features. This survey was carried out for both the dry season and wet seasons in the selected sites. Early morning surveys are not suitable for these taxa as species will be torpid and may not be easily found.

Dip-net sampling

A standardized dip-net was used to scoop through aquatic habitats to sample for aquatic species and for tadpoles (Figure 7). Specimens of aquatic species or tadpoles caught by this method, if not identifiable in

the field were preserved for later identification. This survey was carried out for amphibian fauna both during the dry and wet seasons.

Figure 7: An example of a dip net for sampling aquatic herpetofauna and tadpoles

Pitfall trapping with drift fence

At selected sites, particularly in the MFNP near identified water features, pitfall traps were set up with a drift fence to sample any surface dwelling herpetofauna. The use of drift fences with bucket pitfall traps (Figure 8 and Figure 9) has been the commonest technique for studies of individual species or herpetofaunal communities and has been used with success for amphibians (Mitchell et al., 1993; Heyer et al., 1994, Handley and Varn, 1994; Msuya, 2001).

The results of studies employing drift fences with pitfall traps provide valuable insights into population and community ecology, and behavioural patterns of secretive and difficult to study species (Dodd, 1991). This method was used to determine relative abundance, sex ratio, habitat preference and movements of the herpetofauna. Each drift fence consists of eleven 20-litre plastic buckets placed at an interval of 8-10 m, covering a total length of 100 m. The buckets would be placed in holes dug in the substrate such that their rim is level with the ground.

A 100 m long and 0.5 m high drift fence of black polythene supported vertically by wooden laths was set in an alternating manner with the buckets in the line to permit detection of directional movement of species. The pitfall traps would be inspected twice a day.

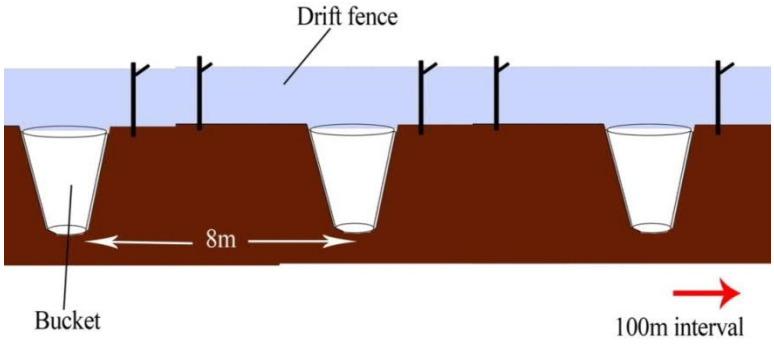


Figure 8: Illustration of the drift fence layout

Figure 9: Pitfall trap with drift fence for herpetiles

Opportunistic Encounters

Opportunistic records are those made outside the sampling points but occur in the surrounding area to be impacted by the project. It helps complete the checklist of the animals as much as possible. Amphibians and reptiles are mobile and can therefore be encountered outside their preferred habitats both spatially and temporally.

Species Identification and IUCN Red listing

Identification of herpetofauna followed Schiøtz, (1999), Spawls et al., (2002, 2006) and Channing & Howell (2006). The AmphibiaWeb (2015) and The Reptile Database (Uetz, P. & Jirí Hošek (eds.) 2015) were also used. The conservation status of the herpetofauna followed the IUCN Red Listing (IUCN 2017) and the Ugandan Red List (WCS 2016).

Consultations

For survey sites inside the Protected Areas, Park Rangers were interviewed to establish the reptilian species known to be present. Outside the PAs, local people who ascertained that they had stayed in the area for a long time (up to 10 years) and had been involved in activities such as farming and grazing in the area were consulted about the occurrence of especially reptilian species.

Night surveys

Evening and night-time surveys are very important for amphibians. Wetland habitats would be stratified in each study area. On locating the potential wetland area for amphibian sampling, a research team

consisting of at least two researchers and a ranger would move to the site at dusk, using head lamps. Sampling would be done between 1800 and 2100 hours on the survey night.

Laboratory analysis

Some laboratory analysis of samples was required where field identification was not possible. Specimens would be taken, photos taken and specimens preserved for later identification in the laboratory at Makerere University Zoological Museum or elsewhere.

Data Analysis

Species accumulation curves, species diversity indices and Clustering were performed to predict species diversity of the sampled locations and important habitats for the amphibian and reptilian species. Cluster analysis is a class of statistical techniques that can be applied to data that exhibit "natural" groupings. Objects in a cluster are similar to each other. They are also dissimilar to objects outside the cluster, particularly objects in other clusters. The analysis was used to produce dendrograms which visually show the groupings produced.

Results

Amphibian species diversity, abundance and distribution

A total of 21 amphibian species belonging to one order – Anura, seven families and nine genera were recorded in the project area during the two campaigns of surveys (Table 15). Campaign 2 was wetter than Campaign 1, with 20 species recorded in 10 sites while 15 species were recorded in only four sites during Campaign 1. Seven additional species came with the wetter season (Campaign 2) namely *Amietophrynus gutturalis, Hyperolius acuticeps, Phrynobtrachus natalensis, Phrynomantis microps, Ptychadena anchietae, Ptychadena oxyrhynchus* and *Ptychadena porosissima* while *Phrynobatrachus auritus* recorded during the drier season (Campaign1) was not encountered in the wetter season (Campaign 2).

The most amphibian species rich sites were Victoria Nile Ferry Crossing - North (BBN) with 15 species followed by Victoria Nile HDD Crossing – North (HDD-N) (12 Spp), WAP (10 Spp), JBR9 (8 Spp) and Victoria Nile Ferry Crossing - South (HDD-S) (7 Spp). The most species poor sites were JBR3 (1 Sp), followed by JBR1 (2 Spp) and JBR-07 (3 Spp). Seven sites namely – BA, Industrial Rea/CPF, JBR-02, JBR-04, JBR-05, JBR-08 and JBR-10 recorded no amphibian species during both campaigns. The sites with the highest diversity are also the most critical sites for amphibians.

The commonest amphibian species were *Afrixalus quadrivittatus* recorded in eight out of the 10 sites in which amphibians were recorded, followed by *Ptychadena mascareniensis* (7/10), then *Amietophrynus vittatus, Hemisus marmoratus* and *Phrynobatrachus acridoides,* each in five out of ten sites. The least common species were *Hyperolius acuticeps*, *Phrynobatrachus auritus, Phrynomantis microps* and *Ptychadena anchiatae* each recorded once.

Table 13: Amphibian species recorded in the project area during campaigns 1 and 2

Species/Sites	BB-S	BB-N	JBR-01	JBR-03	JBR-06	JBR-07	JBR-09	HDD-N	HDD-S	WAP	Total
Afrixalus quadrivittatus	1	1			1	1	1	1	1	1	8
Amietophrynus regularis	1	1							1	1	4
Amietophrynus vittatus	1	1						1	1	1	5
Amietophrynus gutturalis						1	1		1		3
Hemisus marmoratus		1		1		1		1	1		5
Hoplobatrachus occipitalis		1						1		1	3
Hyperolius acuticeps										1	1
Hyperolius cinnamomeoventris		1						1			2
Hyperolius kivuensis		1					1		1	1	4
Hyperolius viridiflavus viridiflavus		1			1					1	3
Kassina senegalensis		1						1		1	3
Phrynobatrachus auritus								1			1
Phrynobatrachus acridoides		1			1		1	1	1		5
Phrynobatrachus mababiensis		1					1	1			3
Phrynobtrachus natalensis	1	1						1			3
Phrynomantis microps								1			1
Ptychadena anchietae					1						1
Ptychadena mascareniensis	1	1	1		1		1	1		1	7
Ptychadena oxyrhynchus		1					1				2
Ptychadena porosissima		1					1				2
Ptychadena sp			1							1	2
Total	**5**	**15**	**2**	**1**	**5**	**3**	**8**	**12**	**7**	**10**	**68**

Species Accumulation Curve for Amphibians

A species accumulation curve plotted for the areas surveyed (Figure 10) shows the graph had started levelling off. This implies that the amphibian diversity of the areas surveyed had almost been exhausted. More sampling effort would yield a few more species. This implies that the sampling employed could have exhausted the available amphibian habitats.

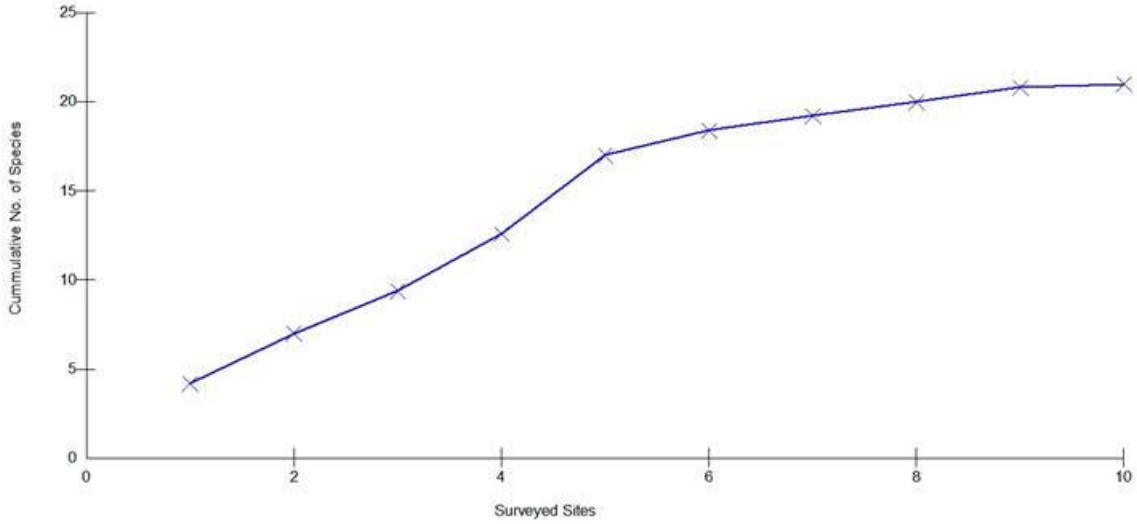


Figure 10: Species accumulation curve for amphibians

Cluster Analysis for Amphibians

A cluster analysis was performed to determine which amphibian habitats/sites group together. A Bray-Curtis Cluster statistic was used to quantify the compositional dissimilarity between different sites, based on counts at each site. Sites with similar characteristics tend to cluster together hence harbouring more or less the same species composition. The fewer the species that utilise a particular habitat compared to another habitat, the more distant the clusters.

The Bray-Curtis analysis below shows that all the 10 sites in which amphibians are generally related to each other in terms of species composition in a hierarchical order (Figure 11). The most distant site was JBR-01 with a similarity to the rest of 33%, followed by JBR-06 at 46%. The rest of the sites are within the 50% similarity distance.

The most similar sites were Victoria Nile HDD Crossing North (PC-N) and Victoria Nile Ferry Crossing North (BB-N) at a similarity distance of 74%. The two happen to be near the edge of the Northern Bank of River Nile. These two then link up with the WAS on the shorelines of Lake Albert at a similarity distance of 64%. This could imply that the shorelines may have similar characteristics and hence have more or less similar species composition. The other most similar sites are the Pipeline Crossing South (PC-S) and Jobi Rii 7 (JBR-07) at a distance of 60%.

The reasons why these sites are similar to each other in composition are not clear because whereas PC-S generally lies in a disturbed wooded savannah area on the southern bank of the River Nile, JBR-07 lies in an area with short savannah grassland with Borassus palms in the valley with few scattered big trees, far away from the river.

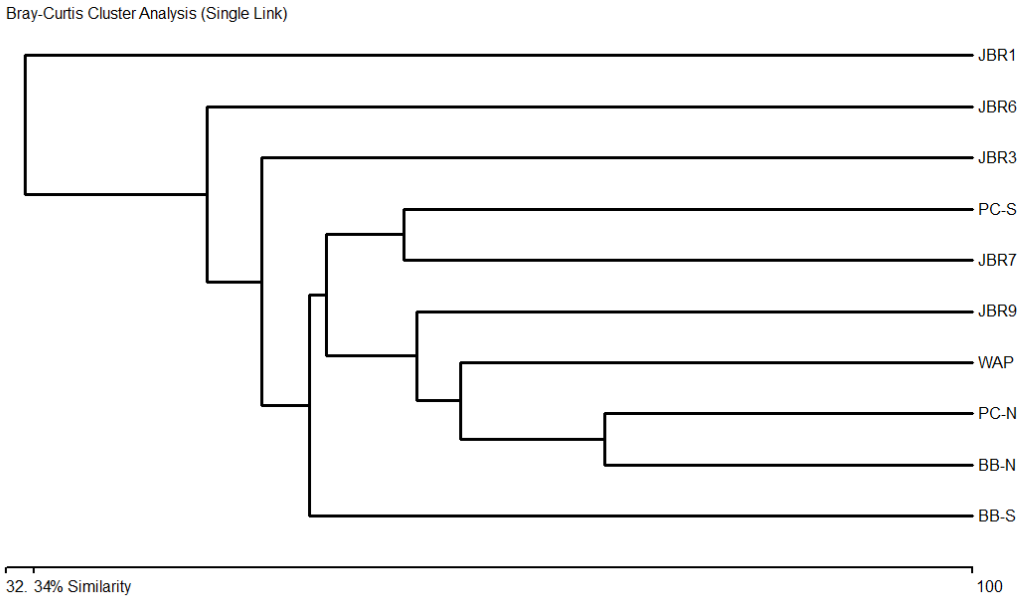


Figure 11: Dendrogram for amphibians

Reptilian species diversity, abundance and distribution

All sites had some reptile species recorded in them. A total of 28 reptilian species belonging to four orders, 14 families and 22 genera were recorded in the project area during the two campaigns of surveys (Table 14). The 29th species *Philothamnus semivariegatus* was recorded opportunistically (Table 14).

Order Chelonii - of turtles and tortoises - had only one species in it; Order Sauria – of true lizards - had 13 species; Order Crocodylia – of crocodiles - had one species while Order Serpentes –the snakes – had 15 species. Twenty six species were recorded during the drier campaign1 and 17 species were recorded during the wetter Campaign 2.

Eleven of the species recorded during Campaign 1 were not recorded during campaign2 while two species namely *Bitis nasicornis* and *Chamaeleo laevigatus* were recorded only during the wetter Campaign2.

Table 14: Reptilian species recorded in the project area during campaigns 1 and 2

Species/Sites	BA	BB-N	BB-S	IA/CPF	JBR-01	JBR-10	JBR-02	JBR-03	JBR-04	JBR-05	JBR-06	JBR-07	JBR-08	JBR-09	HDD -N	HDD -S	WAP	Total
Agama agama	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**17**
Aparallactus lunulatus															1			**1**
Bitis nasicornis								1										**1**
Bitis arietans		1													1		1	**3**
Chamaeleo gracilis																1		**1**
Chamaeleo laevigatus																1		**1**
Crocodylus niloticus		1				1									1			**3**
Crotaphopeltis hotamboeia						1											1	**2**
Dasypeltis scabra					1													**1**
Dendroaspis polylepis		1			1													**2**
Gerrhosaurus major				1								1			1	1		**4**
Hemidactylus brookii				1							1				1	1		**4**
Hemidactylus mabouia		1																**1**
Lamprophis fulginosus		1																**1**
Letheobia sp				1											1	1		**3**
Lygodactylus gutturalis	1		1		1	1	1	1	1			1	1	1	1	1		**12**
Lygosoma sundevalli				1											1	1		**3**
Naja melanoleuca		1	1														1	**3**
Pelomedusa subrufa						1						1				1	1	**4**
Philothmnus bequaerti														1				**1**
Psammophis mossambicus			1	1					1						1			**4**
Python sebae		1								1								**2**
Trachylepis maculilabris	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	**16**
Trachylepis perrotetti								1					1			1		**3**
Trachylepis striata					1	1		1										**3**
Typhlops lineolatus		1																**1**
Varanus exanthematicus								1		1								**2**
Varanus niloticus		1	1		1	1		1	1						1			**7**
Total	**3**	**11**	**6**	**7**	**7**	**8**	**3**	**8**	**5**	**4**	**2**	**5**	**4**	**4**	**12**	**11**	**6**	**106**

Victoria Nile HDD Crossing-North (HDD-N) had the highest diversity with 12 species, followed by Victoria Nile HDD Crossing-South (HDD-S) and BB-N (11 Spp each), then JBR-03 and JBR-10 (8 Spp each) and Industrial area/CPF and JBR-01 (7 Spp each). Sites with the least diversity were JBR-06 (2 Spp), followed by BA and JBR-02 (3 Spp each) and JBR-05, JBR-08 and JBR-09 (4 Spp each).

The commonest species were *Agama agama* in all the 17 sites surveyed, followed by *Trachylepis maculilabris* (16/17) and then *Lygodactylus gutturalis* (12/17). The least recorded species *were Aparallactus lunulatus, Bitis nasicornis, Chamaeleo gragiclis, Chamaeleo laevigatus, Dasypeltis scabra, Hemidactylus mabouia, Lamprophis fulginosus, Philothamnus beauaerti* and *Typhlops lineolatus* each

recorded in only one site, followed by *Crotaphopeltis hotamboeia, Dendroaspis polylepis, Python sebae* and *Varanus exanthematicus* each recorded in 2 out of 17 sites in which the surveys were done.

Species Accumulation for Reptiles

A species accumulation curve plotted for the sites surveyed shows the graph is still rising, relatively steeply (Figure 12). This implies that the reptilian diversity of sites surveyed had not yet been exhausted. More sampling effort could yield a few more species than the 28 recorded.

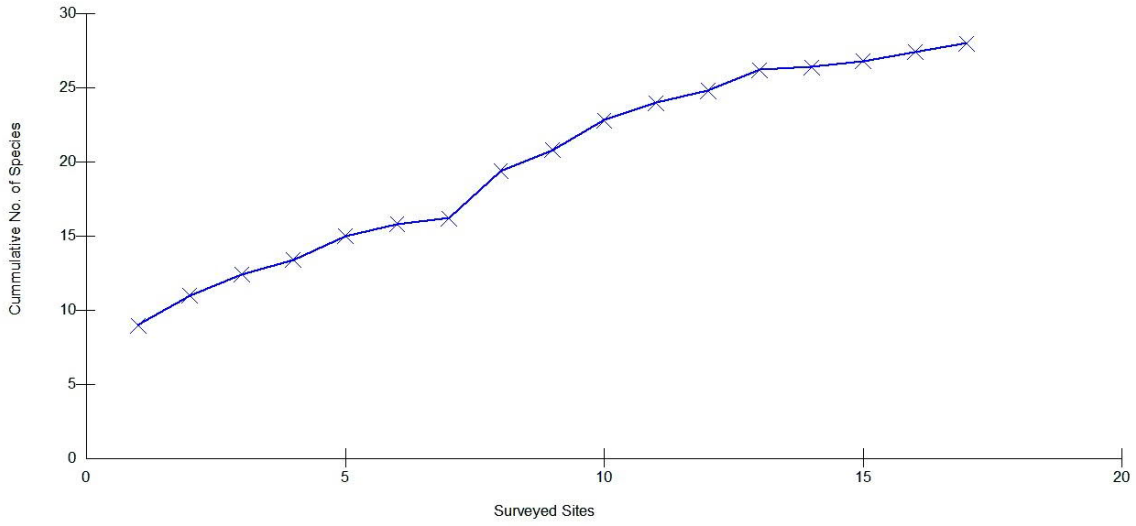


Figure 12: Species accumulation curve for reptiles

Cluster Analysis for Reptiles

A cluster analysis was performed to determine which reptilian habitats/sites group together. The dendrogram (Figure 13) shows that all areas surveyed were related to each other in a hierarchical order. The most dissimilar site was JBR (Jobi Rii 6) at a similarity distance of 44% followed by BB-N (Victorian Nile Ferry Crossing North (47%). The most similar sites were JBR-02 and BA (Bugungu Airstrip) with 100% similarity. JBR-04 and BB-S follow at 91%. Industrial Area/CPF and PC-N follow (74%) and these are joined by PC-S at 67%.

The most closely nested clade of sites are BA and JBR-02, flowed by JBR-08, JBR-09, BB-S, JBR-04 and JBR-07 joining at a similarity distance of 75%. It is not knownas to why the sites with reptilian species clustered in this pattern.

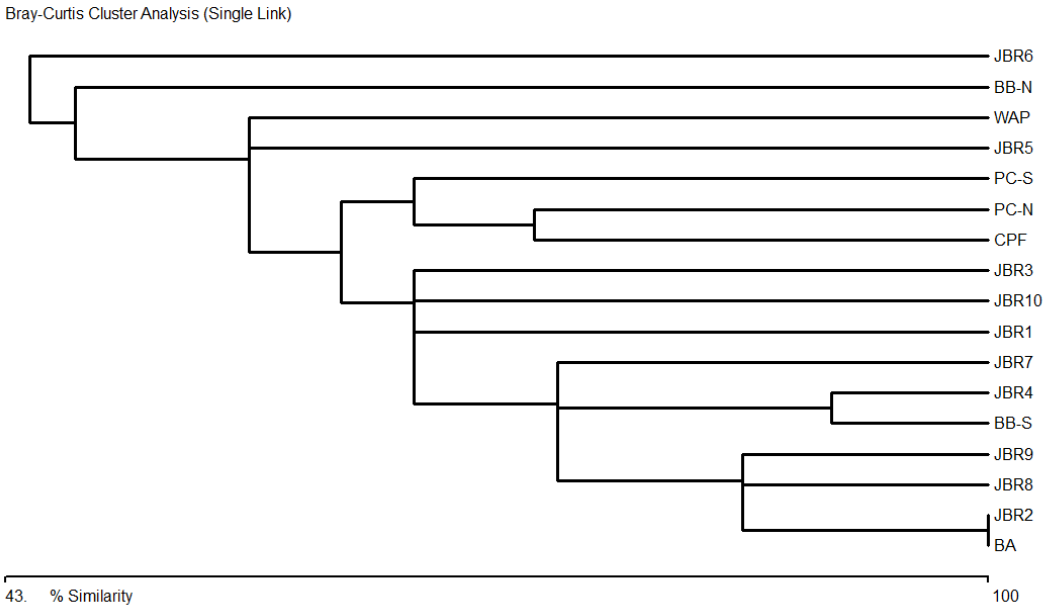


Figure 13: Dendrogram for reptiles

Discussion

A total of 36 amphibian and 25 reptilian species have been recorded in MFNP in the past (Plumptre et al, 2015). Compare this with 21 amphibian and 28 reptilian species recorded during the recent surveys. When the past data (Plumptre et al, 2015) is merged with the current data, the total number of amphibian species rises to 47 while the reptilian fauna rises to 45 species.

The 47 amphibian species represents about 61% of the amphibians of Uganda while the 45 reptilian species represents about 26% of the reptilian species of Uganda (WCS, 2006). The high diversity of amphibian species is more so due to diverse savannah grassland habitats in the Murchison Falls landscape/ecosystem that tend to be inhabited by common species most which were recorded. The remaining percentage of species that were not recorded would therefore be the less common in this ecosystem due to altitude (e.g. montane species), latitude and other specialists (e.g. forest species). The low percentage of reptilian species is most likely due to low diversity of reptilian habitats in the landscape/ecosystem.

Amphibians

All the amphibian species recorded during the recent surveys are a subset of what was recorded in the past. Twenty five of the species recorded in the past surveys (Plumptre et al, 2015) were not recorded during the recent surveys. This is most likely due to more sites and habitats criss-crossing the park having been surveyed during the past surveys

The reasons for the five additional species during the recent surveys are not clear although the recording of the *Letheobia* cf *sudanensis* species for the first time in MFNP and Uganda at large can partly be attributed to the employment of more pitfall traps than in the previous surveys. This method tends to

capture the subterranean and species to which *Letheobia* and *Aparallactus* species belong. Both of these species were captured in good numbers.

Outside MFNP, the only sites surveyed were in Buliisa community (i.e. the Industrial Area/CPF, Victoria Nile HDD Crossing-South (PC-S) and Water Abstraction Point – WAP along the Lake Albert shoreline).

Seventeen amphibian species had been recorded in this community during the past surveys while 13 were recorded during the recent surveys, bringing the total number of amphibian species in the community area to 19. All the species recorded during the recent surveys are a subset of the past survey except *Hyperolius viridiflavus viridiflavus* and *Ptychadena* sp. Six of the species recorded in the past surveys were not recorded during the recent surveys namely *Phrynobatrachus natalensis, Phrynobatrachus* Sp*., Ptychadena anchietae, Ptychadena chrystogaster, Ptychadena* Sp.3 and *Ptychadena* Sp.4. Again, wet season of the past surveys were wetter than that of the recent survey, and thus more amphibians.

No species endemic to the Albertine Rift or threatened species are known from MFNP and its immediate environs except the Nile Soft-shelled Tortoise - *Trionyx triunguis* (Albertine Population Critically threatened) and the Broad-snouted Crocodile- *Osteolaemus tetraspis* (Vulnerable). But these were not recorded during our surveys.

Table 15: Checklist of amphibian species in the study area recorded during campaigns 1 and 2

Order	Family	Species	Common Name	Authority	IUCN Status
Anura	Bufonidae	*Amietophrynus gutturalis*	African Common Toad, Gutteral Toad	Power, 1927	Least concern (Lc)
Anura	Bufonide	*Amietophrynus regularis*	African Common Toad	Reuss, 1833	Least Concern (Lc)
Anura	Bufonide	*Amietophrynus vittatus*	Lake Victoria Toad	Boulenger, 1906	Data Deficient (DD)
Anura	Hemisotidae	*Hemisus marmoratus*	Guinea snout-burrower	Cope, 1865	Least concern (Lc)
Anura	Dicroglossidae	*Hoplobatracus occipitalis*	Crowned bullfrog	Günther, 1858	Least concern (Lc)
Anura	Hyperoliidae	*Afrixalus quadrivittatus*	Four-lined Spiny Reed Frog	Werner, 1907	Least concern (Lc)
Anura	Hyperoliidae	*Hyperolius acuticeps*	Sharp-nosed Reed Frog	Ahl, 1931	Least concern (Lc)
Anura	Hyperoliidae	*Hyperolius cinnamomeoventris*	Cinnamon-bellied Reed Frog	Bocage, 1866	Least concern (Lc)
Anura	Hyperoliidae	*Hyperolius kivuensis*	Kivu reed Frog	Ahl, 1931	Least concern (Lc)
Anura	Hyperoliidae	*Hyperolius viridiflavus viridiflavus*	Common reed frog	Dumeril & Bibron, 1841	Least concern (Lc)
Anura	Hyperoliidae	*Kassina senegalensis*	Senegal Land Frog	Dumeril & Bibron, 1841	Least concern (Lc)
Anura	Phrynobatrachidae	*Phrynobatrachus acridoides*	Eastern puddle frog	Cope, 1867	Least Concern (Lc)
Anura	Phrynobatrachidae	*Phrynobatrachus auritus*	Golden puddle frog	Boulenger, 1900	Least Concern (Lc)
Anura	Phrynobatrachidae	*Phrynobatrachus mababiensis*	East African Puddle Frog	FitzSimons, 1932	Least Concern (Lc)

Order	Family	Species	Common Name	Authority	IUCN Status
Anura	Phrynobatrachidae	*Phrynobatrachus natalensis*	Natal dwarf puddle frog	Smith, 1849	Least Concern (Lc)
Anura	Microhylidae	*Phrynomantis microps*	West African Rubber Frog	Peters, 1875	Least concern (Lc)
Anura	Ptychadenidae	*Ptychadena anchietae*	Anchieta's Ridged Frog	Bocage, 1868	Least concern (Lc)
Anura	Ptychadenidae	*Ptychadena mascareniensis*	Macarene grass frog	Duméril & Bibron, 1841	Least concern (Lc)
Anura	Ptychadenidae	*Ptychadena oxyrhynchus*	Sharp-nosed Ridged Frog	Smith, 1849	Least concern (Lc)
Anura	Ptychadenidae	*Ptychadena porosissima*	Grassland Ridged Frog	Steindachner, 1867	Least concern (Lc)
Anura	Ptychadenidae	*Ptychadena* sp.			

IUCN Red list status for reptiles

Most reptile species of East Africa have for a long time not been evaluated except the chameleons (Tolley and Trape, 2014; Tolley et al., 2014). In this report, the IUCN (2017) Red lisiting shows that most of the reptiles are Not Evaluated (NE) with very few i.e. *Agama agama atricollis* - Common Agama, *Lygosoma sundevalli - Sundevall's* Writhing Skink, *Varanus exanthematicus* - Western Savanna Monitor, *Crocodylus niloticus* - Nile Crocodile, *Dasypeltis scabra* - Common Egg-eater and *Dendroaspis polylepis* - Black Mamba assigned the Least concern (Lc) status (IUCN, 2017) (Table 16).

However, efforts have been underway by WCS together with the local experts to review the status of reptiles and the new proposed red listing is also assigned, in which most of the species that were not evaluated now have a status of Least concern (Lc). A Data deficient (DD) status has been proposed for *Aparallactus lunulatus* - Reticulated Centipede-eater and *Philothamnus bequaerti* - Northern Green Bush Snake (Behangana et al., 2016). A new genus and species to Uganda (awaiting confirmation) *Letheobia cf sudanensis* - Sudan Beaked Snake was recorded for the first time and was caught in pitfall traps both in PC-N and the Industrial area/CPF.

Table 16: Checklist of reptilian species in project area recorded during campaigns 1 and 2

Order	Family	Species	Common Name	Authority	IUCN Status	Proposed Status (Uganda)
Chelonii	Pelomedusidae	*Pelomedusa subrufa*	Helmeted Terrapin, Marsh terrapin	Bonnaterre, 1789	NE	Lc
Sauria	Agamidae	*Agama agama*	Common Agama	Boulenger, 1896	Lc	Lc
Suaria	Chamaeleonidae	*Chamaeleo gracilis*	Gracile Chameleon	Hallowell, 1842	NE	Lc
Suaria	Chamaeleonidae	*Chamaeleo laevigatus*	Smooth Chameleon	Gray, 1863	NE	Lc
Sauria	Geckonidae	*Hemidactylus brookii*	Brook's House Gecko	Hallowell, 1852	NE	Lc
Sauria	Geckonidae	*Hemidactylus mabouia*	Tropical House Gecko	Moreau de Jonnes 1818	NE	Lc
Sauria	Geckonidae	*Lygodactylus guttularis*	Chevron-throated Dwarf Gecko	Bocage, 1873	NE	Lc
Sauria	Scincidae	*Lygosoma sundevalli*	Sundevall's Writhing Skink	A. Smith, 1849	Lc	Lc
Sauria	Scincidae	*Trachylepis maculilabris*	Speckle-lipped Skink	Gray, 1845	NE	Lc
Sauria	Scincidae	*Trachylepis perrotetti*	Taita Mabuya	Dumeril & Bibron, 1839	NE	Lc
Sauria	Scincidae	*Trachylepis striata*	Common Striped Skink	Peters, 1844	NE	Lc
Sauria	Varanidae	*Varanus exanthematicus*	Western Savanna Monitor	Bosc, 1792	Lc	Lc
Sauria	Varanidae	*Varanus niloticus*	Nile Monitor	Linnaeus, 1766	NE	Lc
Sauria	Gerrhosauridae	*Gerrhosaurus major*	Tawny Plated-lizard	Del Prato, 1895	NE	Lc
Crocodylia	Crocodylidae	*Crocodylus niloticus*	Nile Crocodile	Laurent, 1768	Lc	Lc
Serpentes	Boidae	*Python sebae*	African Python	Gmelin, 1789	NE	Lc
Serpentes	Typhlopidae	*Letheobia cf sudanensis*	Sudan Beaked Snake	Schmidt, 1923	NE	DD
Serpentes	Typhlopidae	*Typhlops lineolatus*	Lineolate Blind-snake	Jan, 1864	NE	Lc

Order	Family	Species	Common Name	Authority	IUCN Status	Proposed Status (Uganda)
Serpentes	Colubridae	*Crotaphopeltis hotamboeia*	Whitep-lipped Herald Snake	Laurent, 1978	NE	Lc
Serpentes	Colubridae	*Dasypeltis scabra*	Common Egg-eater	Mertens 1954	Lc	Lc
Serpentes	Colubridae	*Lamprophis fulginosus*	Common House-snake	Boie, 1827	NE	Lc
Serpentes	Colubridae	*Philothamnus bequaerti*	Northern Green Bush Snake	Schmidt, 1923	NE	DD
Serpentes	Colubridae	*Philothamnus semivariegatus*	Variegated Bush-snake	A. Smith, 1847	NE	Lc
Serpentes	Colubridae	*Psammophis mossambicus*	Olive Sand Snake	Peters, 1882	NE	Lc
Serpentes	Atractaspididae	*Aparallactus lunulatus*	Reticulated Centipede-eater	Peters, 1854	NE	DD
Serpentes	Elapidae	*Dendroaspis polylepis*	Black Mamba	Gunther, 1864	Lc	Lc
Serpentes	Elapidae	*Naja melanoleuca*	Forest Cobra	Hallowell, 1857	NE	Lc
Serpentes	Viperidae	*Bitis arietans*	Puffadder	Merrem, 1820	NE	Lc
Serpentes	Viperidae	*Bitis nasicornis*	Rhinoceros Viper	Shaw, 1802	NE	Lc

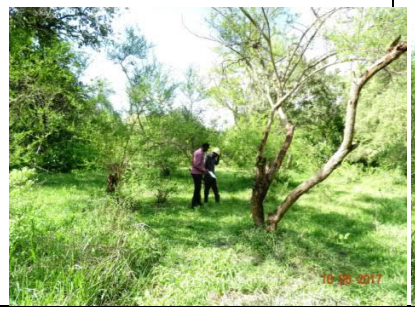
Key Findings

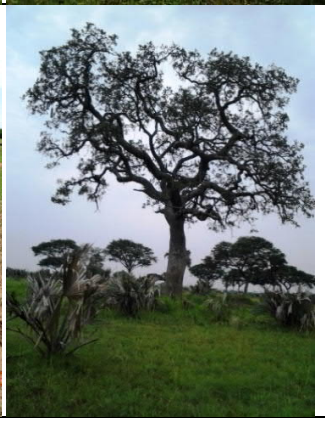
1. The recent surveys regimes were drier than the past regimes that almost adequately covered both the wet and dry seasons. The recent surveys therefore had fewer species recorded than the past surveys.
2. 21 amphibian species belonging to one order – Anura, seven families and nine genera were recorded in the project area during the two campaigns of surveys.
3. Campaign 2 was wetter than campaign1, with 20 species recorded in 10 sites during campaign2 while 15 species were recorded in only four sites during Campaign 1.
4. The richest sites for amphibians were BBN, PC-N, WAP, JBR-09 and PC-S. The most species poor sites were JBR3, JBR1 and JBR7.
5. The commonest amphibian species were *Afrixalus quadrivittatus, Ptychadena mascareniensis, Amietophrynus vittatus, Hemisus marmoratus* and *Phrynobatrachus acridoides.*
6. The least common species were *Hyperolius acuticeps, Phrynobatrachus auritus, Phrynomantis microps* and *Ptychadena anchiatae*
7. A species accumulation curve plotted for the areas surveyed shows the graph had started leveling off, implying that the amphibian diversity of the areas surveyed had almost been exhausted. A few more species could only be added with more sampling effort,
8. The maximum number of species for the study sites for the two campaigns as predicted by species estimators can go up to 26 species.
9. All amphibian species are of Least concern (Lc) except *Amietophrynus vittatus* – the Lake Victoria toad which is said to be Data Deficient (DD).
10. There is no one particular site that can be said to be very unique from the others for amphibian habitation. The conservation of any one amphibian species in the area should hence take an integrated approach through the conservation of the whole area.
11. Twenty nine reptilian species belonging to four orders, 14 families and 22 genera were recorded in the project area during the two campaigns of surveys. Earlier surveys put the reptilian diversity in MFNP to 25 reptilian species. When the past data (Plumptre et al, 2015) is merged with recent data, the total number of reptilian fauna rises to 45 species,
12. Twenty six species were recorded during the drier campaign1 while 17 species were recorded during the wetter campaign2.
13. Sites with the highest diversity Pipeline crossing-North ((PC-N) (Victoria Nile HDD Crossing North), followed by PC-S (Victoria Nile HDD Crossing South) and BB-N, JBR-03 and JBR-10, CPF and
14. Sites with the least diversity were JBR-06, followed by BA and JBR-02, JBR-05, JBR-08 and JBR-09),
15. The commonest species were Agama *agama, Trachylepis maculilabris* and *Lygodactylus gutturalis*,
16. Many reptilian species were not common with 13 recorded in one or two of the 17 sites from which reptiles were encountered.

17. Species estimators predict a maximum of up to 41 reptilian species in the project area, a number that is less than the combined diversity for present and past studies. This could be because past studies covered more diverse micro and macro habitats over a wider area,
18. A species accumulation curve plotted for the sites surveyed shows the graph is still rising, relatively steeply, implying that the reptilian diversity of sites surveyed had not yet been exhausted,
19. The Reticulated Centipede-eater (*Aparallactus lunulatus*) and the Sudan Beakd Snake (*Letheobia cf sudanensis*) have been listed as Data Deficient (DD),
20. The Nile Soft-shelled Tortoise - *Trionyx triunguis* (Albertine Population Critically threatened) and the Broad-snouted Crocodile- *Osteolaemus tetraspis* (Vulnerable) were not recorded during our surveys. The former has however been recorded along the shallower sandy shore of the Victoria Nile,
21. The sites with the highest diversity are also the most critical sites for both amphibians and reptiles,
22. For both amphibians and reptiles there is not one particular site that can be said to be very unique from the other in regard to distribution. The conservation of any one species in the area should take an integrated approach through the conservation of the whole area.

Table 17: Photographic presentation of habitats in the geo-referenced points around which surveys were done

Point Name	Code				
Victoria Nile Ferry Crossing -North	BB-N				
Victoria Nile Ferry Crossing-South	BB-S				
Victoria Nile HDD Crossing-North	PC-N				

Point Name	Code				
					
					
Victoria Nile HDD Crossing-South	PC-S				

Point Name	Code				
Jobi Rii 1	JBR1				
Jobi Rii 2	JBR2				
Jobi Rii 3	JBR3				

Point Name	Code				
Jobi Rii 4	JBR4				
Jobi Rii 5	JBR5				
Jobi Rii 6	JBR6				

Point Name	Code				
Jobi Rii 7	JBR7				
Jobi Rii 8	JBR8				
					

Point Name	Code				
Jobi Rii 9	JBR9				
Jobi Rii 10	JBR10				
Bugungu Airstrip	BA				

Point Name	Code				
Central Processing Facility	CPF				
Water Abstraction Point	WAP				

O1.4 Invertebrates

Methods

Dates of surveys

The first season survey (dry season) was from 28th March to 12th April 2017; the second surveys (wet season) were carried out from 13th June to 28th June 2017.

Field Work

Targeted surveys in the preselected sites were conducted to cover the footprint of the proposed infrastructure. At a given site, transects were established covering 250 m and 500 m from the centre of the selected site to the major directions of North, South, East and West of the centre point (Figure 14). Sections within the interconnections between the major directions (NE, NW, SE & SW) were also surveyed. This design was used at all sites except where a section of the area was located in water (e.g. the Victoria Nile Ferry Crossing areas and the Victoria Nile HDD Crossing Points (North and South). This protocol was used to maximize coverage of the survey area as the invertebrates are constantly in flight within the area. Two methods were majorly used to survey the butterflies and dragonflies within the prescribed areas. In addition, opportunistic observations were made to enhance the species list.

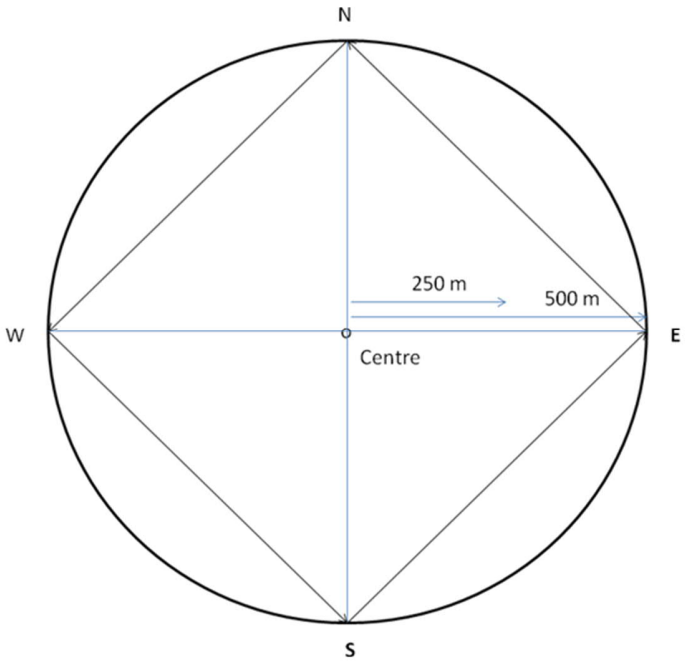


Figure 14: Survey design used to sample the butterflies and dragonflies

a) Sweep netting for adult butterflies and dragonflies

All team members walked along each transect recorded species present as they encountered them. An indication of abundance of each was also noted. Individuals were identified in the field, and only those

species difficult to identify were collected and preserved in envelops for further processing. For butterflies, specimens were dried and stored in their respective envelopes. For dragonflies, only males were taken, soaked in acetone for eight hours (to preserve colours that easily fades on storage) and placed back in envelopes for further taxonomic work. Details of all the records were entered in field datasheets. Aspects of daily weather (e.g. sunny, cold, cloudy, windy etc) and habitat condition were noted especially those that relate directly to the selected invertebrates (e.g. % bare ground, height of grasses, presence of trees and their flowering stage, presence of wallows and seasonal/permanent wetlands/streams/rivers).

b) Use of baited traps for butterflies

This method is largely used to survey specific subfamilies within the butterfly faunas. Blendon traps similar to those used in previous studies such as AECOM (2014) were set in selected sites. Traps were only used in areas that had certain coverage of understorey vegetation and presence of trees. Fermented banana mixed with mango was used as bait.

Invertebrate data handling and identification

Several field guides (e.g. for butterflies: Larsen 1991, 2005; Molleman 2012, Picker *et al.* 2004, Kielland 1990 and for dragonflies: Miller & Miller 2003, Clausnitzer *et al.* 2011, Dikstra & Clausnitzer 2014, Tarboton & Tarboton 2015), web-based resources (e.g. for butterflies: LepiMap-Atlas of African Lepidoptera, African butterflies & Moths-LepSoc, African Butterfly DataBase, for dragonflies: African Dragonflies and Damselflies Online, Dragonflies and Damselflies Worldwide Odonata) offline database (e.g. Butterflies of Uganda-National Biodiversity Data Bank, Encyclopedia of butterflies and skippers of the Afrotropical region - Mark Williams) and the collections at Makerere University Zoological Museum were used for taxonomic treatment of butterflies and dragonflies recorded during the two surveys. These resources were mostly used to identify voucher specimens that could not be identified in the field.

Biodiversity value of each site and identification of critical Species

This was assessed though presence of species of global and national conservation concern. IUCN red list and Uganda National red list data were used to determine presence of critical species within each survey area. In addition, presence of species with specific ecological habitat needs was assessed. Such species, when encountered, were recorded and their habitats noted.

Presence of species of conservation concern (e.g. red list species and/or critical habitat criteria)

1. Bugungu Airstrip

No globally threatened species was noted. However, some nationally listed species were recorded that include:

Butterflies

i. *Acraea pharsalus* is nationally listed as VU. This species requires good forest and woodlands in good conditions.

ii. *Anthene indefinita* is another species that prefers moist savanna and forest. It is listed as VU on the Uganda Red list because of its habitat affiliation and its restriction to eastern Africa, including DRC.

iii. *Colotis chrysonome* is also listed as VU. This species is only known from Northern Uganda from only a few records. They are uncommon, prefers arid savanna but always found resting in shades on hot days.

Dragonflies

i. *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions.

2. JBR-01

No globally threatened species was present. However, some nationally listed species were recorded that include:

Butterflies

i. *Acraea pharsalus* is nationally listed as VU. This species requires good forest and woodlands in good conditions.

ii. *Anthene indefinita* is another species that prefers moist savanna and forest. It is listed as VU on the Uganda Red list because of its habitat affiliation and its restriction to eastern Africa, including DRC.

Dragonflies

No nationally listed species was recorded in this area

3. JBR-02

No globally or nationally species was recorded at the site.

4. JBR-03

The area is very open and there are barely any trees except for those trees located in the seasonally flooded stream.

No globally threatened species was recorded. However nationally red listed species were present.

Butterflies

i. *Euchrysops albistriata* is listed as VU on the Uganda Red List. It's an open country species that mostly occurs in localized colonies and it's often rare. It is mostly found in the Sudan savanna habitats and few disturbed forest areas.

Dragonflies

i. *Pseudagrion (B) torridum* is Nationally listed as VU because of its preference for shore line habitats that are currently under immense threats in Uganda.

5. JBR-04

The area is generally very open with scattered *Acacia* sp. The grasses that were completely burnt during dry season had mostly grown back and there was barely any visible bare ground. On the lower slope, there is a seasonally flooded stream dominated by big Acacia trees.

No globally species was recorded at the site. However some nationally red listed species were recorded.

Butterflies

i. *Anthene indefinita* is another species that prefers moist savanna and forest. It is listed as VU on the Uganda Red list because of its habitat affiliation and its restriction to eastern Africa, including DRC

ii. *Euchrysops subpallida* is also VU locally. The species tends to occur in discrete colonies. Individuals are usually found in the vicinity of the larval food plants, often in shade cast by trees.

Dragonflies

i. *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions.

ii. *Sympetrum fonscolombii* is nationally listed as DD. Only few records exist of this species due to its nomadic and erratic occurrences

6. JBR-05

No globally threatened species was recorded at the site. However, one nationally red listed dragonfly species was present during the wet season survey.

Dragonflies

i. *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions

7. JBR-06

The vegetation is very open with mostly very sparse *Borassus aethiopum* trees. The area was about 20-30% bare ground during the wet season and grasses were mostly less than 10 cm but in some areas, the grasses were almost 0.5m high. There was also eroded bare gullies surrounded by mostly short *Acacia* sp and *Balanites* trees.

No globally threatened species was recorded at the site. However one nationally red listed dragonfly species was present during the wet season survey.

Dragonflies

i. *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions.

8. JBR-07

No globally threatened species was recorded at the site. However one nationally red listed dragonfly species was present during the wet season survey.

Dragonflies

i. *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions.

9. JBR-08

The area is very open with scattered *Borassus aethiopum* dominating. Only few scattered Acacia and Balanites trees are found in the area A Seasonally flooded stream is located with 100m from the JBR-08 centre point

No globally threatened species was recorded at the site. However one nationally red listed dragonfly species was present during the wet season survey

Dragonflies

i. *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions

10. JBR-09

This is fairly wooded area with *Borassus* sp and *Acacia* sp dominating. During the dry season, the grass was burnt but it was still relatively short during the wetter season. The area is generally open, and it had about 30-40% bare ground during the wet season. Sections of the area has deep gulley in the stream/river line.

No globally threatened species was recorded at the site. However some nationally red listed species were recorded and include;

Butterflies

i. *Leptotes marginalis* is listed as DD. This species has only one previous record from Ruwenzori region which is also the type locality. Not much is known about this species in its entire range.

Dragonflies

i) *Acisoma inflatum* is listed as Data deficient (DD). However, recent taxonomic changes make a re-assessment necessary and this species is most likely VU.

ii) *Gomphidia bredoi* is listed as Vulnerable (VU) due to its restricted range in Uganda and forest dependency.

iii) *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions.

11. JBR-10

This is a dense woodland/thicket/ bushland with scattered trees mostly dominated by Acacia species. The vegetation is mostly dense *Acacia* bushland with *Vepris* and *Capparis* in the shrub layer. The grass is short, and the area has several seasonal wallows that were mostly dry during the first season and had water in them during the wetter season. There are also seasonal wetlands located within and in close proximity to the area.

No globally threatened species was recorded at the site. However some nationally red listed species were recorded and include

Butterflies

i. *Lepidochrysops jansei* is an open country species and this is the first record from Uganda and currently considered DD. It is previously known from Kenya and Tanzania and is known to prefer recently burnt areas (which was the case during the survey).

Dragonflies

i) *Acisoma inflatum* is listed as Data deficient (DD). However, recent taxonomic changes make a re-assessment necessary and this species is most likely VU.

ii) *Neurogomphus featheri* is currently listed as DD but should be revised to EN. Murchison falls National Park (< 5000 km^2) is the only area where the species has been recorded. Field observations indicate that this species requires specific habitat conditions.

12. Victoria Nile HDD crossing - North

No globally threatened species was recorded at the site. However one nationally red listed dragonfly species was present during the wet season survey

Dragonflies

i) *Acisoma inflatum* is listed as Data deficient (DD). However, recent taxonomic changes make a re-assessment necessary and this species is most likely VU.

13. Victoria Nile Ferry Crossing - North

This is an area with riverine vegetation located close to the Nile river on the northern bank near the jetty. There is thus much human activity including tourism. The vegetation is riverine woodland that was exceptionally dry during first field season and almost devoid of understorey vegetation.

No globally threatened species was recorded at the site. However two nationally red listed dragonfly species was present.

Dragonflies

i) *Acisoma inflatum* is listed as Data deficient (DD). However, recent taxonomic changes make a re-assessment necessary and this species is most likely VU.

ii) *Sympetrum fonscolombii* is nationally listed as DD. Only few records exist of this species due to its nomadic and erratic occurrences

14. Victoria Nile HDD Crossing - South

This site is located by the southern shores of River Nile. There is on-going development of a tourist facility, with new structures being constructed and vegetation being cleared. The area partly has Riverine forest. Away from the river, there are patches of open grasslands.

No globally threatened species was recorded at the site. However two nationally red listed species were present

Butterflies

i. *Borbo holtzi* is also VU and only known from a few localities in Uganda. The species is often seen feeding from flowers or at muddy places. Males may hilltop but generally establish territories anywhere in the habitat, particularly on the edges of the bush, where they perch on shrubs.

Dragonflies

i. *Acisoma inflatum* is listed as Data deficient (DD). However, recent taxonomic changes make a re-assessment necessary and this species is most likely VU.

15. Victoria Nile Ferry Crossing - South

No globally threatened species was recorded at the site. However nationally red listed species were present

Dragonflies

Acisoma inflatum is listed as Data deficient (DD). However, recent taxonomic changes make a re-assessment necessary and this species is most likely VU.

16. Water Abstraction System (WAS)

No globally threatened species was recorded. However one nationally red listed species of dragonfly was present

Dragonflies

i. *Pseudagrion (B) torridum* is Nationally listed as VU because of its preference for shore line habitats that are currently under immense threats in Uganda

Table 18: summary of invertebrates data (BU = butterflies, DR =Dragonflies)

SITE	Habitat condition	Sensitive microhabitats	Species richness		Threatened species (IUCN)		Threatened species (Uganda red list)	
			BU	DR	BU	DR	BU	DR
Bugungu Airtsrip	Natural	i) High woody biomass in entire area ii) Areas with invasive *Chromolaena odorata*	61	14	0	0	3	1
JBR-01	Natural	Seasonally Flooded Grassland areas in the vicinity	50	20	0	0	2	0
JBR-02	Natural	Where mature trees grow	44	13	0	0	0	0
JBR-03	Natural	i) Wallows with habitat-specific flora ii) Mature trees in vale	33	17	0	0	1	1
JBR-04	Natural	i) Mature trees in vale ii) Seasonally flooded wetland areas with habitat-specific flora	50	21	0	0	2	2
JBR-05	Natural	Small grooves of trees	28	10	0	0	0	1

SITE	Habitat condition	Sensitive microhabitats	Species richness		Threatened species (IUCN)		Threatened species (Uganda red list)	
JBR-06	Natural	i) Vale with sparse mature trees ii) Seasonal wetland areas with habitat-specific flora	31	14	0	0	0	1
JBR-07	Natural	i) Seasonally flooded areas with habitat-specific flora ii) Areas with mature *Borassus* trees	39	18	0	0	0	1
JBR-08	Natural	i) Areas with invasive species ii) Seasonally flooded areas with habitat-specific flora	29	23	0	0	0	1
JBR-09	Natural	Areas with high woody biomass	53	38	0	0	1	3
JBR-10	Natural	i) High woody biomass in dense Bushland ii) Wallows with habitat-specific flora	51	13	0	0	1	2
Victoria Nile HDD crossing - North	Natural	i) Woody biomass of large trees	37	21	0	0	0	1
Victoria Nile Ferry Crossing - North	Natural	i) River banks that may get silted ii) River edges with invasive species that may proliferate	51	26	0	0	0	2
Victoria Nile HDD crossing South	Natural	i) Woody biomass of large trees	63	16	0	0	1	1
Victoria Nile Ferry Crossing - South	Natural	i) River banks that may get silted ii) River edges with invasive species that may proliferate	47	24	0	0	0	1
WAS	Transitional	Permanent wetland with mature trees of Aeschynomene	21	14	0	0	0	1

APPENDIX O2

Tilenga Project

TERRESTRIAL WILDLIFE

CRITICAL HABITAT ASSESSMENT – SUMMARY OF FINDINGS

2018

Appendix O2: Critical Habitat Assessment – summary of findings

1.1 Overview

This Appendix follows provides an up-to-date summary of findings from the Critical Habitat Assessment (CHA) Interpretation carried out in 2017 (TBC & FFI 2017). CHA is an IFC Performance Standard 6 (PS6) process, carried out at the landscape scale, to identify significant biodiversity risks associated with a project. PS6 outlines the requirements for development in areas of Critical Habitat, considering the conservation principles of threat (vulnerability) and geographic rarity (irreplaceability).

This assessment incorporates recent updates for a number of Critical Habitat-qualifying species, based on further interpretation and updates to the IUCN Red List of Threatened Species, Version 2017-3 (IUCN 2017).

1.2 Summary of WCS & eCountability CHA

Applying the PS6 criteria and thresholds for Critical Habitat involves the use of ecologically and/or administratively coherent Discrete Management Units (DMUs). WCS & eCountability (2016) identified ten DMUs (terrestrial and aquatic) for the Project landscape (see Glossary), based on the distribution of potentially Critical Habitat-qualifying taxa.

The entire Murchison-Semliki landscape in which the Project is situated is classed as Critical Habitat. A large proportion of this qualifies as Tier 1 Critical Habitat, i.e. of extreme sensitivity for biodiversity. This includes most of the Project area north of the Nile.

The Project is in Critical Habitat for a suite of species. The Critical Habitat-qualifying taxa comprise terrestrial plants, mammals, birds, reptiles, amphibians, butterflies and dragonflies, freshwater fish, freshwater molluscs and freshwater shrimp (see Section 1.3).

Parts of the Project landscape qualify as Critical Habitat because of concentrations of Vulnerable species (see Section 1.4). These include Budongo, Bugoma and Wambabya Forest Reserves, the escarpment east of Lake Albert, and the Murchison Falls-Nile Delta Ramsar Site.

Seven threatened ecosystems in the project landscape also qualify as Critical Habitat (see Section 1.5). Lake Albert is Critical Habitat not only for its threatened and range-restricted species, but because it supports key evolutionary processes (see Section 1.6). The project landscape also overlaps with 39 protected areas and internationally recognised areas (see Section 1.7).

Critical Habitat-qualifying features are found mainly in areas that are also Natural Habitat, both inside and outside protected areas. Natural Habitat covers over three-quarters (78%) of the Project landscape, and most of this Natural Habitat (69%, or 54% of the total landscape) is classed as transitional habitat (see Section 1.8). Transitional habitat shows signs of modification, yet retains a proportion of typical native constituent species and

could recover if managed appropriately. Transitional habitat has potential for restoration and may support important ecosystem functions and connectivity. Modified habitats represent a smaller proportion (~21%) of the landscape.

CHA is an iterative process. As the information base is developed, knowledge of the distribution, population/extent and threat status of individual species and habitats may change. Thus, the Critical Habitat-qualifying status of a given species may change in the future.

1.2.1 Landscape Contexts

The WCS & eCountability (2016) CHA is a thorough and factual document based on ecological analysis, and has been carried out at a landscape scale appropriate for both the TUOP (EA 2 South) and TEP Uganda (EA1A, EA1 and EA2 North) developments. It identifies that that Project is likely to interact with ~120 Critical Habitat-qualifying species in ten overlapping DMUs, seven threatened ecosystems, six areas with concentrations of Vulnerable species, 39 protected areas and internationally recognised areas, and areas of Natural, transitional and Modified Habitat. It is a complex set of information that practical application from the perspective of the Project.

Therefore, the CHA applies a landscape-scale view of interactions with all Critical Habitat-qualifying features, LPAs and IRAs, using a set of landscape contexts with which the Project is anticipated to interact in particular ways. These contexts fully incorporate the ten DMUs identified in WCS & eCountability (2016), but they themselves are not DMUs. Six landscape contexts have been identified:

Context	Name	Description
A	MFPA	Grassland and woodland within the MFPA and to its north. Contains extensive areas of Moist Combretum Savanna and Hyparrhenia Grass Savanna, and a concentration of Vulnerable species in Bugungu Wildlife Reserve. Critical Habitat-qualifying species are concentrated in MFNP north of the Nile and include Rothschild's Giraffe and Lelwel Hartebeest[1] (Tier 1) and several vulture species (Tier 2). Context A is linked ecologically with Context B, but the management issues in each are different.
B	Savanna corridor	Grassland and open wooded or scrub habitats along a weakly-protected savanna corridor that runs approximately north-south along and below the escarpment. Contains Natural Habitat and transitional habitat, with areas of Moist Combretum Savanna and a concentration of Vulnerable species along the escarpment. Context B includes savanna habitat that is outside the MFPA. This is Critical Habitat for Uganda Kob and Lion (Tier 2), and a small number of other vertebrate species. Context A is linked ecologically with Context B, but the management issues in each are different.
C	Lake Albert, rivers and wetlands	Lake Albert and fringing wetlands, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps. These are Tier 1 Critical Habitat for many highly threatened and narrowly endemic fish and invertebrates (e.g. Albert Lates and Gabiella walleri), and Tier 2 Critical Habitat for several bird and reptile species (e.g. Shoebill and Adanson's Hinged Terrapin). Contains a concentration of Vulnerable species in the Murchison Falls-Albert Delta Wetlands System Ramsar Site.
D	Tropical high forest	Forest and forest fragments and corridors, including the large Central Forest Reserves of Budongo and Bugoma; smaller fragments, including Wambabya, between and around these; and gulley/riparian forests along rivers and streams running down to Lake Albert. Context D contains several CH-qualifying forest-specialist species, including Nahan's Francolin.

[1] Lelwel Hartebeest Alcelaphus b. lelwel is a sub-species of Jackson's Hartebeest A. buselaphus.

Context	Name	Description
E	Nebbi	Unprotected savanna habitats in Nebbi District (West Nile sub-region), including areas of two threatened ecosystems. This context also potentially contains Critical Habitat for a globally and nationally threatened cycad species. This Context extends beyond the area included in the CHA by WCS & eCountability (2016). This is to ensure that the Project's potential Area of Influence west and north of MFNP is adequately considered.
F	Mixed landscape	This is a 'catch all' context that covers mixed habitats landscape-wide, including agriculture. Two landscape species, African Elephant and Chimpanzee, are wide-ranging across several ecosystems and in Modified Habitat. African Elephants are concentrated in protected areas (especially MFNP) but range over the entire landscape, including agricultural areas, when they move out to feed. Notably, they often range some distance north of MFNP, including in swamps along the Albert Nile north of Pakwach. Chimpanzees range in and around tropical forest, and use many habitats outside the forests, including agricultural areas. Riverine forests are important to Chimpanzees, and corridors of other habitat allowing access to Lake Albert water may be important at times.

The Project footprint is expected to interact with the landscape contexts as follows:

Context	Interaction with the Project footprint
A	Well pads, flow lines and roads in EA1 north of the Nile, and to a smaller extent well pads, flowlines and roads elsewhere in EA1 and EA2
B	Well pads, flow lines and roads, Central Processing Facility and a feeder pipeline towards the refinery and export line (routes not yet confirmed) in Modified and mainly unprotected Natural (including transitional) Habitat) around Buliisa, between the Nile and Bugungu Wildlife Reserve;
C	Nile Crossing beneath the Murchison Falls-Albert Delta Wetland System Ramsar Site, facilities for barge crossing of the Nile, and the water extraction facility near the Lake Albert shore.
D	Feeder pipeline
E	No Project footprint anticipated
F	All Project infrastructure

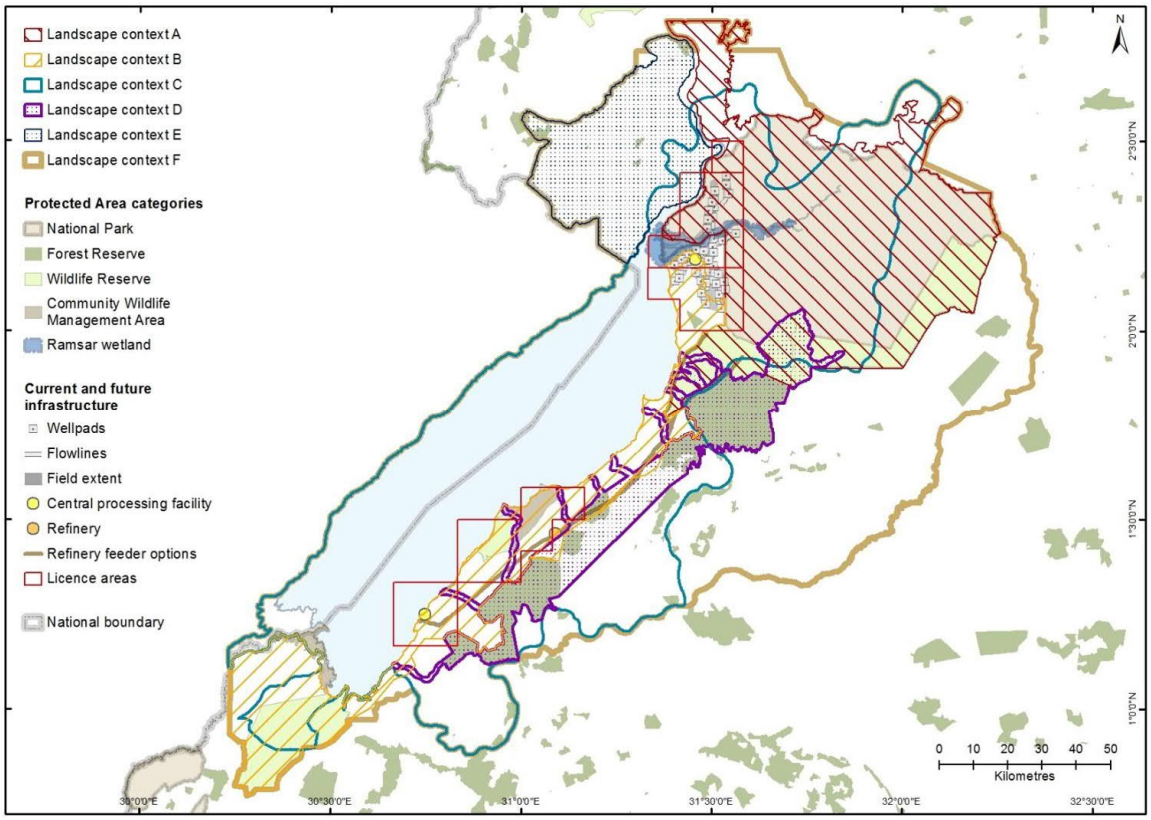


Figure A: Six landscape contexts identified through the CHA interpretation

An evaluation of habitat structure and connectivity shows that the Project footprint overlaps with core grassland habitat, including the largest and most intact area (in context A), and unprotected areas which are already undergoing rapid degradation and conversion (in context B). Large tropical forest patches (context D) in the landscape contain important core habitat, but there is potential for improving connectivity between them. Riverine forest is already fragmented within the landscape. Core areas of woodland habitat exist just south and east of the Project footprint, within MFNP.

1.3 Critical Habitat-qualifying features by taxon

The following tables summarise the Critical Habitat-qualifying features, with IUCN global status and Uganda Red List status, where:

- CR = Critically Endangered
- EN = Endangered
- LC – Least Concern
- DD = Data Deficient
- NE = Not Evaluated

1.3.1 Mammals

Table 1: Critical Habitat-qualifying mammal species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

	Species name		IUCN	Uganda Red List	DMU No.	DMU name	Context	CH criterion	Tier
Carnivora	Spotted Hyena	Crocuta crocuta	LC	CR	7	MFPA	A,B	1e	2
Carnivora	Lion	Panthera leo	VU	CR	2	Savanna corridors	A,B	1e	2
Cetartiodactyla	Lelwel Hartebeest	Alcelaphus buselaphus lelwel	EN	NT	7	MFPA	A,B	1a	1
Cetartiodactyla	Rothschild's Giraffe	Giraffa camelopardalis rothschildi	EN	EN	7	MFPA	A	1ab	1
Cetartiodactyla	Uganda Kob	Kobus thomasi	LC	LC	2	Savanna corridors	A,B	3d	2
Cetartiodactyla	Bohor Reedbuck	Redunca redunca wardi	LC	EN	7	MFPA	A,B	1e	2
Chiroptera	Russet Free-tailed Bat	Chaerephon russatus	VU	DD	Not assigned			Possible 1e	2
Chiroptera	Medje Mops Bat/Congo Free-tailed Bat	Mops congicus	LC	EN	5	Budongo	D	1e	2
Chiroptera	Trevor's Mops Bat/Trevor's Free-tailed Bat	Mops trevori	DD	EN	5	Budongo	D	1e	2
Chiroptera	Savanna (Helios) Pipistrelle Bat	Neoromicia helios	DD	CR	3	Forests and	D	Possible 1e	2

	Species name		IUCN	Uganda Red List	DMU No.	DMU name	Context	CH criterion	Tier
						corridors			
Eulipotyphla	Ugandan Lowland Shrew	Crocidura selina	DD	EN	3	Forests and corridors	D	1e, possible 2b	2
Primates	Uganda Mangabey	Lophocebus ugandai	LC	VU	3	Forests and corridors	D	1e	2
Primates	Chimpanzee	Pan troglodytes	EN	EN	9	Chimpanzee	B,D	GN20, 1abc + 2b	1 & 2
Proboscidea	African Elephant	Loxodonta africana	VU	CR	4	Mixed habitats landscape	A,B,D	1e	2
Rodentia	Charming Thicket Rat	Thamnomys venustus	VU	DD	Not assigned	Forests and corridors	Not assigned	Possible 2b	2

1.3.3 Birds

Table 2: Critical Habitat-qualifying bird species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
GALLIFORMES	Nahan's Francolin	Francolinus nahani	VU	VU	10	Nahan's Francolin	D	2b	2
GRUIFORMES	Grey-crowned Crane	Balearica regulorum	EN	EN	1	Lake Albert and Wetlands	C	1e	2
OTIDIFORMES	Denham's Bustard	Neotis denhami	NT	CR	7	MFPA	A	1e	2
PELECANIFORMES	Madagascar Pond Heron	Ardeola idae	EN	EN	1	Lake Albert and Wetlands	C	1ce	2
PELECANIFORMES	Shoebill	Balaeniceps rex	VU	EN	1	Lake Albert and Wetlands	C	1e	2
CHARADRIIFORMES	African Skimmer	Rynchops flavirostris	NT	VU	8	Murchison Falls-Albert Delta Wetland System Ramsar Site	C	3, possible 2b	2
CHARADRIIFORMES	Black-rumped Buttonquail	Turnix nanus (synonym T. hottentottus)	LC	EN	2	Savanna corridors	A,B	1e	2
STRIGIFORMES	Pel's Fishing Owl	Scotopelia peli	LC	EN	7	MFPA	A	1e	2
ACCIPITRIFORMES	Pallid Harrier	Circus macrourus	NT	CR	2	Savanna corridors	A,B	1e	2
	White-backed Vulture	Gyps africanus	CR	EN	7	MFPA	A	1ce	2

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
	Rüppell's Vulture	Gyps rueppelli	CR	EN	4, 7	Mixed habitats landscape and MFPA	A,B,D	1ce	2
	Hooded Vulture	Necrosyrtes monachus	CR	EN	4, 7	Mixed habitats landscape and MFPA	A,B	1c	2
	African Crowned Eagle	Stephanoaetus coronatus	NT	EN	Not assigned		E	1e	2
	White-headed Vulture	Trigonoceps occipitalis	CR	CR	7 (possible 2)	MFPA (and possibly Savanna corridors)	A,B	1c	2
	Lappet-faced Vulture	Torgos tracheliotus	EN	CR	7	MFPA	A	1e	2
FALCONIFORMES	Fox Kestrel	Falco alopex	LC	EN	7	MFPA	A	1e	2

1.3.4 Reptiles

Table 3: Critical Habitat-qualifying reptile species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Testudines	Common/Serrated Hinge-backed Tortoise	Kinixys erosa	DD	DD	Not assigned			Possible 2	2
Testudines	Adanson's Hinged Terrapin	Pelusios adansonii	NE	CR	1	Lake Albert and Wetlands	C	1e	2

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Testudines	Zaire Hinged Terrapin	Pelusios chapini	NE	CR	8	Murchison Falls-Albert Delta Wetland System Ramsar Site	C	1e	2
Testudines	African Soft-shelled Turtle	Trionyx triunguis	NE	CR	8	Murchison Falls-Albert Delta Wetland System Ramsar Site	C	1e	2
Squamata	Mocquard's African Ground Snake	Goniotophis brussouxi	NE	NE	Not assigned			Possible 2	2
Squamata	Brown File Snake	Hormonotus modestus	NE	NE	Not assigned			Possible 2	2
Squamata	Grass snake species	Psammophylas actus	NE	NE	Not assigned			Possible 2	2
Squamata	Smooth Chameleon	Trioceros laevigatus (synonym Chamaeleo laevigatus)	NE	EN	2	Savanna corridors	A,B	1e	2

1.3.5 Amphibians

Table 4: Critical Habitat-qualifying amphibian species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Anura	Rugege Forest Squeaker Frog	Arthroleptis adolfifriederici	EN	EN	3	Forests and corridors	D	1e, 2b	2
Anura	n/a	Hyperolius langi	LC	DD	Not assigned			Possible 2b	2
Anura	n/a	Hyperolius lateralis	LC	NE	Not assigned			Possible 2b	2
Anura	Rwanda Long Reed Frog	Hyperolius rwandae	NE	DD	Not assigned			Possible 2b	2

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Anura	n/a	Leptopelis oryi	LC	NE	Not assigned			Possible 2b	2
Anura	Golden puddle frog	Phrynobatrachus auritus	EN	LC	3	Forests and corridors	D	1e	2
Anura	Christy's grassland frog	Ptychadena chrystyi	DD	VU	4	Mixed habitats landscape	A,B	2	2
Anura	Uganda Clawed Frog	Xenopus ruwenzoriensis	DD	VU	5	Budongo	D	2	2
Anura	Kivu clawed frog	Xenopus vestitus	EN	LC	3	Forests and corridors	D	1e, 2b	2

1.3.6 Freshwater fish

Table 5: Critical Habitat-qualifying freshwater fish species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Characiformes	Moon fish	Citharinus citharus	NE	CR	1	Lake Albert and Wetlands	C	1e	2
Characiformes	Moon fish	Citharinus latus	LC	CR	1	Lake Albert and Wetlands	C	1e	2
Cypriniformes	n/a	Mesobola bredoi	NE	NE	1	Lake Albert and Wetlands	C	1e,2a	1 & 2
Cypriniformes	n/a	Micropanchax pelagicus	NE	NE	Likely 1	Lake Albert and Wetlands	C	Not assessed	

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Osteoglossiformes	Victoria stonebasher	Marcusenius victoriae	EN	NE	1	Lake Albert and Wetlands	C	1ab, 2b	1
Perciformes	n/a	Haplochromis albertiae	NE	NE	1	Lake Albert and Wetlands	C	2a	1
Perciformes	n/a	Haplochromis loati	DD	EN	1	Lake Albert and Wetlands	C	2a	1
Perciformes	n/a	Haplochromis mahagiensis	NE	EN	1	Lake Albert and Wetlands	C	2a	1
Perciformes	n/a	Haplochromis avium	NE	EN	1	Lake Albert and Wetlands	C	2a	1
Perciformes	n/a	Haplochromis wingatii	DD	EN	1	Lake Albert and Wetlands	C	2a	1
Perciformes	Albert Lates	Lates macrophthalmus	EN	EN	1	Lake Albert and Wetlands	C	1ab, 2a	1
Perciformes	n/a	Oreochromis leucostictus	LC	NE	1	Lake Albert and Wetlands	C	2b	2
Siluriformes	Fischer's Victoria Squeaker	Synodontis afrofischeri	LC	NE	1	Lake Albert and Wetlands	C	2b	2
Siluriformes	Victoria squeaker	Synodontis victoriae	NT	EN	1	Lake Albert and Wetlands	C	1e, 2b	2

1.3.7 Freshwater molluscs

Table 6: Critical Habitat-qualifying freshwater mollusc species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Architaenioglossa	Bellamya rubicunda	Gastropod	NT	NE	1	Lake Albert and Wetlands	C	2a	1
Hygrophila	Biomphalaria stanleyi	Gastropod	DD	NE	1	Lake Albert and Wetlands	C	2b	2
Hygrophila	Ceratophallus bicarinatus	Gastropod	LC	NE	1	Lake Albert and Wetlands	C	2b	2
Hygrophila	Ceratophallus faini	Gastropod	DD	NE	1	Lake Albert and Wetlands	C	2a	1
Littorinimorpha	Gabbiella candida	Gastropod	CR	NE	1	Lake Albert and Wetlands	C	1ab, 2a	1
Littorinimorpha	Gabbiella humerosa ssp. alberti	Gastropod	EN	NE	1	Lake Albert and Wetlands	C	1ab, 2a	1
Littorinimorpha	Gabiella walleri	Gastropod	NE	NE	1	Lake Albert and Wetlands	C	2a	1
Unionoida	Coelatura bakeri	Gastropod	NT	NE	1	Lake Albert and Wetlands	C	2b	2

1.3.8 Freshwater shrimp

Table 7: Critical Habitat-qualifying freshwater shrimp species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name	IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Decapoda	Limnocaridella alberti	DD	NE		Lake Albert and Wetlands	C	Possible 2	Possible 2

1.3.9 Butterflies

Table 8: Critical Habitat-qualifying butterfly species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name	IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Lepidoptera	Acraea alciope	NE	CR	5,6	Budongo, Bugoma	D	1e	2
Lepidoptera	Andronymus caesar	NE	EN	5,6	Budongo, Bugoma	D	1e	2
Lepidoptera	Andronymus gander	NE	EN	3	Forests and corridors	D	1e	2
Lepidoptera	Anthene ituria	VU	VU	Possible 3	Forests and corridors	D	1e, possible 2b	2
Lepidoptera	Bicyclus procura	NE	EN	5,6	Budongo, Bugoma	D	1e	2
Lepidoptera	Euphaedra paradoxa	NE	EN	3	Forests and corridors	D	1e	2
Lepidoptera	Hypocopelates mera	NE	CR	5,6	Budongo, Bugoma	D	1e	2
Lepidoptera	Iridana marina	NE	EN	%	Budongo	D	1e	2
Lepidoptera	Lachnocnema magna	NE	EN	5,6	Budongo, Bugoma	D	1e	2
Lepidoptera	Leptosia marginea	NE	EN	5,6	Budongo, Bugoma	D	1e	2

Order	Species name	IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Lepidoptera	Leptosia medusa	NE	EN	3	Forests and corridors	D	1e	2
Lepidoptera	Liptena hapale	NE	EN	4	Mixed Habitats Landscape	D	1e, possible 2b	2
Lepidoptera	Liptenara hiendlmayri	VU	VU	Possible 3	Forests and corridors	D	1e, possible 2b	2
Lepidoptera	Liptena undina	NE	EN	5	Budongo	D	1e	2
Lepidoptera	Micropentila bunyoro	DD	EN	5	Budongo	D	1e	2
Lepidoptera	Milothrus hylara	NE	NE	3	Forests and corridors	D	1e	2
Lepidoptera	Thermoniphas togara	NE	EN	5	Budongo	D	1e	2
Lepidoptera	Uranothauma heritsia	NE	EN	3	Forests and corridors	D	1e	2
Lepidoptera	Xanthodisca vibius	NE	EN	5	Budongo	D	1e	2

1.3.10 Dragonflies

Table 9: Critical Habitat-qualifying dragonfly species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Odonata	Orange-bellied Flasher	Aethiothemis coryndoni	LC	VU	Not assigned		D	1e, possible 2b	2
Odonata	Albertine Jewel	Chlorocypha schmidti	VU	NE	Not assigned		D	Possible 1e	2

Order	Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Odonata	Black Threadtail	Elattoneura nigra	LC	EN	3	Forests and corridors	D	1e	2
Odonata	Pale Duskhawker	Heliaeschna trinervulata	LC	CR	3	Forests and corridors	D	Possible 1e	2

1.3.11 Terrestrial plants

Table 10: Critical Habitat-qualifying terrestrial plant species. Grey type indicates that the species may qualify, but data are limited and it has not been possible to map distribution

Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
n/a	Afrothismia winkleri	CR	EN	3	Forests and corridors	D	1ab, 2b	1 & 2
Afzelia	Afzelia africana	VU	EN	7	MFPA	A	1e	2
Albizia	Albizia ferruginea	VU	EN	3	Forests and corridors	D	1e	2
Antrocaryon	Antrocaryon micraster	VU	CR	5	Budongo	D	Possible 1e	2
n/a	Brachylaena huillensis	NT	CR	7	MFPA	D	Possible 1e	2
n/a	Brazzeia longipedicellata	EN	EN	5	Budongo	D	1ab, 2b	1 & 2
n/a	Chytranthus atroviolaceus	NE	EN	3	Forests and	D	1e	2

Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
					corridors			
n/a	Citropsis articulata	NE	VU	3	Forests and corridors	D	2b	2
Drum Tree, West African Cordia	Cordia millennii	LC	EN	3	Forests and corridors	D	1e	2
n/a	Dialium excelsum	EN	EN	3	Forests and corridors	D	1b, 1e	1 & 2
n/a	Efluensia montana	NE	VU	3	Forests and corridors	D	2b	2
Cycad	Encephalartos macrostrobilus (see Annex F)	EN	EN	Not assessed in WCS & eCountability 2016[2]		E	1c	2
Cycad	Encephalartos septentrionalis	NT	EN	Not assessed in WCS & eCountability 2016[2]		E	1e	2
Sapele	Entandrophragma angolense	VU	EN	3	Forests and corridors	D	1e	2
Sapele	Entandrophragma cylindricum	VU	EN	3	Forests and corridors	D	1e	2
Sapele	Entandrophragma utile	VU	EN	3	Forests and corridors	D	1e	2

[2] The West Nile region was not included in the screening undertaken by WCS & eCountability (2016).

Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
Light Bossé, Scented Guarea	Guarea cedrata (same as L. cedrata)	VU	EN	3	Forests and corridors	D	1e, 2b	2
False Rubber Tree	Holarrhena floribunda	LC	CR	3	Forests and corridors	D	1e	2
African Mango/Bush Mango	Irvingia gabonensis	NT	EN	3	Forests and corridors	D	1e	2
African Mahogany; White Mahogany	Khaya anthotheca	VU	EN	3	Forests and corridors	D	1e	2
Large leaved Mahogany	Khaya grandifoliola	VU	EN	3	Forests and corridors	D	1e	2
African Mahogany; Dry Zone Mahogany	Khaya senegalensis	VU	EN	7	MFPA	A	1e	2
Brown Mahogany; Kilimanjaro Magongany	Lovoa swynnertonii	NT	EN	3	Forests and corridors	D	1e	2
African walnut	Lovoa trichilioides	VU	EN	3	Forests and corridors	D	1e	2
n/a	Milicia excelsa	NT	EN	3	Forests and corridors	D	1e	2
n/a	Millettialacus alberti	VU	CR	5	Budongo	D	2b	2
n/a	Psilotrichum axilliflorum	EN	VU	5	Budongo	D	1b, 2b	1

Species name		IUCN	Uganda Red List	DMU	DMU name	Context	CH criterion	Tier
n/a	Uvariodendron magnificum	EN	VU	5	Budongo	D	1be	1 & 2

1.4 Vulnerable species that might qualify the area as Critical Habitat

Order	Species	
Birds		
ACCIPITRIFORMES	Ayres's Hawk Eagle	Hieraaetus aynesii
ACCIPITRIFORMES	Secretary Bird	Sagittarius serpentarius
ANSERIFORMES	White-backed Duck	Thalassornis leuconotus
APRIMULGIFORMES	Mottle-throated Spinetail	Telacanthura ussheri
BUCEROTIFORMES	Forest Wood Hoopoe, Forest Scimitarbill	Rhinopomastus castaneiceps
CAPRIMULGIFORMES	Cassin's Spinetail	Neafrapus cassini
CAPRIMULGIFORMES	Scarce Swift	Schoutedenapus myioptilus
CHARADRIIFORMES	Rock Pratincole	Glareola nuchalis
CHARADRIIFORMES	Great Snipe	Gallinago media
CICONIIFORMES	Woolly-necked Stork	Ciconia microscelis
CICONIIFORMES	Saddle-billed Stork	Ephippiorhynchus senegalensis
CORACIIFORMES	Shining-blue Kingfisher	Alcedo quadribrachys
FALCONIFORMES	Greater Kestrel	Falco rupicoloides

Order	Species	
GALLIFORMES	Ring-necked Francolin	Francolinus streptophorus
GRUIFORMES	Corncrake	Crex crex
GRUIFORMES	African Finfoot	Podica senegalensis
PASSERIFORMES	Ituri Batis	Batis ituriensis
PASSERIFORMES	Red-billed Oxpecker	Buphagus erythrorhynchus
PASSERIFORMES	Green-breasted Pitta	Pitta reichenowi
PASSERIFORMES	African Pitta	Pitta angolensis
PELECANIFORMES	Goliath Heron	Ardea goliath
PELECANIFORMES	Black Heron or Black Egret	Egretta ardesiaca
PICIFORMES	Black-breasted Barbet	Pogonornis rolleti
PICIFORMES	Martial Eagle	Polemaetus bellicosus
PSITTACIFORMES	Grey Parrot	Psittacus erithacus
STRIGIFORMES	Marsh Owl	Asio capensis
STRIGIFORMES	Red-chested Owlet	Glaucidium tephronotum
SULIFORMES	African Darter	Anhinga rufa
Dragonflies		
Odonata	n/a	Aethiothemis coryndoni
Amphibians		

Order	Species	
Anura	Mottled Squeaker	Arthroleptis poecilonotus
Anura	Kivu Tree-frog	Leptopelis kivuensis
Anura	Golden-bellied Rocket Frog	Ptychadena chrysogaster
Reptiles		
Squamata	Western Forest File-snake	Gonionotophis poensis
Squamata	Cape File Snake	Gonionotophis capensis
Squamata	Smyth's African Water-snake	Grayia smythii
Squamata	Tholloni's Water-snake	Grayia tholloni
Squamata	Black-lined Green-snake	Hapsidophrys lineatus
Squamata	Uganda House Snake, Yellow Forest-snake	Hormonotus modestus
Squamata	Egyptian Cobra	Naja haje
Squamata	Thirteen-scaled Green-snake	Philothamnus carinatus
Squamata	Eastern Snake-eater	Polemon christyi
Terrestrial plants		
n/a	Afzelia bipindensis	
n/a	Beilschmiedia ugandensis	
n/a	Chrysophyllum albidum	
n/a	Chrysophyllum muerense	
n/a	Chrysophyllum perpulchrum	
n/a	Citropsis articulata	
n/a	Craterosiphon scandens	
n/a	Dalbergia melanoxylon	
n/a	Dioscorea baya	
n/a	Disperis aphylla	

Order	Species
n/a	Erythrophleum suaveolens
n/a	Fagaropsis angolensis
n/a	Fleroya stipulosa
n/a	Mondia whitei
n/a	Nauclea diderrichii
n/a	Secamone racemosa
n/a	Turraeanthus africana
n/a	Warburgia ugandensis

1.5 Criterion 4: Highly threatened and/or unique ecosystems

1.5.1 PS6 criteria

Highly Threatened and/or Unique Ecosystems are defined in IFC GN6 (paragraph GN90) as:

- Those at risk of significantly decreasing in area or quality;
- Those with a small spatial extent; and/or
- Those containing unique assemblages of species including assemblages or concentrations of biome-restricted species.

Areas determined to be irreplaceable or of high priority/significance based on systematic conservation planning techniques carried out at the landscape and/or regional scale by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally-recognized NGOs) or that are recognized as such in existing regional or national plans, such as the National Biodiversity Strategy and Action Plan (NBSAP), also qualify as critical habitat per Criterion 4 (IFC 2012b, paragraph GN90).

1.5.2 Qualifying ecosystems

Using the WWF Global 200 Ecosystems Assessment, the IUCN Red List of Ecosystems Criterion A1 (Rodríguez-Clark et al. 2015), and the classification of Langdale-Brown, 1964, the CHA (WCS & eCountability 2016) identified seven ecosystems as Endangered or Vulnerable (Figure 1). More detail on the criteria for assessing threatened ecosystems is given in Annex E.

Under Criterion A1, an Endangered ecosystem is which in which there has been a reduction in habitat extent of ≥ 50% over the past 50 years. For Vulnerable ecosystems, this reduction is ≥ 30% over the past 50 years.

The Endangered and Vulnerable ecosystems in the Project study area are (Figure 1):

- Endangered ecosystems:

- Dry Acacia Savannah
- Forest/Savanna Mosaic
- Moist Acacia Savanna
- Moist Combretum Savanna

- Vulnerable ecosystems:
  - Butyrospermum Savanna
  - Palm Savanna (Borassus palms)
  - Hyparrhenia Grass Savanna

Six of these seven (all except Hyparrhenia Grass Savanna) also qualify under criterion A3, a reduction in extent of ≥ 70% (Endangered) or ≥ 50% (Vulnerable) over a historical time-frame, since around 1750 (Rodríguez-Clark et al. 2015). These threatened ecosystems constitute Critical Habitat under PS6, because of their declining extent and/or ecological role in supporting Critical Habitat-qualifying species.

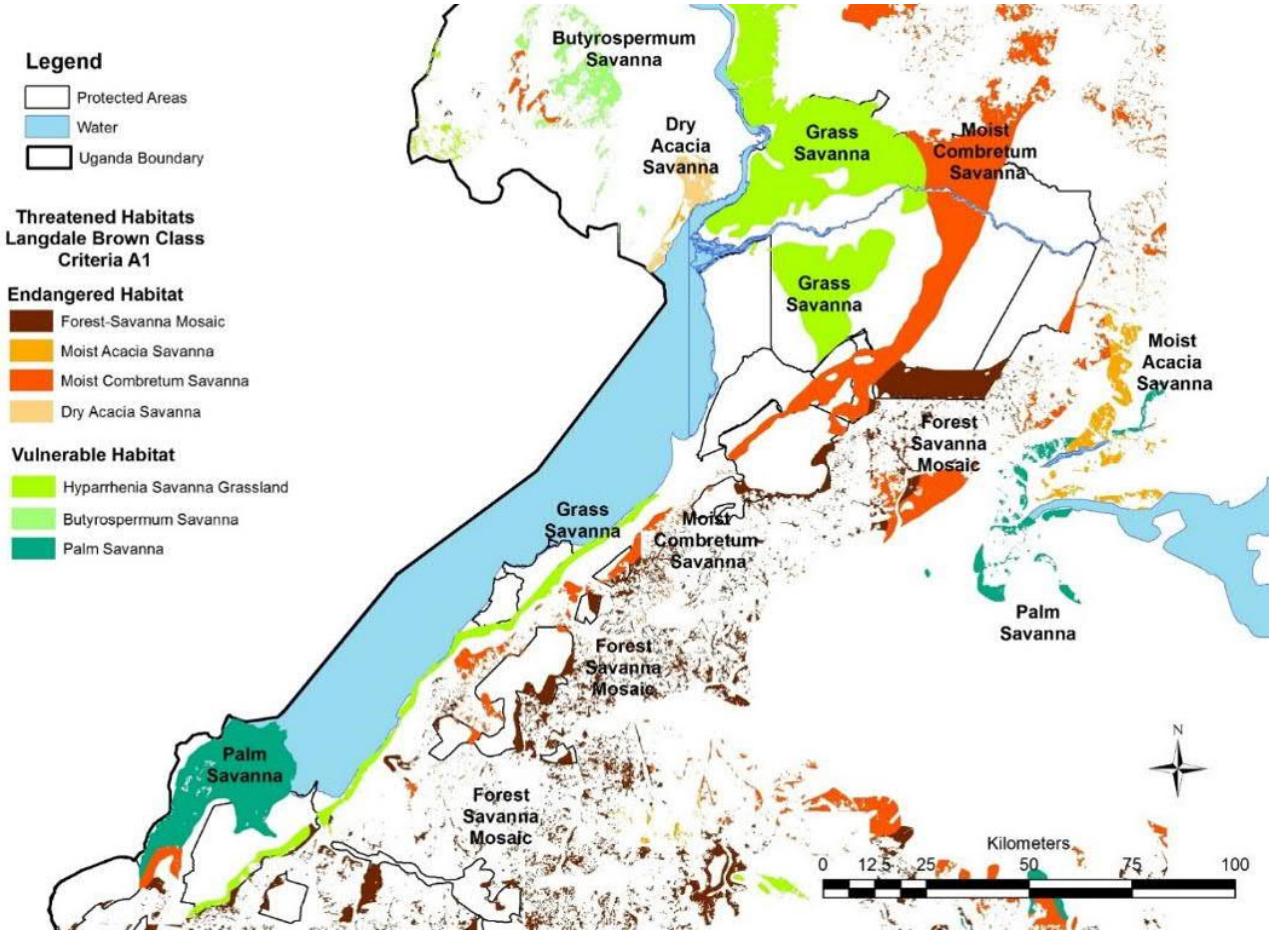


Figure 1: Threatened ecosystems in the Project landscape. Figure redrawn from WCS & eCountability (2016) using WCS-supplied data.

1.6 Criterion 5: Key evolutionary processes

1.6.1 PS6 criteria

This criterion is defined by the physical features of a landscape that might be associated with particular evolutionary processes, and/or subpopulations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history (IFC 2012b, paragraph GN95).

1.6.2 Qualifying features

In the Project landscape, this criterion is likely to apply to Lake Albert and its associated fringing wetlands (including the Murchison Falls-Albert Delta Wetland System Ramsar site), with a significant level of endemism in fish and invertebrate species. Lake Albert and associated wetlands are also Critical Habitat-qualifying under Criterion 1 to 3.

1.7 Protected areas

1.7.1 PS6 criteria

IFC PS6 paragraph 20 addresses project activity in Legally Protected Areas[3] (LPAs) and Internationally Recognised Areas[4] (IRAs). Where a Project is within an LPA or IRA, the client should meet the requirements of paragraphs 13 to 19 of PS6 (paragraphs 13-15 relate to Natural Habitat, and paragraphs 16-19 to Critical Habitat) (IFC 2012a). In addition, the client should:

- 'Demonstrate that the proposed development in the LPA/IRA is legally permitted;
- Act in a manner consistent with any government recognized management plans for such areas;
- Consult Protected Area sponsors and managers, Affected Communities, Indigenous Peoples and other stakeholders on the proposed project, as appropriate; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area'.

1.7.2 Qualifying features

The project landscape intersects with a large number (39) of LPAs and IRAs. Figure 2 shows the most significant sites in the study area.

[3] IFC PS6 footnote 16 defines an LPA as: 'A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values'.

[4] IFC PS6 footnote 17 defines IRAs as: 'UNESCO Natural World Heritage Sites, UNESCO Man and the Biosphere Reserves, Key Biodiversity Areas, and wetlands designated under the Convention on Wetlands of International Importance (the Ramsar Convention)'.

Table 11: Legally Protected and Internationally Recognised Areas in the landscape

Protected Area	Category	IUCN criteria	Designation
Murchison Falls	National Park	II	National
	Important Bird Area	A1, A3, A4i	International
Murchison Falls-Albert Delta Wetland System	Ramsar Wetland/Important Bird Area	-	International
Budongo	Forest Reserve	-	National
	Important Bird Area	A1, A3	International
Bugoma	Forest Reserve		National
	Important Bird Area	A1, A3	International
Bugungu	Wildlife Reserve	III	National
Bujawe	Forest Reserve	-	National
Hoima	Forest Reserve	-	National
Kabwoya	Wildlife Reserve	III	National
Kaiso Tonya	Community Wildlife Management Area	IV	National
Karuma	Wildlife Reserve	-	National
Kasongoire	Forest Reserve	-	National
Kijubya	Forest Reserve	-	National
Kyahaiguru	Forest Reserve	-	National
Kyamugongo	Forest Reserve	-	National
Maseege	Forest Reserve	-	National
Mukihani	Forest Reserve	-	National
Nyabyeya	Forest Reserve	-	National
Nyamakere	Forest Reserve	-	National
Rwensama	Forest Reserve	-	National
Wambabya	Forest Reserve	-	National

Protected Area	Category	IUCN criteria	Designation
Toro-Semliki	Wildlife Reserve	III	National
Rwengara	Community Wildlife Management Area	VI	National
Semliki reserves	Important Bird Area	A1	International
Kibeka	Forest Reserve	-	National
Kaduku	Forest Reserve	-	National
Masindi Port	Forest Reserve	-	National
Kigulya Hill	Forest Reserve	-	National
Masindi	Forest Reserve	-	National
Kirebe	Forest Reserve	-	National
Kasokwa	Forest Reserve	-	National
Sirisiri	Forest Reserve	-	National
Nyakunyu	Forest Reserve	-	National
Kitonya Hill	Forest Reserve	-	National
Fumbya	Forest Reserve	-	National
Nsekuro Hill	Forest Reserve	-	National
Musoma	Forest Reserve	-	National
Kandanda - Ngobya	Forest Reserve	-	National
Ibamba	Forest Reserve	-	National
Kahurukobwire	Forest Reserve	-	National

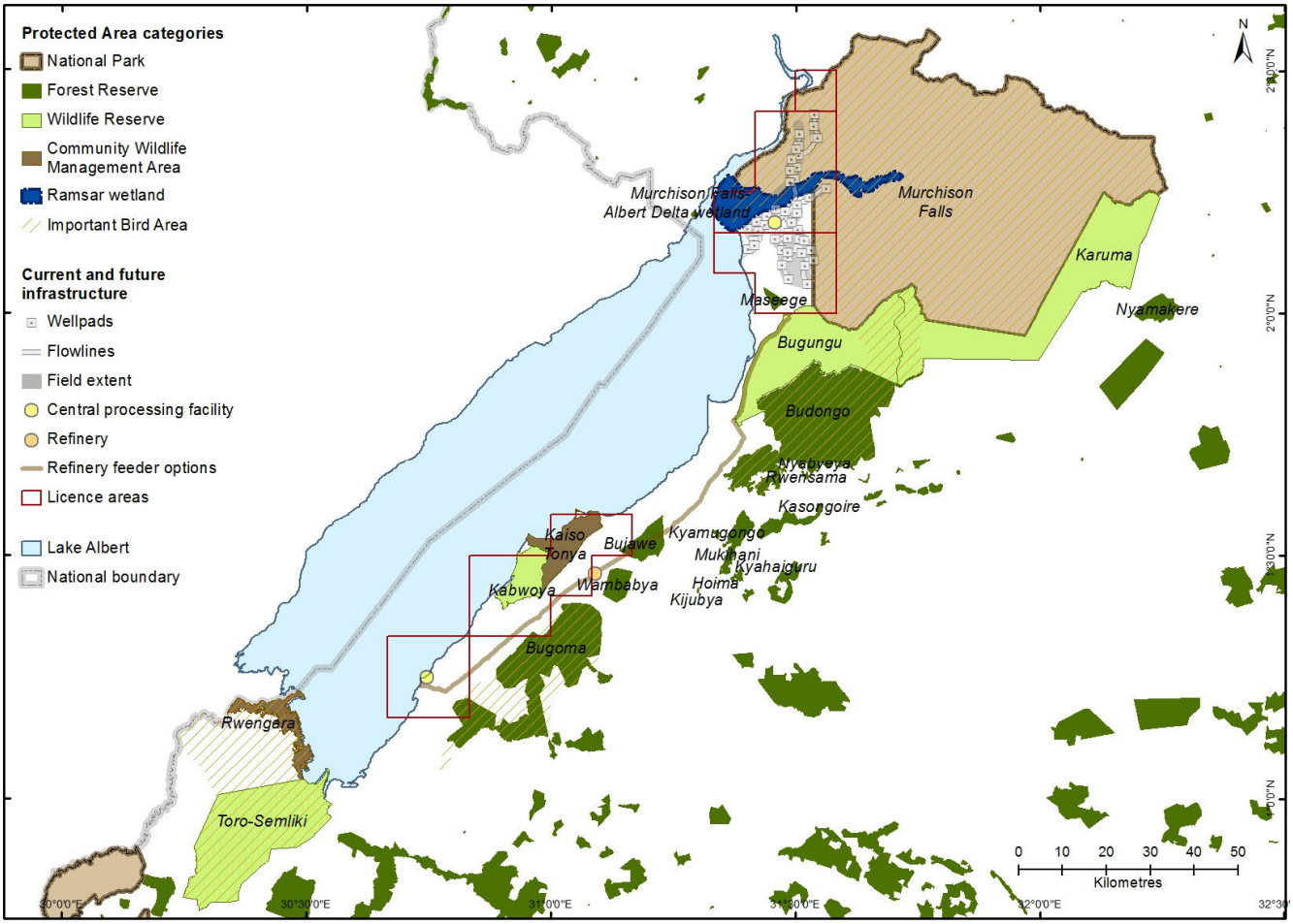


Figure 2: Protected areas in the Project landscape.

1.8 Natural and Modified Habitat

1.8.1 PS6 criteria

PS6 outlines the requirements for development in Natural and Modified Habitats. The Project should not significantly convert or degrade Natural Habitats, unless it can be demonstrated that there are no viable alternatives in Modified Habitat, consultation has been carried out and any conversion/degradation is mitigated according to the mitigation hierarchy. In Modified Habitats with significant biodiversity value, the Project should minimise impacts on biodiversity and implement mitigation measures as appropriate. In the Project landscape, some areas of Modified Habitat may be important as actual or potential corridors connecting areas of Natural Habitat and allowing dispersal and gene flow within metapopulations.

1.8.2 Presence of Natural and Modified Habitat in the Project landscape

Analyses led by WCS in respect of the EA2 development (WCS & eCountability 2016) indicate the following:

- The Project footprint overlaps with areas of Natural, transitional and Modified Habitat;
- The majority (~54%) of the study area is transitional habitat. Transitional habitat is that which shows signs of modification, yet retains a proportion of typical native constituent species and could recover if managed appropriately
- Approximately 24%, remains entirely natural. Most Natural Habitat in the landscape is within Protected Areas; and
- Approximately 21% is Modified.

1.9 IFC PS6 Criteria 1-3

Table 12: Quantitative thresholds for PS6 Criteria 1-3 for identifying Tier 1 and Tier 2 CH (PS6 GN6 (IFC 2012b))

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Species	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.
2. Endemic/ Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert opinion.
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert opinion. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance.

Criteria	Tier 1	Tier 2
		(d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.

1.10 References

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WCS & eCountability (2016) Phase 2 Biodiversity Study Land Cover Analysis Report Final Draft (Report prepared for Tullow Uanda Operations Pty).

APPENDIX O3

Tilenga Project

TERRESTRIAL WILDLIFE

Species Specific Assessment Tables

2018

APPENDIX O.3
SPECIES SPECIFIC ASSESSMENT TABLES

Table of Contents

Mammals

Chimpanzee, *Pan troglodytes*					
Mammals	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
Chimpanzee	EN	See Footnote GN20* (1a)	**B** **D** F	Located largely outside the **Project footprint** and concentrated in tropical forest, but generally wide-ranging, occurring also in open wooded or scrub habitats and mixed habitats. N.B. Also a Tier 2 species.	VERY HIGH
* Included based on reference to footnote GN20 which discusses the special consideration for wide-ranging, large EN and CR mammals that would not otherwise trigger Tier 1 thresholds.					

Chimpanzee, *Pan troglodytes*	
SPECIES OVERVIEW	
Biodiversity significance	Chimpanzees are a globally EN and nationally EN species. The subspecies present in Uganda is the Eastern Chimpanzee (*Pan troglodytes schweinfurthii*), one of four commonly recognised subspecies. Chimpanzees are a Critical Habitat Qualifying Species (CHQS) for the Project and have triggered Tier 1, the highest level of biodiversity significance recognised by IFC PS6. Chimpanzees are listed under Appendix I of CITES and protected by national law under the Schedule to the Game Preservation and Control Act (Ref 14.A1). Global population estimates for Chimpanzee are unprecise, ranging from 173,000 to 475,000. The majority of *P. t. schweinfurthii* are found in the Democratic Republic of Congo (173,000 – 248,000). There are approximately 8,000 Eastern Chimpanzees ranging outside DRC; with the 2nd largest population, roughly 5,000, inhabiting western Uganda (Ref 14.A2). The Biodiversity Study Area includes a significant part of chimpanzee range within Uganda and contains approximately 60% of the national population. Eastern Chimpanzee populations outside of Uganda have experienced a significant population reduction over the past 20–30 years with recent surveys indicating 80–98% declines at key sites in just 20 years, principally caused by illegal hunting for bushmeat (Ref 14-A3). The IUCN assessment predicts a continued decline of Eastern Chimpanzee populations as a precautionary approach, based on the rapidly-increasing human population in East Africa and the degree of political instability in some range countries. The relatively stable populations in protected areas in Uganda are therefore of high significance for the long-term conservation of this subspecies. Chimpanzee sensitivity is thus considered Very High in this assessment.
Species Ecology	Eastern Chimpanzees are found predominantly in lowland and submontane tropical forests, and forest galleries extending into savanna woodlands. They occur at relatively high densities at 1,000-2,000 m above sea level. Montane forest at higher altitudes is not considered good chimpanzee habitat. They are omnivorous, and their diet varies between populations and seasons. Ripe fruit constitutes about half of their diet; leaves, bark and stems are also important. Mammals and invertebrates (termites) make up a small but significant component of the diet of many populations. Eastern Chimpanzees form communities of 20–150 individuals (Ref 14-A4). Territories are larger in woodland forest mosaics than in mixed forest (averaging 72 km² at Semliki in Uganda compared to c. 6 km² at Budongo in Uganda). Territory size is dependent on food availability but also on community size. There are several long-term chimpanzee study sites in Western Uganda: Budongo Forest Reserve, Kibale Forest National Park, Semliki Wildlife Reserve, Bwindi Impenetrable National Park, and Kalinzu Forest Reserve. In the Project Area of Influence (AoI), the main existing threats to chimpanzee populations include loss of habitat, due primarily to conversion of land for subsistence farming and road construction. Although chimpanzees are not actively targeted for hunting, they are occasionally killed; especially as a result of human-wildlife conflicts (farmers protecting their crops). They are also caught and injured in snares and infants are occasionally captured for the pet trade, usually as a bi-product of bushmeat hunting.
Habitat Preference	Chimpanzees are associated with Landscape contexts B (Savanna Corridor), D (Tropical High Forest) and F (Mixed Landscape). Chimpanzees in the AoI are found predominantly in forests and

Chimpanzee, *Pan troglodytes*	
	forest fragments on the escarpment, but they also use riverine forests and savanna woodland. They are generally wide-ranging and use different habitat types, and are relatively resilient to habitat degradation, compared to many other species. Chimpanzees also use the mixed subsistence farming landscape, in particular the cultivated corridors between Wambabya and Bugoma Forest Reserves, where they raid fruit and other crops from farms to supplement their diet as well as leaves, bark and stems from forest trees and plants. This puts them in direct conflict with local farming communities. Chimpanzees are known to range seasonally along the Biso – Masindi road, occurring from Hakimi A to Bwinamira 3. They have also been recorded at the Kasokwa Forest Reserve (Ref 14-A5).
Population & Trends in the Area of Influence	In Western Uganda, sizeable chimpanzee populations are found in Budongo Forest Reserve (400 – 800 individuals), Bugoma forest (450 - 850), Kibale NP (900 – 1800) and Wambabya Forest Reserve (100 – 150) and also in small forest fragments between Budongo and Bugoma (256 – 319). Data collected from several protected areas within their range in Uganda (Budongo and Bugoma Forest Reserves and Kibale National Park) indicate that the populations there are relatively stable (Ref 14-A6Ref 14-A7. However, deforestation is occurring at many of the smaller unprotected forest sites, with an overall rate of loss of forest of about 5.1%/year (equivalent to c.8,000ha/year) between 2005 and 2010 Ref 14.A8). In comparison to protected areas, these fragmented pockets of forest are especially vulnerable to deforestation and disturbance (Ref 14-A54).
Summary of state of knowledge	Broad distribution and habitat affinity of chimpanzees is well-understood. However, the number of chimpanzee communities (as well as their size and location of their territories) present within the Study Area and potentially impacted by the project is unknown, especially outside protected areas. There in insufficient data on chimpanzee habitat use along the route of the proposed Tilenga feeder pipeline and Northern of the current EACOP route (Ref 14-A5]).
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	Direct project impacts are expected to be most significant during the site preparation and construction phases, mainly due to increase traffic. **Habitat Loss and Degradation** There are likely to be minor deforestation for the construction of the Project facilities in areas occupied by chimpanzees. **Population changes** Habitat loss may result in a decline in species population, with at least two known chimpanzee communities directly impacted which range between Budongo Forest Reserve and Masindi. The increase in the number of people using the Project area during construction increases a risk of disease transmission between workers and chimpanzees especially if appropriate mitigation measures are not respected (e.g.no proper disposal of waste including human-waste). Common human contagious diseases such as a cold and smallpox can adversely affect chimpanzees. Workers may engage in illegal hunting activities for various reasons. This could be highly detrimental to chimpanzees, especially if hunting pressure (including snaring) increase within the protected areas where a higher wildlife density can be found. **Disturbance** Widening and realignments of oil roads are likely to increase levels of disturbance (visual, noise and vibration) for chimpanzee communities living in proximity. Given that these roads are mainly existing roads, chimpanzees have probably had time to adapt their behaviour to their presence. However, chimpanzees can still get killed from vehicle collision, especially on intensely used roads where speed limits are not enforced. Indeed, a healthy chimpanzee was recently killed in the vicinity of the Study Area on a road near Bulindi (Ref 14-A9). Project vehicles travelling along oil roads are likely to increase vehicle traffic, noise and visual disturbance, creating barrier effects and resulting in an increased potential of vehicle-animal collisions leading to chimpanzee mortality. **Barrier Effects** Widening or realignment of oil roads are likely to lead to increased vehicle traffic through chimpanzee areas, which may create barrier effects and hence reduce connectivity. This effect is likely to be particularly significant around Budongo Forest Reserve, where it could lead to a reduction in connectivity to the surrounding non-protected forest patches.
Potential Impacts - indirect	Indirect project impacts are expected to be more significant than direct project impacts, mainly through induced access and in-migration. This could lead to an increased pressure on chimpanzees and their habitat, through an increase in habitat loss and hunting, which could be particularly

Chimpanzee, *Pan troglodytes*				
	significant outside of protected areas. **Habitat Loss and Degradation** Eastern chimpanzees are associated with Landscape contexts B (Savanna Corridor), D (Tropical High Forest) and F (Mixed habitats). There are potential indirect impacts on forests and other habitat used by chimpanzees within these three landscape contexts. Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. Habitat loss is expected to be more significant in non-protected areas at first, but pressure is likely to increase on protected areas as they harbour the remaining forested habitat and still possess significant wildlife populations. **Population changes** There may be an increase in habitat loss, hunting and the threat of disease transmission due to Project's induced access and in-migration. Oil roads and other access improvements in the region are likely to increase vehicle traffic along roads and enable people to enter more easily and impact on this receptor during and beyond all phases of the Project. People may enter a forest for its resources (protein, wood, medicinal plants, water) and while there, may defecate in the forest, which can increase the threat of disease transmission, especially for chimpanzees that are genetically closely related to humans and susceptible to most human diseases. Domestic animals (dogs, sheep, goats, cows, pigs) allowed to graze in areas inhabited by chimpanzees could also transmit zoonotic diseases. Several small chimpanzee communities live in the non-protected areas surrounding the Budongo Forest Reserve, and at least six bigger communities are present within Budongo Forest Reserve, which are all at threat from Project impacts. Given the slow reproductive success of chimpanzees, even small impact on their population may make it difficult for them to recover, thus even small impact may translate into a significant loss. **Disturbance** Induced human population changes in the landscape may potentially increase levels of disturbance (visual, noise) for chimpanzees. **Barrier Effects** Widening or realignment of oil roads leading to increased vehicle traffic through chimpanzee areas may create barrier effects. Land use changes where forests areas are lost or fragmented may also create barriers to movement and dispersal of chimpanzees. The loss of connectivity with other neighbouring communities and larger population (e.g. Bugoma Forest Reserve) may impede dispersal of sexually mature females and hence gene flow, thus decreasing the viability of this population over the long-term.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**LOW**	**LOW**	**LOW**	**LOW**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact Magnitude	A small proportion of the species population is expected to be impacted during this phase probably corresponding to less than 10%, given the smaller extent of direct impacts, the smaller duration of this phase which would also limits the effect of indirect impacts.. During this phase, minor habitat degradation or disturbance of	Direct impacts are likely to be affecting chimpanzee communities; however indirect impacts are expected to be more significant, possibly affecting chimpanzees at the population level if mitigation measures are not implemented. Therefore, between 10% and 20% of the chimpanzee population could be	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of the chimpanzee population could be affected during this phase through habitat	During this phase, indirect impacts will be the most significant, as the Project footprint will have already been cleared (reducing direct impacts). It is expected that between 10% and 20% of the chimpanzee population could be impacted during this phase through

Chimpanzee, *Pan troglodytes*				
	chimpanzee habitat is expected. Change during this phase will result in a Moderate significant impact on chimpanzees and/or their habitat. This impact will be mainly temporary.	affected by the Project through direct and indirect impacts, notably through habitat loss, degradation, and disturbance. Many workers will move to the area during the construction phase to work for the Project or in search of work. This will increase potential indirect impacts, through a possible increase in demand for land and for bushmeat. Road improvements and pipeline construction will likely result in moderate habitat degradation and/or disturbance, and improve access to the area. This will in turn affect several chimpanzee communities living inside and outside protected areas, potentially leading to a reduction in chimpanzee numbers and to a potential loss of habitat and connectivity.	degradation, disturbance, increased hunting, increased road traffic and potential vehicle collisions, and potential disease transmission. Increase in road traffic and Project in-migration will likely result in moderate habitat degradation or disturbance, leading to reduction in species population, habitat functionality, or protected site integrity, including connectivity. Impact likely to result in change in conservation status of the species or habitat. The direct impact will be medium term, lasting between 5 and 10 years, but indirect impacts related to induced access and in-migration may be permanent.	habitat degradation and disturbance, increased road traffic and vehicle collisions, and continued pressure from indirect impacts, such as a potential increase in hunting, habitat loss and disease transmission,. Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction in species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Impacts likely to affect several chimpanzee communities and their habitat. The impact will be low to medium term, lasting between 5 and 10 years, but indirect impacts of in-migration may be permanent.
Potential Impacts Significance	**MODERATE**	**HIGH**	**HIGH**	**HIGH**
IN-COMBINATION EFFECTS				
RISK of in-combination effects	**MODERATE**	**HIGH**	**HIGH**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are expected to be less significant during this Phase, as few workers will be present within the Project area and limited vegetation clearance will take place. Vegetation removal will take place for supporting and associated facilities, leading to minor degradation and disturbance of chimpanzee habitat. Impact will not be enough to result in	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on chimpanzees and their habitat. A significant impact on the chimpanzee population could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. New critical oil roads will facilitate access to	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on chimpanzees and their habitat. A significant impact on the chimpanzee population could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works of supporting and associated facilities will lead to moderate degradation of habitat and/or disturbance of ecological function. Impact likely to affect chimpanzee and their habitat, especially chimpanzee populations in small unprotected forest habitats.

Chimpanzee, *Pan troglodytes*				
	change in conservation status of the species or habitat. This impact will be temporary.	the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat, as well as in increase in hunting and a reduction in habitat connectivity should be expected and could lead to reduction in the chimpanzee population. Impacts likely to result in change in conservation status of the species or habitat, especially chimpanzee populations in small unprotected forest habitats.	migration into the area will impact chimpanzee populations at first in non-protected areas, which will in turn increase pressure and isolate population contained within protected areas. Increased road traffic will create barrier effects and increase potential road mortality. In-migration to the area may increase habitat loss, fire risk, disease transmission, hunting pressure and human-wildlife conflict. These effects may be permanent.	
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Induced changes in local human population (in-migration) and associated environmental pressures (deforestation through illegal agriculture and logging, illegal hunting /poaching/ snares and zoonotic disease transmission) on the landscape will be more significant for chimpanzees than the direct impacts associated with the Project. General and species specific mitigation measures address potential impacts under Project control, however given the high significance of in-combination effects, the Project will also need to plan and implement mitigation measures at the landscape level. Long-term strategies to protect and enhance forest habitat, reconnect fragmented populations and prevent detrimental land use changes should be developed. Although the Tilenga Project Proponents will not be constructing in or near forests where chimpanzees are present, there may be indirect effects of the project on forests due to population in-migration induced by the project. Therefore, Project Proponents should consider contributing to development and implementation of a long-term chimpanzee monitoring and evaluation program in order to better understand the number and size of chimpanzee communities possibly impacted by the Project, as well as the location of their territories. These surveys would need to take into account seasonal variation in habitat use and thus should be conducted over at least one year. Implementation of mitigation measures will need to start early on, accompanied by monitoring to permit adaptive management, as the effectiveness of some of these measures is not well understood and other measures, such as restoration activities, will take many years before helping in reducing threats to chimpanzees. At a landscape level, reforestation initiatives, in cooperation with other stakeholders, should consider objectives to improve connectivity between forests areas such as Wambabya and Bujawe (and possibly Bugoma and Wambabya) through creation of woodland corridors/ stepping stones (e.g. pockets of forest). As such, careful planning should be considered when connecting isolated chimpanzee populations to reduce risk of one community killing the other, as chimpanzees are territorial and can engage into 'warfare' with neighbouring communities (Ref 14-A10, Ref 14-A11). Priority should be to connect small fragmented forest habitat containing relic chimpanzee populations with larger tracts of forest that are unoccupied by chimpanzees.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and fragmentation (mainly due to indirect impact) is expected to impact on chimpanzee populations, affecting their ability to disperse (female chimpanzees normally migrate from their natal group which helps maintain genetic variability in populations). Fragmentation of habitat could result in relic isolated populations of chimpanzees. This effect may be particularly significant around Budongo Forest Reserve which could become isolated from other parts of the chimpanzee's range. Reforestation and afforestation schemes to create corridors and community buffer zones may help reduce this threat, improve connectivity and increase the availability of			

Chimpanzee, *Pan troglodytes*				
	potential chimpanzee habitat, however trees are likely to take over 10 years to reach a degree of maturity and success is not always guaranteed. Should long-term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures to be reduced and the decline of suitable habitat halted or reversed. However Project induced in-migration into the area for economic reasons may be permanent, and migrant workers and their families may settle permanently in the area, impacting forest resources for hunting, farming and firewood, rather than returning to their original homeland after decommissioning. **Population changes** Mitigation to protect habitats and reduce poaching and disease transmission, if effective, should reduce pressures on species population. Indirect impacts are likely to be more severe than direct impacts, especially among chimpanzee populations inhabiting some of the smaller non-protected areas (estimated population of c. 300 chimpanzees living in the area comprised between Budongo Forest Reserve and Bugoma Forest Reserve). **Disturbance** Mitigation to protect habitats, reduce poaching and reduce human access (thereby reducing threat of habitat loss, hunting, fire outbreaks and disease transmission), if effective, should reduce pressures on this species population. **Barrier effects** Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier effects. Traffic is likely to reduce after decommissioning but, due to in-migration, is unlikely to return to previous baseline levels. (Note that in-combination effects are not considered in assessing the residual impacts.)			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be minor loss and degradation of chimpanzee habitat during that phase, together with limited disturbance (visual/ noise/ vibration). This has been assessed as having a medium adverse magnitude impacts, but is expected to lead to a low significance of residual impacts after effective additional mitigation are implemented by the Project.	Indirect impacts are expected to be the most significant during this phase. Degradation of chimpanzee habitat, together with increased disturbance (visual/ noise/ vibration), barrier effects from roads due to increased traffic and hunting pressure from project induced access and in-migration will result in high adverse magnitude impacts which could be reduced to a moderate significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Particular attention will need to be placed on in-combination effects which could increase significantly impacts to	Indirect impacts are expected to be the most significant during this phase. Degradation of habitat, together with increased barrier effects from roads due to increased traffic and hunting pressure from project induced access and in-migration will result in high adverse magnitude impacts which could be reduced to a moderate significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Particular attention will need to be placed on in-combination effects which could increase significantly impacts to the chimpanzee population in this area.	Impacts should be reduced during this phase, as the size of the Project will decrease and less workers will be present on-site. Degradation of habitat, together with increased disturbance (visual/ noise/ vibration), barrier effects from roads due to increased traffic and hunting pressure from project induced in-migration have been rated as potentially having a high adverse magnitude impacts, however mitigation measures should be effective when reaching this phase of the Project and restoration activities should start to be effective as well. This can lead to a medium residual significance impacts. Residual impacts are

Chimpanzee, *Pan troglodytes*				
		the chimpanzee population in this area. Indirect impacts can be significantly reduced if mitigation is well-managed and effective.	Residual impacts will be mainly linked to indirect impacts. However, these can be significantly reduced if mitigation is well-managed and effective.	expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*					
Mammals	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
Rothschild's Giraffe	EN	1ab	**A**	Species concentrated in and around the Project Footprint, in MFNP and mainly north of the Nile. Small numbers of Rothschild's Giraffe have recently been re-introduced south of the Nile.	VERY HIGH

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*	
SPECIES OVERVIEW	
Biodiversity significance	Rothschild's Giraffe, is globally EN and nationally EN. The current global estimate is less than 2,500, where MFNP supports the only wild population in the world, with approximately 70% of this (sub)species population inhabiting the AoI. This population has also been the source population for translocation to other sites (Kidepo, Lake Mburo etc) and further translocations are likely to be required to manage genetic diversity of re-established populations. In Uganda, giraffe are protected under the Game (Preservation and Control) Act of 1959 (Chapter 198) and are also listed under Part A of the First Schedule of the Act as animals that may not be hunted or captured in Uganda. Recent aerial survey from 2016 of the MFNP (Ref 14.A12) indicates that there are around 900 giraffe within the protected area. The study found that CA1/1A holds about 60% of MFCA's giraffe, and the surveys indicate that these herds move between *Acacia sieberiana* groves along the Albert Nile, and along the numerous drainage lines in the southern part of Buligi; The Rothschild's Giraffe is one of the most threatened giraffe (sub) species remaining in the wild. Illegal hunting, agricultural expansion, human encroachment, and habitat degradation, fragmentation and destruction have led to the loss of Rothschild's giraffe from almost all of its former range. The species concentrated in and around the Project Footprint, in MFNP and mainly north of the Nile. In 2016, 18 Rothschild's Giraffe were captured north of the Nile and translocated south of the Nile, within MFNP. The population in MFNP is one of 10 or fewer areas where populations of these species are present management globally making it Tier 1 Critical Habitat under criterion 1a,b.
Species Ecology	Rothchild's giraffe are associated with Landscape context A (MFNP) and move seasonally within that landscape to areas of higher quality and/or quantity forage generally in line with the end of each wet or dry season. Therefore there are movements from the delta area north and east into the interior of the park after the start of the wet season when forage in these areas improve, however at least some giraffe use all areas year-round (Ref. 14.A13). Rothchild's giraffe has no defined breeding season. Rothschild's giraffes mate at any time of the year and have a gestation period of 14 to 16 months, typically giving birth to a single calf.
Habitat Preference	Within MFNP giraffe spend most of their time in open grassland with isolated Acacia trees, Crateva trees and also in Borassus open woodland, with 53.37% of their locations in these three habitats (Ref 14.A14). *Borassus aethiopicum*, mixed with *Acacia sieberiana* and *Hyperthelia dissoluta* open woodland is commonly used habitat and is also ranked among the top five habitats preferred by Giraffes. The results indicate that Borassus / Acacia open woodland is preferred habitat for giraffes. Preferred food species include *A. senegal, Harrisonia abyssinica, Crateva adansonii, A. sieberiana, and A. drepanolobium*. Habitat associations of individual giraffe vary between dry and wet seasons. Fenessy and Brown (2016) (Ref 14-A13) recorded that during July and December, the greatest percentage of giraffe were seen in open grassland (50.8% and 57.1% respectively), dense woodland (14.3% and 8.4% respectively) and wooded grassland with thicket (9.9% and 18.3% respectively). According to Fenessy and Brown (2016), there are notable shifts in the associated habitat types for individual giraffe across wet and dry seasons. By the end of the dry season (March), the percentage of giraffe observed in open grasslands and wooded grassland with thicket declined to 0.7% and 28.6% respectively, while there was a marked increase in the percentage of observations associated with wooded grassland (32.1%) and dense woodland (23.8%). Qualitatively, across seasons - but especially in the post rainy seasons (December, July) - giraffe

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*	
	density is greatest in the western delta portion of the Park (see Fig 18 of that report). In the post dry season (March), the distribution indicates that a greater proportion of the observed giraffe population is present in the central areas. Fenessy and Brown predict that in dry seasons, population density as a whole- and relative density in particular- will shift from deciduous *Acacia* and *Harrisonia abyssinica* savanna to broadleaf savanna habitats (i.e. *Combretum* sp. and *Terminalia* sp.) as the abundance and nutritional benefits of the Acacia and deciduous forage species decline. These seasonal shifts in habitat associations may potentially be attributable to the phenology of plants on which the giraffe feed, resulting in changing relative value of plants to giraffe diet across seasons. The dominant plant species preferred by giraffe are: *Acacia senegal, Harrisonia abyssinica, Crateva adansonii, Acacia sieberiana,* and *Acacia drepanolobium (*Fenessy and Brown 2006).
Population & Trends	As noted above, recent aerial sample counts (Ref 14.A12) of wildlife in the MFCA Area estimated the Rothschild's giraffe population at 900-1000 individuals, which indicates an increase from previous estimated numbers, (e.g. Ref. 14.A15 found 884 individuals). However, the giraffe study undertaken by Fennessy. & Brown (Ref 14.A12) photographed over 1,400 unique individuals north of the Nile within the MFNP. Accumulation curves had not saturated, indicating that the overall population may be greater than this. The high proportion of calves and sub-adults supports the assessment of an increasing population. However, the large number of giraffe observed with snare injuries indicate that that future trends are likely to be dependent on continued good protection of MFPA. In January 2016, 18 adult Rothchild's giraffe were translocated from the northern bank to the southern bank of the MFNP. These consisted of 13 females and 5 males. There is insufficient data and it is too early to determine how successful this has been and whether any calves have been born or whether they suffered injuries or mortality. Review of data in that report indicates that giraffe numbers have increased by around 500% since 2006. However, compare to ground surveys, aerial surveys can be inaccurate, leading to observation bias and an overestimated species count, due to a variety of factors (e.g. aircraft type, observer fatigue, observer skill, observer seat position, animal behaviour, season, distance from the aircraft, group size, angle of the sun, landscape shading from cloud cover, topography, amount of vegetation cover, and vegetation type) (Lee and Bond 2016).
Summary of state of knowledge	While there is sufficient data on the giraffe population on the northern bank of the Nile, the population on the southern bank have only recently (2016) been translocated. They will need regular monitoring and further surveys to determine their ranging and habitat preference and to measure the impact of the Project on this small vulnerable population.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** *Northern giraffe population* This species is associated with a Landscape Context A (MFNP). Construction of project infrastructure within the MFNP is likely to result in direct loss of savanna habitat, which is a preferred habitat for giraffe, as well as representing habitat that connects other preferred areas, such as open Borassus and Acacia woodland. During the Site Preparation and Enabling Works, Construction and Pre-Commissioning and also the Decommissioning phase there is potential for habitat to be affected by construction activities where they may spread into areas outside of the immediate project footprint. During this phase habitat is likely to be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. In addition, project activities during these phases may result in loss of connectivity between these habitats due to trenching and flowline construction activities, as well as degradation of this connecting habitat. During the operational phase, there is potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint. **Population changes** The project may impact on this population directly and indirectly. Increased traffic as a result of Project construction is likely to result in greater disturbance and could result in an increase in mortality due to vehicle-animal collisions. **Disturbance** Giraffe are likely to be disturbed by the presence of Project staff in the landscape, Project vehicle movements, noise and vibration from various stages of the project. The greatest potential for

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*	
	disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. This disturbance may be greatest during the dry season when giraffe are likely to need to move towards water holes and remaining wetter areas and may be impeded by the flow line works. Work on sensitivity of giraffe during past project activities seems to indicate that giraffe were especially sensitive to seismic activity, resulting in a 33% and >60% reduction in herd sizes in proximity to one well pad than when compared with drilling or maintenance (Prinsloo et al. 2011). At another well pad, there was avoidance of up to 250 metres during drilling, and giraffe densities were at their lowest. There was strong avoidance of a well pad of up to 750-1000 metres, where construction was taking place. In one study in MFNP 28 giraffe (1.9 % of all identified individual giraffe) had snare wounds. This may be a conservative estimate as it did not include numbers of giraffe that may have died from their injuries. **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for giraffe as they traverse the landscape, particularly as they move at the end of each season to and from the delta in search of better forage and water. It is likely that individuals will be deterred from using certain routes between preferred habitats during periods where there is more intense activity and more people are present in the landscape. During the operational phase, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced. During the operational phase, barrier effects are likely to be limited to the existence of well pads and other select infrastructure in the Project Area. This may cause some deterrent to movement where routes pass close to or between well pads, particularly where these are located close to one another (e.g. JBR-05 & JBR-06 and JBR-07 and JBR-08). *Southern translocated giraffe population* Similar to giraffe on the northern bank of the Nile, the translocated giraffe on the southern bank may be affected from the following direct impacts: habitat loss and degradation; greater barrier effects from Project related traffic; increased injury and mortality due to Project vehicle collisions; and an increased risk of fire spreading through the Park. However, having a much smaller population of just 18 individuals (and with the footprint of works and activities being much smaller than in the south, any serious injuries and/or losses or disruption to social behaviour could be significantly detrimental to the long-term viability of the population as a whole.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. **Population changes** As more people move into the area and settle, there may be an increase in habitat loss, hunting and the threat of disease transmission (from domestic animals grazing in the Park). Oil roads and other access improvements in the region are likely to increase vehicle traffic along roads and this is likely to result in an increase in vehicle-animal collisions leading to an increase in giraffe mortality. As the population increases, there may be increased pressures on other wildlife from hunting, with giraffe sustaining injuries (some fatal) from snares/traps etc. With a founding population of just 18, the southern translocated population, any serious injuries and/or fatalities w are likely to ill have a significant impact on the viability and / or genetic diversity of the southern population. **Disturbance** Induced human population changes may potentially increase disturbance to giraffe through an increase in people moving through the park and increase in road traffic. **Barrier effects** Widening or realignment of access and oil roads is likely to lead to increased vehicle traffic, which w is likely to ill create barrier effects and reduce connectivity. *Southern translocated giraffe population* Similar to giraffe on the northern bank of the Nile, the translocated giraffe on the southern bank are likely to be affected from the following indirect impacts due to Project induced access and in-migration: habitat loss and degradation; greater barrier effects from traffic; increased injury and

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*				
	mortality due to vehicle collisions; increased risk of fire; and an increase in potential indirect injuries and deaths due to snares and traps laid indiscriminately for other species. Having a much smaller population of just 18 individuals, any serious injuries and/or losses or disruption to social behaviour could be significantly detrimental to the long-term viability of the population as a whole.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Up to 20% of this species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be negligible. The extent of direct impacts are likely to be greater for the very small southern translocated population during this phase. During this phase, minor habitat degradation or disturbance of giraffe habitat is expected. Change during this phase will result in a High significant impact on giraffe and/or their habitat. This impact will be mainly temporary.	Direct impacts are likely to affect populations of giraffe on both banks of the Nile (through habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), and project vehicle-animal collisions). As people start to move into the landscape in search of employment and other economic opportunities, this will lead to a number of indirect impacts (increased habitat loss, disturbance, fire risk, injuries and fatalities from snares/traps etc. and vehicle-giraffe collisions). These direct and indirect impacts may affect giraffe at the population level if mitigation measures are not implemented. Population could be affected through direct and indirect impacts; notably through habitat loss, degradation, loss of connectivity, increased disturbance, disease transmission, fire risk, road collisions and hunting pressure. Some impacts could remain beyond that phase.	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on giraffe and their habitat. A significant impact on the giraffe, especially the small southern translocated population, could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact giraffe, creating barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, disease transmission, hunting pressure and human-wildlife conflict. These effects may be permanent.	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic will be irreversible.
Potential Impact Significance	**HIGH**	**HIGH**	**HIGH**	**HIGH**

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*				
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**INSIGNIFICANT**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Site preparation for new critical oil roads, will lead to increased disturbance and habitat loss and temporary barrier effects.	Construction of supporting and associated facilities will cause increased Project induced-migration leading to an increase of injuries and mortality due to snares/ traps and increase road traffic collisions etc.	Increased Project induced-migration leading to an increase of injuries and mortality due to snares/ traps and increase road traffic collisions etc.	Disturbance and habitat loss and increased Project induced-migration leading to an increase of injuries and mortality due to snares/ traps and increase road traffic collisions etc.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	This species is associated generally with wooded savanna habitats and the MFNP in particular. Works during this stage are likely to disturb this species (people, vehicles and heavy machinery, noise, vibration, dust, other emissions and lighting) such that it avoids the construction areas whilst works are on-going. There may also be barrier effects where well pads are located close together (e.g. JBR-07 & JBR-08). However, the construction of the barriers around the well pads should help to reduce or avoid disturbance as the animals will be less likely to see humans on foot moving within the well pad sites, although these barriers will not surround the flow lines. Most well pads are located in open savanna areas, which represent the general habitat type for this species. Therefore, there is a requirement to ensure that disturbance and barrier effects on this species are managed and minimised as much as possible during all phases of the project, particularly the early construction phases when there will be extensive clearance of vegetation and subsequently linear trenching for flow lines. The construction of the flow lines is likely to create particular barrier effects, which will require scheduling and alignment of flowline excavations such that barriers impeding animal movements are minimised. A maximum length of open trench of 1km will be implemented for the flowlines. Wide corridors will be left to allow giraffe to move freely through the habitat unrestricted. Noise and particularly low frequency vibration from piling and from the HDD activities, that may disturb these animals, will need to be controlled and minimised. Based on the dedicated giraffe studies, there seems to be seasonal movement of giraffe from the delta areas to the park interior to find better quality and quantity of forage as the dry season advances and forage source reduce in the interior of the park. Then when the rains come the giraffe spread out eastwards into the park again. These sorts of movements are similar to movements by other large mammals in the park (although they may not happen at the same times, directions or locations. During the dry seasons, population density as a whole- and relative density in particular- tends to shift from deciduous *Acacia* and *Harrisonia abyssinica* savanna to broadleaf savanna habitats (i.e. *Combretum* sp. and *Terminalia* sp.) as the abundance and nutritional benefits of the Acacia and deciduous forage species decline. Scheduling of works should therefore consider these seasonal movements, especially the dry seasons when food availability is scarce (from the end of November and then after the start of the wet season (March, approximately)). Wide corridors should be left in between works to allow giraffe to pass through undisturbed. Giraffe population will need to be monitored to measure the levels of disturbance Project activities are having on the giraffe when in proximity to work sites. The data from this monitoring will provide guidance for management and control of noise/vibration/seismic levels/vehicle traffic etc. when animals are within proximity (<2km) of Project activities.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat within the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for			

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*				
	giraffe, this loss can be defined as significant. **Population changes** The giraffe population are the northern bank of the Nile is increasing steadily and the additional mitigation measures proposed should avoid pressures on species population. The southern population number just 18 and were translocated only in 2016. However, Project induced migration may result in an increase in hunting pressures. Although not necessarily directly targeted by hunters, giraffe are often caught and injured in snares and traps. The number of snares is likely to increase as more people move into the area for economic reasons. These indirect impacts are difficult to accurately predict and will require monitoring of giraffe populations. **Disturbance** Disturbance will be minimised although there will still be disturbance, particularly from the presence of people and vehicle movements within the park. It will not be possible to fully eliminate disturbance from noise and vibration.. The construction of the barriers around the well pads in MFNP (Bund walls) should help to reduce noise (as well as visual) disturbance during the operating phase. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. . However, these will not be completely reduced or avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. The existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other, during the operation phase. During the decommissioning phase, barrier effects will be minimised although there will still be disturbance through this phase, which will diminish gradually as sites are restored. Ultimately barrier effects will be entirely removed by the end of this phase and the end of the project. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of giraffe habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). After additional mitigation this will result in a moderate residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance.	There will be temporary degradation of giraffe habitat in MFNP, along with increased disturbance (visual/ noise/ vibration), increased vehicle traffic, and an increase in fire risks. After additional mitigation this will lead to moderate residual significance impacts. Particular attention will need to be placed on the southern translocated giraffe population as any loss to their small population may affect genetic diversity and the long-term viability and success of the	There will be degradation of giraffe habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration), and potentially increased injuries/mortality from snares, and increased fire risks. After additional mitigation this will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and possible population loss. However these can be significantly reduced if mitigation is well-managed and effective.	There will be temporary degradation of giraffe habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, resulting in moderate adverse magnitude impacts, which after additional mitigation will lead to moderate residual significance impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of

Rothchild's Giraffe, *Giraffa camelopardalis rothschildii*				
		translocation. Residual impacts will be a loss of habitat and temporary disturbance and an increase in injuries/ fatalities from snares. However, these can be significantly reduced if mitigation is well-managed and effective.		the Project.
Residual Impact Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Lelwel Hartebeest, *Alcelaphus buselaphus ssp. Lelwel*					
Mammals	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
Lelwel Hartebeest	EN	1ab	**A**	Subspecies concentrated in and around the **Project Footprint**, in MFNP and mainly north of the Nile (Area A).	VERY HIGH

Lelwel Hartebeest, *Alcelaphus buselaphus ssp.* Lelwel	
SPECIES OVERVIEW	
Biodiversity significance	Lelwel Hartebeest are globally EN and nationally NT and are associated with savanna habitats but have no specific protected status in Uganda. They have undergone significant reductions in numbers particularly in Uganda and Central African Republic, where they are now confined to a few protected areas. MFNP has the largest population of Hartebeest which has been nearly or completely eliminated from other places in Uganda. It's a Tier 1 species so of the highest possible conservation concern for the Project.Although the population of Lelwel hartebeest is relatively high in MFNP, globally, numbers have fallen drastically since the 1980s due to habitat destruction, are agro-pastoral development and hunting. (IUCN red list). The distributions of most hartebeest subspecies are likely to become increasingly fragmented until they are confined to those areas where there is effective control of poaching and encroachment by livestock and settlement (IUCN red list).
Species Ecology	Lelwel Hartebeest once ranged from southern Chad through the Central African Republic, southern Sudan, northern and north-eastern Democratic Republic of Congo, south-western Ethiopia, north-west Kenya, northern Uganda and extreme north-western Tanzania. Almost exclusively grazers, Hartebeest feed selectively in medium-height grassland; they are less water dependent than other alcelaphines, but nonetheless dependent on the availability of surface drinking water (IUCN red list, Ref 14.A16).
Habitat Preference	The most commonly used habitats include the *Borassus* open woodlands and Acacia open woodlands/grasslands with *Hyperthelia dissoluta* and *Hyparrhenia* grass. The three most used habitats account for 46.6% of all hartebeest locations. Preferred habitats occur around the Buligi circuit, Tangi region, Buliisa and Bugungu Wildlife Reserve dominated by Acacia woodland and *Hyperthelia*, *Brachiaria*, *Sporobolus* grasses [Ref 14.A17] They are more tolerant of woodland areas and high grass than other alcelaphines, and prefer the edge to the middle of open plains and thus appear to be an edge or ecotone species, generally avoiding more closed woodland (Ref 14.A16).
Population & Trends	Aerial surveys recorded around 10,000 hartebeest (10,136 hartebeest + 754 (SE)) [Ref 14.A12]. This is 66% higher than previous UWA estimates of 2006-10, suggesting that the population is increasing rapidly, and/or that previous counts may have been missed or overestimated many hartebeest. A recent survey undertaken in 2016 by UWA estimated the population much lower at 5,525 (se: 704) (Ref 14.A17). In 2008, 24 hartebeest were reintroduced to Kabwoya Wildife Reserve (Ref 14.A18). Hartebeest show a consistent distribution in MFCA throughout the surveys, implying that herds have small home ranges.
Summary of state of knowledge	The aerial survey was conducted in 2010 so the population may have changed (either increased or decreased) significantly since then. A new aerial survey should be undertaken prior to Project activities commencing. A recent report (Ref 14-A17]) notes that ranging behaviour and specific ecological requirements and demographic behaviour is lacking for Lelwel hartebeest, and recommend field observations to record demographic parameters and ground counts and collaring of individuals from different herds to provide information on seasonal and daily movements, and actual habitat usage.
POTENTIAL IMPACTS: ALL PROJECT PHASES	

Lelwel Hartebeest, *Alcelaphus buselaphus ssp.* Lelwel				
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** During Site preparation and Enabling Works, construction of project infrastructure within the MFNP will result in direct loss of savanna habitat, which is a preferred habitat for hartebeest, as well as representing habitat that connects other preferred areas, such as open Borassus and Acacia woodlands/grassland (similar to giraffe). During the Construction and Pre-Commissioning phase, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of the immediate project footprint. During this phase habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. Construction of project infrastructure within the MFNP will result in direct loss of savanna habitat, which is the preferred habitat for hartebeest and also connects other preferred areas. However, project activities may also result in loss of connectivity between these habitats and temporary degradation of this connecting habitat due to trenching and flowline construction activities. . **Population changes** The project may impact directly on this population directly and indirectly. Increased traffic as a result of Project construction are likely to result in greater disturbance and could result in an increase in mortality due to vehicle-animal collisions. **Disturbance** Hartebeest are likely to be disturbed by the presence of Project staff in the landscape, vehicle movements, noise and vibration from various stages of the project. As with other savanna species, the greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. This disturbance may be greatest during the dry season when hartebeest are likely to need to move towards wetter areas and may be impeded by flow lines excavations and associated works. **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for hartebeest as they traverse the landscape. It is likely that individuals will be deterred from using certain routes between preferred habitats during periods where there is more intense activity and more people are present in the landscape. During operation of the well pads, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced. Barrier effects will be limited to the existence of well pads and other select infrastructure in the Project Area. This may still be some deterrent to movement where movement routes pass close to or between well pads, particularly where these are located close together (e.g. JBR-05 & JBR-06 and JBR-07 and JBR-08).			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. New settlements and an increase in agricultural practices are likely to lead to increased habitat loss and degradation. **Population changes** As more people move into the area, there is likely to be an increase in hunting, As people settle in the area there is likely to be increased habitat loss through land-use change. With more people moving through the Park there is likely to be a greater fire risk. All these threats may lead to a population decline. **Disturbance** Induced human population changes in the landscape may potentially increase levels of disturbance (visual, noise). **Barrier effects** Widening or realignment of access and oil roads is likely to lead to increased vehicle traffic (project and non-project related), which is likely to create barrier effects and reduce connectivity.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**

Lelwel Hartebeest, *Alcelaphus buselaphus ssp.* Lelwel				
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Up to 20% of this species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be negligible. During this phase, minor habitat degradation or disturbance of hartebeest habitat is expected. Change during this phase will result in a High significant impact on hartebeest and/or their habitat. This impact will be mainly temporary.	Direct impacts are likely to affect hartebeest through habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), and project vehicle-animal collisions. As people start to move into the landscape in search of employment and other economic opportunities, this will lead to a number of indirect impacts (increased habitat loss, disturbance, fire risk and hunting pressure). These direct and indirect impacts may affect hartebeest at the population level if mitigation measures are not implemented. Impacts might last beyond that phase.	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on this small hartebeest population and their habitat. A significant impact on hartebeest could be expected if appropriate mitigation measures are not implemented early and/or if mitigation measures are not effective. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, hunting pressure. These effects may be permanent.	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic from this and previous phases may be irreversible.
Potential Impacts Significance	**HIGH**	**HIGH**	**HIGH**	**HIGH**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause increased disturbance and habitat loss and degradation and temporary barrier effects.	Construction of supporting and associated facilities will cause increased induced-migration leading to an increase in population loss due to hunting and increase Project related road traffic that could result in increased number of collisions etc.	Increased Project induced-migration leading to an increase in population loss due to hunting, an increased fire risk and disease transmission, and increase in non-project road traffic collisions etc.	Disturbance and habitat loss and increased Project induced-migration leading to an increase in population loss due to hunting, an increased fire risk and disease transmission, and increase in non-project road traffic collisions etc.

Lelwel Hartebeest, *Alcelaphus buselaphus ssp.* Lelwel				
Mitigation (General)	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Issues of habitat loss and disturbance will affect this species close to the actual construction areas within the MFNP. This species is associated with savanna habitats and the MFNP in particular. Works are likely to disturb this species such that it avoids the construction areas whilst works are on-going (people, vehicles and heavy machinery, noise, vibration, dust, other emissions and lighting). There may also be barrier effects where well pads are located close together (e.g. JBR-05 & JBR-06 and JBR-07 & JBR-08). Most well pads in the MFNP are located in open savanna areas which represent preferred habitat for this species. Therefore, there is a requirement to ensure that disturbance and barrier effects on this species are managed and minimised as much as possible during all phases of the project, particularly during the early construction phases when there will be extensive clearance of vegetation and subsequently linear trenching for flow lines. The construction of the flowlines will create particular barrier effects, which will require scheduling and alignment of flowline excavations such that barriers impeding animal movements are minimised. A maximum length of open trench of 1km will be implemented for the flowlines, and adequate wide corridors should be left, allowing hartebeest and other species to traverse the Park unhindered. Noise and particularly low frequency vibration from piling and from the HDD activities will also need to be controlled and minimised as much as practicable. Mitigation requirements will be very similar during the decommissioning phase as to the site clearance phase, although focusing on making sure activities do not spill out of the defined infrastructure footprint. Effective restoration may take time and will require monitoring and remedial action to ensure that it is effective. Project induced in-migration into the area will result in people settling close to the park. It is important that the capacity of UWA is increased sufficiently so monitoring and law enforcement activities are adequate in order to reduce predicted increases in poaching and other illegal activities.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat with the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for hartebeest, this habitat loss can be defined as significant even after mitigation. **Population changes** The hartebeest population is increasing steadily and the additional mitigation measures proposed should reduce pressures on species population during all phases. **Disturbance** Disturbance will be minimised although there will still be disturbance through all phases, particularly from the presence of people and vehicle movements within the park. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. During the operational phase, the existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other. During the decommissioning phase, barrier effects can be minimised although there will still be disturbance through this phase, which will diminish gradually as sites are restored. Ultimately barrier effects will be entirely removed by the end of this phase and the end of the project. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**

Lelwel Hartebeest, *Alcelaphus buselaphus ssp.* Lelwel				
Summary justification for residual impact assessment	There will be temporary degradation of hartebeest habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a low residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance.	There will be temporary degradation of hartebeest habitat in MFNP, along with increased disturbance (visual/ noise/ vibration), increased vehicle traffic, and an increase in fire risks due to both direct and indirect impacts. This will lead to moderate residual significance impacts. Residual direct and indirect impacts will be a loss of habitat and temporary disturbance and an increase in injuries/ fatalities from snares. However, these can be significantly reduced if mitigation is well-managed and effective.	There will be degradation of hartebeest habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration), and potentially increased injuries/mortality from snares, and increased fire risks, which after additional mitigation will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on hartebeest populations of MFNP.	There will be temporary degradation of hartebeest habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, resulting in moderate impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

African Elephant, *Loxodonta africana*					
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
African elephant	CR	1e	A B C F	Species recorded in MFNP, Bugungu WR, and the Ramsar site. Elephant also range widely in various habitats (hence Landscape Context F) north & south of MFNP.	HIGH

African Elephant, *Loxodonta africana*	
SPECIES OVERVIEW	
Biodiversity significance	The African Elephant is globally VU (nationally CR) and has a wide range across Africa. African Elephant currently occur in 37 countries in sub-Saharan Africa. Although large tracts of continuous elephant range remain in parts of Central, Eastern and Southern Africa, elephant distribution is becoming increasingly fragmented across the continent (IUCN red list).In Uganda, African Elephant populations have been heavily reduced since the 1960s and are now largely confined to protected areas at historically low densities. The species is protected by national law under the Game Preservation and Control Act (Uganda Government 1959).
Species Ecology	Camera trap surveys have shown elephants in Bugungu WR. Numbers in Budongo FR are unknown (Ref 14-A19). Bugoma FR has a relict population still occasionally seen but that apparently no longer connects with other populations. Elephants in Uganda are largely confined to protected areas where forests alternate with savanna. They tend to move between a variety of habitats and can be found in dense forest, open and closed savanna, and grassland. Elephants can range into mixed agricultural landscapes which can create conflict with farmers and other local people. Poaching for ivory and meat has traditionally been the major cause of the species' decline. There is no defined reproductive season but success may be lower during drought. Reproductive females produce calves every 8 to 9 years. Currently the most important perceived threat is the loss and fragmentation of habitat caused by ongoing human population expansion and rapid land conversion.
Habitat Preference	MFPA holds one of the three main populations in Uganda and is key to conservation of the species in this landscape. Elephants are therefore associated with Landscape Context A (MFNP), B (Savanna Corridor), D (Tropical High Forest) and F (Mixed Landscape). Within MFPA, surveys have consistently found most elephants in the Buligi and Ayago areas on the north bank, with smaller numbers present on the south bank and in the east of MFPA. In MFPA, preferred habitat for elephants is located near the water around the Buligi area and in the Borrassus woodland in the Tangi region, which overlaps with the northern extent of well pads within the MFNP (Ref 14.A14). A sample of collared elephants spent around 39.9% of their time in the central region of the Buligi area and Tangi region in three of the most abundant habitats (forming 26% of the area mapped) much of this is likely to be movements back and forth to the preferred habitat along the lake and river shore. This means their movements may intersect the alignment of some of the infrastructure components of the project within MFNP. A recent study on satellite collared elephants in MFNP between March 2016 and November 2017, showed that ranging was fairly consistent between seasons in the Buligi area and that range size did not vary greatly between seasons. Only the June-August 2017 elephant ranges were larger than at other times, and this was after a prolonged dry period with little rain. Bulls had significantly larger ranges than cows for most seasons, and this was attributed to their search for mates. The five cows that had been monitored over four years were fairly consistent in their ranging during each season between the years studied. Range size did not differ significantly during the period of oil exploration compared with subsequent years, although with only a small sample size (5 collared individuals) this may be due to the variation between ranging in individual elephants. There was evidence that the elephants moved less far each day during the oil exploration period compared with the same time of year subsequently (Ref 14-A20).
Population & Trends	Aerial surveys undertaken between June 2015 and April 2016 indicated the population of elephants within the MFNP to be around 1,600 individuals. (Ref 14.A12) This is an increase compared to

African Elephant, *Loxodonta africana*	
	estimates between 1990 and 2010, but is still a low population compared to pre-1973 levels. The rate of elephant poaching in MFPA is currently low, but a recent assessment identified several issues which could lead to it becoming a significant issue in the future.
Summary of state of knowledge	Population size, trends and broad distribution are well-understood. Some data on movements of a sample of individuals on the north bank. Movements of elephants elsewhere in MFPA, including Bugungu are not well-known, including the extent of movements into and out of MFPA.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** This species is associated with a variety of Landscape Contexts. Site clearance for project infrastructure within the MFNP are likely to result in direct loss of savanna habitat, which although not preferred habitat for elephants, connects their preferred areas. Project activities may therefore result in loss of connectivity between these habitats, as well as degradation of this connecting habitat. During the Construction and Pre-Commissioning phase most site clearance should already have taken place and therefore there should not be significant increase in habitat directly lost. However, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of the immediate project footprint. During this phase habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. As for previous phase, project activities during this phase may result in loss of connectivity, between these habitats due to trenching and flowline construction activities, as well as degradation of this connecting habitat. During the Commissioning and Operations phase all construction and new land take should have been completed. However, there is still potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint. **Population changes** Project staff activity within the MFNP may impact on population growth which for elephants is very slow. However, this is not likely to be significant. Recent historical elephant populations in the landscape were much higher than previously, and recent trends have been showing a steady increase in the population, and it is likely that there is still capacity for the elephant population to expand within the park. **Disturbance** Elephants are likely to be disturbed by the presence of Project staff in the landscape, Project vehicle movements, noise and vibration from various stages of the project. Drilling, piling and the HDD activities will produce low frequency vibrations that travel far and could result in disturbance. The greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. Studies in MFNP have shown that elephant ranging patterns are influenced by not only the oil exploration activities, but also natural factors. Elephants showed a net movement away from well pads being drilled up to 5 km away; elephants moved shorter distances (500-1000m) when near active well pads or moved longer distances (4000-8000m) when near seismic activity. Elephant locations could be predicted by both oil exploration activities (60% of factors) and natural factors such as distance to water, vegetation and distance to park boundary (32%) and by distance to roads which were used for oil exploration traffic as well as tourist traffic (8%). Analyses showed that the elephants were responding to well pads and seismic activities by moving away for the most part. Ranging of the elephant tracked in both study periods contracted significantly by 35-43% during oil exploration activities (Ref 14-A20]). However, some individuals seemed to be less affected by the oil exploration activities than others, with one individual seeming to be fairly habituated to the disturbances and did not react as strongly. Individual variation is therefore important in the results and means that study of only eight elephants may not capture the full spectrum of the variation that may exist (Ref 14-A12). **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for elephants as they traverse the landscape. It is likely that they will be deterred from using certain

African Elephant, *Loxodonta africana*				
	routes between preferred habitats during periods where there is more intense activity and more people are present in the landscape. During operation, where the level of activity will be considerably less and where there are no open excavations from flow lines or other construction, the barrier effects should be considerably reduced. This may still be some deterrent to movement where routes pass close to or between well pads, particularly where these are located close together.			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. **Population changes** There may be an increase in habitat loss, hunting and the threat of disease transmission (from domestic animals grazing in the Park) due to Project's induced access and in-migration. Oil roads and other access improvements in the region are likely to increase vehicle traffic along roads and enable people to enter more easily and impact on this receptor during and beyond all phases of the Project. As the population increases, there may be increased pressures on elephant from direct poaching, and indirectly through elephant sustaining injuries (some fatal) from snares/traps laid for other species etc. Elephants often raid cops for food and this brings them into direct conflict with communities, who often retaliate by killing elephants leading to loss of population. Elephants are intelligent species that live in close-knit kin-based societies. If the matriarch of a herd is killed then this can have disastrous consequences for the welfare of the remaining elephants in the herd, as her vast knowledge of the terrain, and survival instincts and acquired strategies (e.g. responding to threats such as predators, food scarcity and/or severe drought) will be lost. Extremely disruptive events, including culling, poaching and translocation to new areas can lead to serious disruption to their intricate social structure, with severe impacts on young individual elephant's close social bonds and opportunities for learning from older group members. Furthermore, such disruption can lead to aberrant behaviour similar to the post-traumatic stress disorder experienced by humans following extreme traumatic events (Ref 14-A21). Furthermore, the social understanding of orphaned elephants is often impaired for decades after the death or loss of adult members of the herd. Studies have shown this can have negative impact on fitness, and their ability to maximise survival and reproductive success in constantly changing socio-ecological environments (Ref 14-A21). **Disturbance** Induced human population changes may potentially increase disturbance to elephant through an increase in people and an increase in road traffic, resulting in an increase in vehicle-animal collisions and road kills. **Barrier effects** Widening or realignment of access and oil roads is likely to lead to increased vehicle traffic, which will create barrier effects and reduce connectivity.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary	Up to 20% of this	Direct impacts are	Indirect impacts could	Impacts during this

African Elephant, *Loxodonta africana*				
justification for impact magnitude	species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be low as there will be little in-migration during this phase. During this phase, minor habitat degradation, disturbance (visual, noise and vibration) and barrier effects will be the main impacts on elephant. Change during this phase will result in a Moderate significant impact. This impact will be mainly temporary.	likely to affect the population of elephant (through habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), and project vehicle-animal collisions). As people start to move into the landscape in search of employment and other economic opportunities, this will lead to a number of indirect impacts (increased habitat loss, disturbance, fire risk, poaching, injuries and fatalities from snares/traps etc. and vehicle-animal collisions). If a key member of the herd is lost (e.g. matriarch) then this may have further negative repercussions for the long-term survival of the remaining members of the herd. These direct and indirect impacts may affect elephant at the population level if mitigation measures are not implemented. Direct and indirect impacts would be through habitat loss, degradation, loss of connectivity, increased disturbance, disease transmission, fire risk, road collisions and hunting pressure. Impacts might last beyond that phase.	be significant during this phase, especially related to in-migration and induced access, which could further increase pressure on elephants and their habitat. A significant impact could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. If a key member of the herd is lost (e.g. matriarch) then this may have further negative repercussions for the long-term survival of the remaining members of the herd. Increase in road traffic and human in-migration into the area will impact elephant, creating barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, disease transmission, hunting pressure and human-wildlife conflict. These effects may be permanent.	phase should be less significant than the previous phases, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic may be irreversible.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause increased disturbance and habitat loss and degradation	Construction of supporting and associated facilities will cause increased Project induced-migration leading to an	Increased Project induced-migration leading to an increase in disturbance, fire risk, injuries and mortality due to	Disturbance and habitat loss and increased Project induced-migration leading to an increase of injuries

African Elephant, *Loxodonta africana*				
	and temporary barrier effects.	increase in disturbance, barrier effects, injuries and potentially mortality due directly to poaching and indirectly from snares/ traps laid for other species and an increase in road traffic collisions etc. However, these can be significantly reduced if mitigation is well-managed and effective.	poaching, and indirect hunting (snares/ traps laid for other species) and an increase in road traffic collisions etc. Human-wildlife conflict may increase, leading to human retaliation and injury/death to "problem" elephants.	and mortality due to poaching, and indirect hunting (snares/ traps laid for other species) and an increase in road traffic collisions etc.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	This species is wide ranging and is present outside of the park within various Landscape Contexts. On the one hand this means that it is more vulnerable to disturbance at various locations, but on the other there is therefore more space and capacity for this species, whose populations are currently lower than a few decades ago but are recovering. Various phases of the Project works will impact on elephants, causing disturbance, especially during drilling, piling and the HDD activities, which will produce low frequency vibrations that travel far. These activities will need to be controlled and minimised. Recent behavioural studies (Ref. 14.A22) indicate that elephants can be disturbed and avoid locations where people are present, with some individuals avoiding well pads by up to 1km during drilling operations. However, this behaviour seems to depend on the experience of the elephant, in that older more mature individuals seem to be less disturbed than younger individuals or females with calves. The construction activities will mean loss of habitat and in some places loss of trees, particularly Borassus palm, which elephants feed from and which comprises some of their preferred habitat range. However, there is capacity within the park for them to move elsewhere without detriment to their population. In addition, coverage of borassus palm throughout the park is increasing as they are spread by elephants. A study in 2015 on the impacts of oil exploration on elephants within MFNP (Elephant behavioural studies (Ref 14.A22 indicate that elephants tend to move to the north east of their ranges (north of Paraa lodge and south of the Tangi River) around the end of the December-February dry season and for much of the wet season in March-May. One possible reason this might be happening is that the grasslands may get burnt heavily during the dry season which would lead the elephants to move to the bushier north east. When water is scarce within the park during the dry season, these species, as well as most ungulates are often found closer to the Albert Nile or Victoria Nile than during the wet season. It will be particularly important to avoid affecting the locations and quality of wallows and watering holes which may be located near to well pad sites, or where catchments are crossed by roads or flow lines which may impede or divert natural recharge flow to those important resources. A study on the effectiveness of electric fences as elephant barriers in Amboseli National Park found that the presence of an electric current made no difference to the level of fence breaking by elephants. Similarly, the study did not find an inverse relationship between fence breaking and fence voltage (Kioko et al 2007). Electric fences surrounding well pads alone may not be effective barriers in preventing elephants from breaking into the well pad and causing potential damage to infrastructure and equipment and potentially to the elephant.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of	**Loss, degradation or fragmentation of species habitat**			

African Elephant, *Loxodonta africana*				
Residual Impact	Although the Project will mean direct loss of habitat with the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. **Population changes** Mitigation should avoid pressures on species population throughout all phases. **Disturbance** Disturbance will be minimised although there will still be disturbance through all phases. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. During the operational phase, the existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of elephant habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a moderate residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance.	There will be temporary degradation of elephant habitat in MFNP, along with increased disturbance (visual/ noise/ vibration), increased vehicle traffic, and an increase in fire risks. This will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and an increase in injuries/ fatalities from snares. However, these can be significantly reduced if mitigation is well-managed and effective.	There will be degradation of elephant habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration), and barrier effects. There may be increased deaths from hunting as well as injuries/ mortality from snares (laid for other species) and from human-wildlife conflict. There will be increased fire risks. These effects will result in having moderate significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on the elephant population of MFNP.	There will be temporary degradation of elephant habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, resulting in having moderate significance impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.

African Elephant, *Loxodonta africana*				
Residual Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Lion, *Panthera leo*						
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint						
Lion	CR	1e	A	B	Species recorded in MFNP, Bugungu WR, and the Ramsar site.	VERY HIGH

Lion, *Panthera leo*	
SPECIES OVERVIEW	
Biodiversity significance	Lion is globally VU and nationally CR. The global population is estimated at 20,000 individuals and is declining and in Uganda the population is estimated at around 400 individuals forming isolated meta-populations existing in only three of 10 national parks, including MFPA, Kidepo Valley National Park and Queen Elizabeth National Park. Lions are protected through regulations for protected areas and by-laws. The overall classification of lion as Vulnerable is perhaps misleading, as while certain subpopulations have increased by 12% (Botswana, Namibia, South Africa and Zimbabwe), there has been an observed decline of around 60% in many subpopulations outside these countries including in Uganda (Ref 14-A23). MFPA remains one of only three sites in Uganda with potentially viable populations of lions. Conserving lions is a specific management priority for the MFPA, especially as the population has been significantly declining.
Species Ecology	In East Africa lions prefer savanna woodlands, but they have a broad habitat tolerance and thick brush, scrub, and grass complexes appear to be optimal habitats in providing cover for hunting and denning. In MFNP, typical lion prey species include giraffe (*Giraffa camelopardalis rothschildi)*, Ugandan kob (*Kobus kob thomasi*), warthog (*Phacochoerus africanus)*, waterbuck (*Kobus ellipsiprymnus)*, buffalo (*Syncerus caffer)* and hartebeest (*Alcelaphus buselaphus)* (Ref 14-A24). Lions are associated with Landscape Contexts A (MFPA) and B (Savanna Corridor), specifically MFNP and Bugungu WR, which support more than 25% of the Uganda population.
Habitat Preference	Within the MFNP lions mainly use the open grassland and woodland with *Hyperthelia dissoluta* and *Hyparrhenia* grass which account for 66.4% of location records. Lions use a wide range of habitats throughout MFNP. However, two preferred habitats are wetland or seasonally flooded and denser areas of scrub and *Euphorbia* and *Acacia* (Ref 14.A14). There was a clear avoidance by lions of the predominately available thicketed savannah vegetation type, and a strong preference for open savannah (Ref 14-A25). It is likely that these sites provide good habitat for making kills, the wet areas in the dry season when ungulates will make their way there for forage and water and the denser habitats where ambush methods will work well for making kills. Lions may also use the dense scrub areas to hide their kills if the kills are made in the open as this will lessen the chances of losing them to hyenas and vultures. A wide range of other habitats throughout MFPA are used by lions and any changes to these, if they lie within a pride's territory, may have a significant impact.
Population & Trends	Within the MFPA the population is estimated at around 130 individuals (dat from c.2009/2010), with a declining population based on a census from 2008/9, so this data is almost 10 years old and the current population is likely to have changed since then (Ref 14-A25). There are 5 established prides within MFNP; 4 (Delta, Oil, Borassus, and Wangkwar Prides) on the northern bank and 1 (Southern Bank Pride) on the southern bank of the Nile) (Turtilo and Jiingo 2014). The highest lion densities are on the northern side, near the west delta areas. The Southern Bank Pride is estimated at 27 individuals. A recent survey (WCS 2017) identified another pride of lions occupying habitat within the south west delta area and Bugungu Wildlife Reserve that may be threatened by indirect impacts (Ref 14-A14). The lions of MFPA occur at low densities estimated at about 12 individuals per 100 km^2, which lies below the established 35 to 45 individuals per 100 km^2 for the prey rich and large East Africa savannahs but above 1.5 to 2.0 lions in the drier regions in southern Africa like Kalahari. They also form smaller group sizes (18.5 ± 2.5) only observed in lions that dwell in woodlands with the more open savannah parks like Serengeti having larger lion assemblies at 35 individuals (Ref 14-A26). Given that the planned Project infrastructure will intersect the habitat of two of the major prides of lions on the northern bank of the Nile (Borassus Pride and Oil Pride), this represents approximately 33% of the total known lion population within MFPA. The JBR10 well pad access road, in particular, may intersects or lies very close to the territory of the Delta pride, which could mean >40% of all lions

Lion, *Panthera leo*	
	in MFPA are directly impacted by the Project. If we include potential indirect impacts to lions inhabiting the south west delta areas, then this would mean an estimated 75% of the MFNP lion population being adversely affected by the Project. The lions of MFPA were found to live in small ranges (36 km^2 – 70 km^2) about half of the area recorded for home ranges elsewhere in East Africa but typical of Uganda's lions as observed in QENP. Such small ranges have been observed in prey rich open savannahs. This is not surprising because large mammal census in MFNP showed all the lion prey population to be on the increase from previous estimates. Therefore, it is reasonable to assume as observed elsewhere that prey presence is one of the major factors influencing habitat choice and size (Ref 14-A26).
Summary of state of knowledge	The most recent ground survey of lions was carried out in 2008 and is almost 10 years old. Radio collaring provided detailed information on movement, habitat use and demographics of three prides intersecting project area on the north bank and a fourth 'control' pride further away that has been used to inform this assessment. However, this study was discontinued post-exploration and therefore provides only general background and not up-to-date data for mitigation planning: this will be essential to update for detailed mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** During Site preparation and Enabling Works, construction of project infrastructure within the MFNP will result in direct loss of about 200 ha or 0.2% of savanna habitat. The majority of these Project activities will take place within the northern bank of the MFNP, where the highest lion encounter rates / densities have been recorded. This area is also a preferred habitat for many prey species for lion. Denser woodland habitat, for example within or close to the Ramsar are less likely to be directly or indirectly lost to the project footprint. During the Construction and Pre-Commissioning phase, most site clearance should already have taken place and therefore there should not be significant increase in habitat directly lost. However, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of the immediate project footprint. During this phase approximately 100 ha (or 0.1%) of habitat will be temporarily lost, due to construction of flow lines and also the land required for the HDD Nile Crossing activities Trenching and flowline construction may result in loss of connectivity between different areas of pride's territories, well as degradation of this connecting habitat. During the operational phase, there is potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint thereby affecting savanna habitat. **Population changes** An increase in traffic from Project construction vehicles may lead to increased disturbance and an increase of collisions between Project vehicles and lion, leading to road kills. Furthermore, Project vehicles may also collide with lion's preferred prey species (e.g. antelopes) reducing the availability of prey within their territory. Lions kills might also occur in case of concerns with project staff's safety **Disturbance** Being territorial species with complex social structures, the impacts on lions could be significant and will depend on the particular configuration of a pride's territories. Lions within MFNP are known to have relatively small ranges (36 km2 – 70 km2) and a significant part of a pride's range could be within the Projects footprint. If all disturbance during clearance happens to fall within the territory of one pride and the area represents a significant part of its territory then the impacts on that pride would be significant. If however, impacts are spread across several prides then impacts would be lower. Lions are likely to be disturbed by the presence of Project staff, Project vehicle movements and noise and vibration from various stages of the project. An increase in vehicle traffic from Project construction vehicles will create disturbance to lions. The greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. Studies at Queen Elizabeth Conservation Area recorded that collared lions were much harder to locate after seismic activity, and were often eventually located far from their normal range. This was also partly attributed to high levels of disturbance caused by heavy trucks moving between drilling sites, the presence of oil company personnel and the many tracks that were constructed for the operation (Ref 14-A27).

Lion, *Panthera leo*				
	Lions will also be impacted if their prey species are disturbed and displaced though temporary or permanent loss of habitat or impacts on wallows, watering holes and other wetlands areas near the delta, where prey may congregate. This may disturb the availability and ranging of lion preferred prey species, resulting in lions having to hunt further away from their territories bringing them potentially into competition with neighbouring prides, which could result in injury and/or fatalities. Any of the above disturbances could lead to individual males or a pride moving into the territory of another pride and this could be leading potentially to injuries and/or fatalities, especially to adult males and young. **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for lion and their prey as they traverse the landscape. During operation of the well pads, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced. During the operational phase, barrier effects are likely to be limited to the existence of well pads and other select infrastructure in the Project Area. This may still be some deterrent to movement of prey species where routes pass close to or between well padwell pads, particularly where these are located close together (e.g. JBR-05 & JBR-06 and JBR-07 and JBR-08). An increase in Project vehicle traffic along oil and access roads is likely to create a barrier effect. During the decommissioning phase, barrier effects are likely to be similar to the site clearance phase and, where pipelines are to be removed.			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agriculture or cattle grazing. Increased human presence within the park may disturb the availability and ranging of lion preferred prey species, resulting in lions having to hunt further away from their territories bringing them potentially into competition with neighbouring prides. **Population changes** Induced impact of in-migration might result in increased human activity within the MFPA which may impact on population levels of lion, particularly if this comprises illegal activity such as poaching, which is a significant factor in lion fatalities (*ibid*.). Increased human settlement may result in domestic livestock grazing close to lion habitat. This may attract lions resulting in an increase in human-wildlife conflict if lions kill livestock and communities retaliate by killing the lions or their prey. These are particularly significant risks for the lion populations south of the Nile in Bugungu Wildlife Reserve since 1) this population seems to be small and concentrated in a small area, 2) the lions are in an area adjacent to an area identified as a potential hotspot for in-migration. As the human population increases, this is likely to lead to more road traffic, resulting in increased disturbance and an increase in collisions between Project vehicles and lion, leading to fatalities. Furthermore, vehicles may also collide with lion's preferred prey species (e.g. antelopes) reducing the availability of prey within a pride's territory. **Disturbance** Lions are likely to be disturbed by the presence of people and vehicle movement and noise in the landscape. This may cause them to move territories, which may bring them into conflict with neighbouring prides. **Barrier effects** Increased human use of natural and transitional habitat inside and adjacent to MFPA may create barriers between different parts of pride territories, potentially preventing movement to seasonally important habitat or resources (e.g waterholes).			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**HIGH**	**HIGH**	**HIGH**

Lion, *Panthera leo*				
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Up to 20% of this species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be negligible. During this phase, minor habitat degradation or disturbance of lion habitat and disturbance to lion prey species is expected. Some lions or prides may be affected and displaced into neighbouring pride territories, which may result in injuries and/or fatalities, especially to adult males and young lions. This impact will be mainly temporary.	Direct and indirect impacts are likely to affect between 50% and 75% of the total lion population of MFPA, while direct impacts alone are likely to affect 25% to 50% of the MFNP population. These direct and indirect impacts will affect lions through habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), project vehicle-animal collisions, change in prey availability, and competition between individual lions and neighbouring prides. Project induced access and in-migration will lead to a number of indirect impacts (increased habitat loss, disturbance, fire risk, human-wildlife conflict. fatalities (poisoning, snares/traps etc.) and vehicle-animal collisions). These direct and indirect impacts may affect lion at the population level if mitigation measures are not implemented. Given that the lion population is already greatly reduced and under high pressure (eg from accidental snaring) it is unlikely to be resilient to such increased pressures. Impacts might last beyond that phase.	Up to 50% of this species population is expected to be indirectly impacted during this phase. Although direct impacts will be reduced, indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on lion and their habitat. Significant impact on the lion could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact lion, creating disturbance and barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, disease transmission, prey species availability, and human-wildlife conflict. Given that the lion population is already greatly reduced and under high pressure, some of these effects may be permanent.	Up to 20% of this species population is expected to be directly impacted during this phase. Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic will be irreversible.
Potential Impacts Significance	**HIGH**	**CRITICAL**	**CRITICAL**	**CRITICAL**
IN-COMBINATION EFFECTS				
Risk of in-	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Lion, *Panthera leo*				
combination effects				
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause disturbance, habitat loss and degradation. Increased disturbance and habitat loss to lions and prey species, and temporary barrier effects.	Construction of supporting and associated facilities will cause disturbance, habitat loss and degradation. Increased Project induced-migration leading to an increase of injuries and mortality due to poisoning/snares/ traps and increase road traffic collisions, etc.	Increased Project induced-migration leading to an increase of injuries and mortality due to poisoning /snares/ traps and increase road traffic collisions etc.	Disturbance and habitat loss and increased Project induced-migration leading to an increase of injuries and mortality due to poisoning /snares/ traps and increase road traffic collisions etc.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Lion are found throughout the MFNP and prefer more enclosed habitats for cover and resting, as well as making it easier for them to ambush prey. The main impact on lions is if prey species are displaced though temporary or permanent loss of habitat or impacts on wallows, watering holes and other wetlands areas near the delta, where prey may congregate. In those cases the lions will most likely move to where the prey species are located. Project works (drilling and operations) is likely to cause disturbance, to lions and also to their preferred prey species, likely to cause lions to move into the territories occupied by other prides. This may lead to increased population loss, especially among adult males and young. The construction of the flow lines will create particular barrier effects, which will require scheduling and alignment of flowline excavations such that barriers impeding animal movements are minimised. A maximum length of open trench of 1km will be implemented for the flowlines. An increase in vehicle traffic from Project construction vehicles and indirectly through in-migration will create disturbance to lions and also to their preferred prey species. The lion population is already under extreme pressure from poaching with 71% of adult lion mortality being due to illegal snares and traps (Tutilo and Jingo 2014). It is therefore critical that effective management planning and appropriate mitigation is implemented to reduce these threats.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat within the MFPA, mitigation should prevent direct loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for lion and its prey species this loss can be defined as significant. Indirect loss of species habitat is less likely as lion core habitat is located within the MFPA and is less likely to be lost due to settlement and cultivation. **Population changes** The lion population is declining steadily and the additional mitigation measures proposed should avoid acceleration of that decline. **Disturbance** It will not be possible to eliminate all disturbance to lions, although this will be minimised by monitoring for presence of lions are close by when works commence. There will be residual disturbance particularly from the presence of people and vehicle movements within the park. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. During the operational phase, the existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other. During the decommissioning phase, barrier effects will be minimised although there will still be disturbance through this phase, which will diminish gradually as sites are restored.			

Lion, *Panthera leo*				
	The indirect impact of in-migration into the area may result In a residual increase of traffic along improved and upgraded roads. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of lion habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a moderate residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance to lions and prey species.	There will be temporary degradation of lion habitat in MFNP, along with increased disturbance (visual/ noise/ vibration) to lions and to prey species, increased competition (and potential mortality) among individual lions/prides, increased vehicle traffic, and an increase in fire risks. This will lead to high residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and an increase in human – wildlife conflict leading to mortalities. However, these can be significantly reduced if mitigation is well-managed and effective.	There will be degradation of lion habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration) to lion and prey species, increased inter-pride competition, and potentially increased injuries/mortality from human-wildlife conflict, and increased fire risks, which will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on the lion population of MFNP.	There will be temporary degradation of lion habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, resulting in moderate adverse magnitude impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impact Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Spotted Hyena, *Crocuta crocuta*					
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
Spotted Hyena	CR	1e	**A**	Species recorded in MFNP, Bugungu WR, and the Ramsar site.	HIGH

Spotted Hyena, *Crocuta crocuta*	
SPECIES OVERVIEW	
Biodiversity significance	Spotted Hyena is globally LC but nationally CR. This species has a tentative estimate of the total global population is between 27,000 and 47,000 but with around 300 in Uganda, with perhaps fewer than 40 individuals in MFPA (Ref. 14.A28), including Bugungu WR. Spotted Hyena is protected through regulations for protected areas and by-laws.
Species Ecology	Spotted Hyenas are present in all habitats including semi-desert, savanna and open woodland, dense dry woodland, and even montane habitats up to 4,100 m altitude. In many parts of their range, they occur in close association with human habitations. Although long periods may elapse between drinking, spotted hyenas are at least somewhat dependent on water. Often considered just scavengers, they are in fact effective and flexible hunters as well (Ref 14-A29). Territory size is highly variable among spotted hyena, ranging from less than 40 km^2 in the Ngorongoro Crater to over 1,000 km^2 in the Kalahari. Recent survey work by Tilenga ESIA team within MFNP recorded a number of hyenas near Pakuba airstrip and also between JBR-03 and JBR-06. In addition, potential hyena dens, for example near JBR-01 and JBR-07 were identified. Threats to spotted hyena including persecution, through poisoning and snaring, as well as habitat loss and degradation which reduces habitat for populations of wildlife that are suitable prey for the spotted hyena. Rapid decline of populations has taken place outside conservation areas making the species increasingly dependent on them.
Habitat Preference	Hyena are associated with Landscape Context A (MFPA) including Bugungu Wildlife Reserve. Lure count surveys estimated 12 individuals north of the Nile and 29 south of the Nile, principally in savanna habitats, but also in woodland. In contrast, ranger observations are more frequent north of the Nile.
Population & Trends	Fewer than 40 individuals are thought to be present in MFPA, but estimates are not precise, and use parameters from other contexts which may not be comparable. However, it is clear that hyena density is low. There is no information on trends, however, the Strategic Action Plan for Large Carnivore Conservation in Uganda considers that hyena populations are likely declining across their range in Uganda (UWA 2010). The population is likely lower than in the past and if persecution and accidental poisoning is well-controlled may rebound with the increase in prey populations observed in parts of MFPA. The current distribution of hyena may therefore not reflect the potential distribution during future project phases.
Summary of state of knowledge	Surveys undertaken in 2018 recorded hyena dens near Pakuba airstrip and also between JBR-03 and JBR-06. In addition, there are potential hyena dens near JBR-01 and JBR-07. A pack of 22 hyenas was recorded in between JBR-03 and JBR-05 that occupied a den 120 meters from the flowline route. Population estimates are based on data from 2008/9 and so out of date. There is no data on ranging or behavioural ecology of hyena in MFPA.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** During the Site Preparation and Enabling Works phase, construction of project infrastructure within the MFNP will result in direct loss of savanna habitat, which is a habitat used by hyena, and their various prey species. Changes to hydrology may affect watering holes and wallows where prey species congregate. During the Construction and Pre-Commissioning phase, potential impacts are likely to be similar to the previous phase. During this phase most site clearance should already have taken place and therefore there should not be significant increase in habitat directly lost. However, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of

Spotted Hyena, *Crocuta crocuta*	
	the immediate project footprint. During this phase habitat will be temporarily lost due to construction of flow lines and the HDD Nile Crossing activities. During the construction phase, most site clearance should already have taken place and therefore there should not be significant increase in habitat directly lost. However, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of the immediate project footprint. During this phase habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. During the operational phase, there is potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint thereby affecting savanna habitat. Being territorial species with complex social structures, the impacts on hyena could be significant and will depend on the particular configuration of a hyena's territories. Spotted hyenas are mammalian carnivores, but their societies, called 'clans', resemble more cercopithecine primates, such as baboons and macaques, with respect to their size, hierarchical structure, and frequency of social interaction among both kin and unrelated group-mates. Hyena regularly patrol their territory borders. Spotted hyenas routinely form coalitions with their kin to defend carcasses from unrelated conspecifics, and they also routinely join forces with unrelated clan-mates to advertise and defend their group territories, and to defend their kills against lions and hyenas from neighbouring clans (Ref 14-A30). Within MFNP, the exact territory ranges are unknown and potentially could overlap one or more well pads and flowline. If all disturbance during clearance happens to fall within the territory of one clan and the area represents a significant part of its territory then the impacts on that clan would be significant. If however, impacts are spread across several clans then impacts would be lower. The effect could lead clans moving into the territory of other clans and this could lead to conflict, injury and mortality. **Population changes** Project construction vehicles will lead to an increase in traffic along oil and access roads from Project construction vehicles, which may lead to increased disturbance to hyena and also their prey species as well as increased collisions between Project vehicles and hyena and with their prey species. Accidental poisoning is a risk if chemicals and other hazardous waste is not stored in hyena-proof structures. **Disturbance** There are known dens between JBR-03 and JBR-06, with one den 120 meters from the route of the flowline. Hyena are likely to will be disturbed by noise and vibration from various stages of the project. They are also likely to be disturbed by the presence of Project staff and vehicle movements within the landscape, vehicle movements. The greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. If construction activities take place after daylight hours, then noise and artificial lighting may impact on hyena and other nocturnal species (e.g. aardvark, bats, nocturnal birds, etc.). **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for hyena as they traverse the landscape, possibly because of disruption to prey movements. During operation of the well pads, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced and limited to the existence of well pads and other select infrastructure in the Project Area. This may still be some deterrent to movement of prey species where routes pass close to or between well pads, particularly where these are located close together.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. Increased human presence within the park may disturb the availability and ranging of hyena preferred prey species, reducing the overall quality of habitat, and resulting in hyena having to hunt further away from their territories bringing them potentially into competition with neighbouring clans. **Population changes** Human activity within the MFNP may impact on population levels of hyena, particularly if this comprises illegal activity such as poaching.

Spotted Hyena, *Crocuta crocuta*				
	Increased human settlement may result in domestic livestock being raised near to hyena habitat. This may attract hyenas resulting in an increase in human-wildlife conflict if hyena kill livestock and communities retaliate by killing the hyena. Hyena may also be accidental victims of poisoning targeted for lions in case of human-lion conflict. With only approximately 40 spotted hyena estimated in MFPA, any loss to their population could be critical for their long-term survival in MFPA. An increase in vehicle traffic from vehicles as a result of in-migration may lead to increased vehicle-animal collisions and hyena mortality. **Disturbance** Hyena are likely to be disturbed by the presence of people and vehicle movement and noise in the landscape. This may cause them to move territories, which may bring them into conflict with neighbouring clans. **Barrier effects** Widening or realignment of oil roads is likely to lead to increased (non-Project) vehicle traffic along roads and may create barrier effects.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Up to 20% of this species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be negligible. During this phase, minor habitat degradation or disturbance of hyena habitat and disturbance to hyena prey species is expected. Some hyena or clans may be affected and displaced into neighbouring clan territories, which may result in the loss of some hyena. This impact will be mainly temporary.	Direct impacts through habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), project vehicle-animal collisions, change in prey availability, and competition between individual hyena and neighbouring clans. Project induced access and in-migration will lead to a number of indirect impacts (increased habitat loss, disturbance, fire risk, human-wildlife conflict. fatalities (poisoning, snares/traps etc.) and vehicle-animal collisions). These direct and indirect impacts may affect hyena at the population level if mitigation measures are not implemented. Hyena population could be affected through direct and indirect impacts;	Although direct impacts will be reduced, indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on hyena and their habitat. Significant impact on the hyena could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact hyena, creating disturbance and barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic will be irreversible.

Spotted Hyena, *Crocuta crocuta*				
		notably through habitat loss, degradation, loss of connectivity, increased disturbance, disease transmission, fire risk, road collisions and hunting pressure. Impacts might last beyond that phase.	habitat loss, fire risk, disease transmission, prey species availability, and human-wildlife conflict. Some of these effects may be permanent.	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. Increased disturbance and habitat loss to hyena and prey species, and temporary barrier effects.	Construction of supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. Increased Project induced-migration leading to an increase of injuries and mortality due to poisoning/snares/ traps and increase road traffic collisions etc.	Increased Project induced-migration leading to an increase of injuries and mortality due to poisoning /snares/ traps and increase road traffic collisions etc.	Disturbance and habitat loss and increased Project induced-migration leading to an increase of injuries and mortality due to poisoning /snares/ traps and increase road traffic collisions etc.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Hyena are found throughout the MFPA associated with savanna habitats and the prey species that use them. As with other large predators, this species will move to where the prey species are as they are dependent to some extent on kills made by lions or leopards. Given the very small population size estimated from MFPA, impacts affecting even a small number of hyena could have significant effects on the population persistence. During field surveys undertaken in 2018, several hyena dens were recorded between JBR-03 and JBR-06 and near Pakuba airstrip. A pack of 22 hyenas was recorded in between JBR-03 and JBR-05 that occupied a den 120 meters from the flowline route. In addition, during field surveys carried out in 2017 it was noted that there were a number of burrow complexes at certain areas, which appeared to be in use by hyena. It is possible that these dens between located JBR-01 and JBR-07 may be lost or compromised during site clearance and earthworks. The construction of flowlines will create particular barrier effects which will require scheduling and alignment of flowline excavations such that barriers impeding animal movements are minimised. During the 2018 field surveys, a hyena den was recorded 120 meters from the route of the flowline between JBR03 and JBR05. A maximum length of open trench of 1km will be implemented for the flowlines. All well pads and flow lines during construction should be fenced off with temporary fencing. The area should be inspected each morning prior to works commencing and any animals released unharmed. During the decommissioning phase, mitigation requirements will be very similar to the site clearance phase, although focusing on making sure activities do not spill out of the defined infrastructure footprint. Effective restoration may take time and will require monitoring and remedial action to ensure that it is effective.			

Spotted Hyena, *Crocuta crocuta*				
	As Project works commence and Project induced migration leads to more people settling in the landscape, the risk of fire outbreak within MFPA and other habitats will increase. Although in the event of a fire outbreak hyena should be able to escape to the safety of their dens, they may still be negatively impacted if their preferred prey species are killed or escape the fire by vacating the clan's territory.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat with the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for prey species for hyena this loss may be significant **Population changes** The hyena population is declining steadily and the additional mitigation measures proposed should avoid acceleration of that decline. **Disturbance** The hyena population is thought to be declining steadily and the additional mitigation measures proposed should avoid acceleration of that decline. However, indirect impacts are difficult to forecast and control so on-going monitoring is necessary to verify this assumption. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed The existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other, during the operation phase. During the decommissioning phase, barrier effects be minimised although there will still be disturbance through this phase, which will diminish gradually as sites are restored. Ultimately barrier effects will be entirely removed by the end of this phase and the end of the project. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of hyena habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a moderate residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance to hyenas and their prey species. However, impacts can be reduced if night time activities are avoided and where unavoidable minimised as much as practicable.	There will be temporary degradation of hyena habitat in MFNP, along with increased disturbance (visual/ noise/ vibration) to hyenas and to prey species, increased competition (and potential mortality) among individual hyenas, increased vehicle traffic, and an increase in fire risks. This will result in a moderate residual significance impact. Residual impacts will be a loss of habitat and temporary disturbance and an increase in human – wildlife conflict leading	There will be degradation of hyena habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration) to hyena and prey species, increased inter-species competition, and potentially increased injuries/mortality from human-wildlife conflict, and increased fire risks, resulting in moderate impact significance, but after additional mitigation will result in a low residual significance impact. Residual impacts will	There will be temporary degradation of hyena habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, resulting in moderate impact significance. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.

Spotted Hyena, *Crocuta crocuta*				
		to mortalities. However, these can be significantly reduced if mitigation is well-managed and effective	be a loss of habitat and disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on the hyena population of MFNP.	
Residual Impact Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Bohor Reedbuck, *Redunca redunca wardi*					
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
Bohor Reedbuck	EN	1e	**A**	Subspecies recorded in MFNP and the Ramsar site.	HIGH
Bohor Reedbuck, *Redunca redunca wardi*					
SPECIES OVERVIEW					
Biodiversity significance	Bohor reedbuck, is globally LC but nationally EN. It does not have protection status in Uganda and has been eliminated from large parts of its natural range through overhunting and loss of habitat. Its numbers are in gradual decline over most of its remaining range. Bohor reedbuck is a CHQS as a significant proportion of its national population is found within the MFPA.				
Species Ecology	This species ranges north of the forest zone from Senegal, The Gambia, and southwest Mauritania through the woodlands and floodplain grasslands of the savanna zone of West Africa through southern Chad, the savanna woodlands of the Central African Republic, extreme northeast DR Congo, southern Sudan, to Ethiopia and south to Lake Tanganyika and the Rovuma River in Tanzania. In Uganda the species occurs in Queen Elizabeth Park, MFPA and Kidepo NP but numbers are very low and likely to be declining.				
Habitat Preference	Bohor reedbuck is associated with Landscape Context A (MFNP). Survey transects for this project undertaken by Tilenga ESIA team recorded a small number of individuals in the vicinity of JBR-05 to JBR-08 (near Pakuba Airstrip). They generally inhabit woodland and floodplain grassland across much of their range. They are effectively water-dependent grazers, with a strong preference for extensive areas of flood plains and open inundated grasslands where access to water may become restricted in the dry season. Bohor Reedbuck have been eliminated from large parts of their natural range by overhunting and loss of habitat to the expansion of settlement and livestock, although it tends to survive for longer in over-exploited areas than less secretive and more easily hunted species. In many countries it only survives in viable but greatly depleted numbers in protected areas. Drought has also been cited as a major threat (Ref. 14.A28).				
Population & Trends	Global population numbers appear to be low and are declining (Ref. 14.A28). The population of reedbuck in MFNP is unknown.				
Summary of state of knowledge	Bohor Reedbuck is difficult to survey and whilst there are estimates for populations in Queen Elizabeth and Kidepo Valley. There is limited detailed data available on the population status of reedbuck in MFNP, although in a recent field survey (2018) Bohor reedbuck faeces were recorded between JBR-03 and JBR-05. Therefore the precautionary principle should be adopted for this species when considering mitigation. A new aerial survey should be undertaken to estimate the population of large mammals within MFNP prior to Project activities commencing. This may allow an estimate of reedbuck to be made, although as they prefer woodland habitat, may be less easy to spot from the air than other more savanna-inhabiting species.				
POTENTIAL IMPACTS: ALL PROJECT PHASES					
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** Construction of project infrastructure within the MFNP will result in direct loss of savanna habitat. Poorly managed works could also affect adjacent habitats through erosion and other effects, such as degradation of water holes and seasonal wetlands, which are preferred habitat for this species. During the construction phase, potential impacts are likely to be similar to the previous phase. During this phase most site clearance should already have taken place and therefore there should not be significant increase in habitat directly lost. However, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of the immediate project footprint. During this phase habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. During the operation phase, all construction and new land take should have been completed.				

Bohor Reedbuck, *Redunca redunca wardi*				
	However, there is still potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint thereby affecting savanna habitat. **Population changes** Increased presence of Project vehicles within the park may impact on the reedbuck population, through an increase in vehicle-animal collisions which could lead to injury/kill. **Disturbance** Reedbuck are likely to be disturbed by the presence of Project staff in the landscape, Project vehicle movements and noise and vibration from various stages of the project. The greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. During the operation phase, potential sources of impacts from disturbance are likely to be similar to the previous phase, although at a lower intensity, as there will be far fewer people and vehicles in the landscape during operation. **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for reedbuck as they traverse the landscape. It is likely that individuals will be deterred from using certain routes between preferred habitats during periods where there is more intense activity, excavation and more people present in the landscape. During operation of the well pads, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced and will be limited to the existence of well pads and other select infrastructure in the Project Area. This may still be some deterrent to movement where movement routes pass close to or between well pads, particularly where these are located close together. During the Decommissioning phase, barrier effects are likely to be similar to the site clearance phase and, where pipelines are to be removed, the Construction and Pre-Commissioning phase.			
Potential impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. New settlements and an increase in agricultural practices are likely to lead to increased habitat loss and degradation. **Population changes** As more people move into the area, there is likely to be an increase in hunting, As people settle in the area there is likely to be increased habitat loss and degradation of associated floodplains and wetlands, through land-use change. With more people moving through the Park there is likely to be a greater fire risk. All these threats may accelerate any decline from what is already a low population. **Disturbance** Reedbuck are likely to be disturbed by the presence of people in the landscape. **Barrier effects** Widening or realignment of access and oil roads is likely to lead to increased (non-Project) vehicle traffic (project and non-project related), which is likely to create barrier effects and reduce connectivity.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for	Up to 20% of this species population is expected to be directly	Direct impacts are likely to affect reedbuck through	Indirect impacts could be significant during	Impacts during this phase should be

Bohor Reedbuck, *Redunca redunca wardi*				
impact magnitude	impacted during this phase. Indirect impacts during this phase are likely to be negligible. During this phase, minor habitat degradation or disturbance of reedbuck habitat is expected. Change during this phase will result in a Moderate significant impact on reedbuck and/or their habitat. This impact will be mainly temporary.	habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), and project vehicle-animal collisions. As people start to move into the landscape in search of employment and other economic opportunities, this will lead to a number of indirect impacts (increased habitat loss, disturbance, fire risk, hunting pressure, zoonotic disease transmission and vehicle-animal collisions). These direct and indirect impacts may affect reedbuck at the population level if mitigation measures are not implemented. Impacts might last beyond that phase.	this phase, especially related to in-migration and induced access which could increase pressure on this small reedbuck population and their habitat. A significant impact on the reedbuck could be expected if appropriate mitigation measures are not implemented early and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact reedbuck, creating barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, disease transmission, hunting pressure and human-wildlife conflict. These effects may be permanent.	less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic from this and previous phases may be permanent.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause increased disturbance and habitat loss and degradation and temporary barrier effects.	Construction of supporting and associated facilities will cause increased Project induced-migration leading to an increase in population loss due to hunting and increase Project related road traffic collisions etc.	Increased Project induced-migration leading to an increase in population loss due to hunting, an increased fire risk and disease transmission, and increase in non-project road traffic collisions etc.	Disturbance and habitat loss and increased Project induced-migration leading to an increase in population loss due to hunting, an increased fire risk and disease transmission, and increase in non-project road traffic collisions etc.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation	Issues of habitat loss and disturbance will affect this species close to the actual construction areas			

Bohor Reedbuck, *Redunca redunca wardi*				
Discussion	within the MFNP. In the MFNP, small numbers of reedbuck are known to inhabit in the vicinity of JBR-05 to JBR-08 (near Pakuba Airstrip). In a recent 2018 field survey reedbuck faeces were recorded between JBR-03 and JBR-05. Works are likely to disturb this species such that it avoids the construction areas whilst works are on-going. There may also be barrier effects where well pads are located close together. The population of reedbuck is unknown, although small numbers have been recorded during 2018 within MFNP between JBR03 and JBR-05. Any reduction in this small population may be critical to their continued existence within MFNP. Monitoring of this species will be required prior to site clearance works and during Project activities in order to measure the levels of disturbance on this population. There is a requirement to ensure that disturbance and barrier effects on this species (and others) are managed and minimised during all phases of the project, particularly during early construction phases when there will be clearance of vegetation and subsequently linear trenching for flow lines. During the construction phase, mitigation requirements will be very similar to the previous phase. However, the construction of the flowlines will create particular barrier effects which will require scheduling and alignment of flowline excavations such that barriers impeding animal movements are minimised. A maximum length of open trench of 1km will be implemented for the flowlines and adequate wide corridors should be left, allowing reedbuck and other species to traverse the Park unhindered. During the operation phase, mitigation requirements will be very similar to the previous phase, although focusing on making sure activities do not spill out of the defined infrastructure footprint. Mitigation requirements will be very similar during the decommissioning phase as to the site clearance phase, although focusing on making sure activities do not spill out of the defined infrastructure footprint. Effective restoration may take time and will require monitoring and remedial action to ensure that it is effective. Project induced in-migration into the area will result in people settling close to the park. It is important that the capacity of UWA is increased sufficiently so monitoring and law enforcement activities are adequate in order to reduce predicted increases in poaching and other illegal activities.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat with the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for bohor reedbuck this loss can be defined as significant. Mitigation during the construction phase should prevent loss or damage to habitat outside of the project footprint within savanna. **Population changes** The reedbuck population appears to be declining and the additional mitigation measures proposed should reduce the risk of further decline. **Disturbance** Mitigation will minimise disturbance through all phases although this cannot be eliminated completely, particularly from the continued presence of people and vehicle movements within the park. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed The existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other, during the operation phase. During the decommissioning phase, barrier effects be minimised although there will still be disturbance through this phase, which will diminish gradually as sites are restored. Ultimately barrier effects will be entirely removed by the end of this phase and the end of the project. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**

Bohor Reedbuck, *Redunca redunca wardi*				
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of reedbuck habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a low residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance.	There will be temporary degradation of reedbuck habitat in MFNP, along with increased disturbance (visual/ noise/ vibration), increased vehicle traffic, and an increase in fire risks. This will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and an increase in injuries/ fatalities from snares. However, these can be significantly reduced if mitigation is well-managed and effective.	There will be degradation of reedbuck habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration), and potentially increased injuries/mortality from snares, and increased fire risks, resulting in moderate impacts. Residual impacts will be a loss of habitat and temporary disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on reedbuck populations of MFNP.	There will be temporary degradation of reedbuck habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, resulting in moderate impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impact Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Uganda Kob, *Kobus kob thomasi*						
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Criterion 3: Migratory and congregatory species						
Uganda Kob	N/A (IUCN LC)	3d	**A**	**B**	Kob congregate at traditional lekking sites during breeding. This subspecies is concentrated in MFPA and along the savanna corridor to the south. The Project footprint area is a global stronghold for this species, which is not yet globally threatened but is vulnerable to hunting & disturbance.	HIGH

Uganda Kob, *Kobus kob thomasi*	
SPECIES OVERVIEW	
Biodiversity significance	Uganda kob, is globally LC and is not included in the Uganda Red List. Kob is widespread in a band across Africa from Senegal to south-east Ethiopia. The subspecies *thomasi* (Uganda Kob) occurs in north-east DR Congo, south-west Sudan and widely throughout Uganda. Numbers of Uganda Kob within parks and reserves may be stable, with an estimated total population size of 100,000, with 98% in protected areas, although the Uganda population of *K. k. thomasi* is believed to contain more than 10,000 animals (Ref 14.A16). This species qualifies MFPA as CH as a significant proportion of its population congregate within the Study Area.
Species Ecology	Uganda kob is not specifically protected in Uganda and has been declining in other parts of its range as its specific habitat requirements and social behaviours make it very vulnerable to loss of savanna habitats and human interference, particularly in terms of disturbance to lekking sites and behaviours. It is also a key prey species for lion. Within MFNP Uganda kob show no habitat preference variation across seasons, although densities are higher on the northern than the southern bank of the Nile. Their most preferred habitat occurs within the footprint area, Buligi circuit, Tangi region and Bugungu Wildlife Reserve (Ref 14-A14). At certain times some 40-50% of MFCA's Uganda kob are found within the Project Area, and as a result Project activities may significantly disturb this species. The sedentary nature of kob and their tendency to occur in relatively large concentrations make them highly susceptible to poaching, severely reducing the population, which now survives mainly in and around protected areas. Kob congregate at traditional lekking sites during breeding. Female kob ovulate every 20-26 days when not in calf and are therefore capable of breeding all year round.
Habitat Preference	Uganda kob spend most of their time in Borassus, Acacia, Crateva open woodlands, Combretum closed woodlands and grassland areas of the MFNP, with 39% of their locations in these three habitats. Preferred habitats tend to be the open Borassus woodland, Crateva, Balanites open woodland in the Buligi circuit and seasonally flooded areas which likely retain forage during the dry season (Ref 14.A14). In the study area the species prefers savanna habitat and savanna corridors, which associates them with Landscape Contexts A (MFNP) and B (savanna corridor).
Population & Trends	The aerial survey carried out in 2016 identified an aggregated estimate of 118,290 kob + 13,473 (SE) (Ref 14.4A12), which doubles the previous highest estimate for Murchison of 58,313, conducted by UWA/ GEC in May 2014, and raises the general Uganda population estimate by approximately 75%. The study (Ref 14.A12) states that previous surveys have clearly underestimated kob, and the population of this species in MFPA is rapidly increasing. Kob were found to be widespread, with dense concentrations in Buligi, Ayago, Heart-of-Park as well as in Bugungu WR. The surveys indicate that many kob move out of Study Area westwards to Ayago in the long dry season, and return at the start of the first rains. At this time they particularly congregate in areas that were burned in the previous dry season.
Summary of state of knowledge	Within MFNP, there is a confirmed lekking sites at proposed well pad sites (JBR-07) and evidence of a lekking site close to well pad JBR-06. Proposed well pad JBR-03 is close to seasonally wetland

Uganda Kob, *Kobus kob thomasi*	
	areas, which are important habitats for Kob and many other species. Lekking sites within the MFNP are well mapped particularly in the Buligi areas where contstruction and operation of the Tilenga Projtect will take place. Monitoring of Kob should be undertaken to determine the onset of lekking behaviour and distribution within MFNP, and monitor any changes in behaviour to kob as a result of Project activities. A new aerial survey should be undertaken to estimate the population prior to Project activities commencing.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** During the site clearance phase, vegetation clearance to prepare the ground for construction of well pads, flowlines and oil roads within the MFNP will result in direct loss of savanna habitat, which is a preferred habitat for kob, as well as representing habitat that connects other preferred areas, such as open Borassus and Acacia woodlands/grassland. Three well pads have been identified as being close to habitats important for kob. During the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases, potential impacts are likely to be similar during this phase most site clearance should already have taken place and therefore there should not be significant increase in habitat directly lost. However, there is still potential for habitat to be affected by construction activities in case they spread into areas outside of the immediate project footprint. During this phase habitat will be temporarily lost due to construction of flow lines across savanna areas. By the operation phase, all construction and new land take should have been completed. However, there is still potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint thereby affecting savanna habitat. Being a congregatory species, kob are likely to be impacted more through Project works during lekking periods than at other times. Kob have a highly evolved system of territorial behaviour. Male kob will establish and defend small, fixed territories (leks), where they attract females. These leks are located within a central area of concentrated territorial activity, which is surrounded by a zone of more widely spaced territories. Females enter the territorial ground throughout the year for the purpose of breeding. Males are rarely found outside their lek areas, and females usually visit only one specific lek for breeding (Ref. 14-A31). Kob breeding behaviour will be impacted if site clearance and construction works are undertaken close to the leks during lekking periods. As previously mentioned, construction of project infrastructure within the MFNP will result in direct loss of savanna habitat, which is the preferred habitat for kob and also connects other preferred areas. However, project activities during this phase may result in loss of connectivity between these habitats due to trenching and flowline construction activities, as well as degradation of this connecting habitat. Previous monitoring of Uganda Kob response to well pad construction, maintenance, drilling and seismic activities provided differing results. At one well pad (BE1) kob showed no obvious reaction to the activities with distance, with kob being more abundant in general within 2 km of the well pad, while at another well pad (BE4) there was a strong avoidance of the pad of up to 750 metres under all operations. The differences may be due to several factors. Kob can be curious and want to see what is making any new noise. They may also hang around the pads when lights are on at night to help them detect predators so that they are numerous at certain times of day near the pad (Ref 14-A32). **Population changes** Project activity within the MFNP may impact on population levels of kob, particularly where activities disrupt kob lekking sites. However, recent counts indicate that the population is considerably higher than previously thought. Nevertheless, increased human presence and activity within the park may impact on their population. **Disturbance** Kob are likely to be disturbed by the Project vehicles and staff in the landscape, leading to visual disturbance as well as noise and vibration from various stages of the project. As with other savanna species, the greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. Uganda kob showed some avoidance up to 250-500 metres away but in some cases the presence of the pad seemed to benefit these species and they could occur at relatively high densities near the pad. It is thought they may have learnt to avoid predation by staying around the pads at night where there are spotlights (Ref. 14-A32).

Uganda Kob, *Kobus kob thomasi*				
	Barrier effects Site clearance and construction of well pads, access roads and flow lines may create barrier effects for kob as they traverse the landscape. It is likely that individuals will be deterred from using certain routes between preferred habitats during periods where there is more intense activity and more people are present in the landscape. During the operation phase, barrier effects are likely to be limited to the existence of well pads and other select infrastructure in the Project Area. This may still be some deterrent to movement where movement routes pass close to or between well pads, particularly where these are located close together (e.g. JBR-05 & JBR-06 and JBR-07 and JBR-08). During the decommissioning phase, barrier effects are likely to be similar to the site clearance phase and, where pipelines are to be removed, the pre-commissioning phase.			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project-associated induced access and in-migration are likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. New settlements and an increase in agricultural practises are likely to lead to increased habitat loss and degradation. **Population changes** As more people move into the area and settle, there may be an increase in poaching and the threat of disease transmission (from domestic animals grazing in the Park) due to Project's induced access and in-migration. Oil roads and other access improvements in the region are likely to increase vehicle traffic along roads and enable people to enter more easily and impact on this receptor during and beyond all phases of the Project. As the human population increases, there may be increased pressures on kob from poaching, with kob sustaining injuries (some fatal) from snares/traps etc. **Disturbance** Induced human population changes may potentially increase disturbance to kob through an increase in people moving through the park and increase in road traffic. **Barrier effects** Widening or realignment of access and oil roads is likely to lead to increased (non-project) vehicle traffic, which is likely to create barrier effects and reduce connectivity.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Up to 20% of this species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be negligible. During this phase, minor habitat degradation or disturbance of kob habitat is expected. Change during this phase will result in a Moderate significant impact on kob population and/or their	Direct impacts are likely to affect populations of kob through habitat degradation and loss of connectivity, disturbance (visual, noise, vibration), and project vehicle-animal collisions). As people start to move into the landscape in search of employment and other economic opportunities, this will lead to a number of	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on kob and their habitat. A significant impact on the kob could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved

Uganda Kob, *Kobus kob thomasi*				
	habitat. This impact will be mainly temporary.	indirect impacts: increased habitat loss and disturbance; fire risk; increased threat of hunting; and a further increased number of vehicle-animal collisions. Together these direct and indirect impacts may affect kob at the population level if mitigation measures are not implemented. Kob population could be affected through direct and indirect impacts; notably through habitat loss, degradation, loss of connectivity, increased disturbance, disease transmission, fire risk, road collisions and hunting pressure. Impacts might last beyond that phase.	effective. Kob population could be affected through direct and indirect impacts; Increase in road traffic and human in-migration into the area will impact kob, creating barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, disease transmission, hunting pressure and human-wildlife conflict. The operation phase will last approximately 25 years and these effects may be permanent.	roads and increased traffic will be irreversible.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**INSIGNIFICANT**	**LOW**	**LOW**	**INSIGNIFICANT**
Justification of in-combination sensitivity	Increased disturbance and habitat loss and temporary barrier effects. Site preparation will take place for supporting and associated facilities, leading to minor degradation and disturbance of kob habitat. Impact will not be enough to result in change in conservation status of the species or habitat. This impact will insignificant. and be temporary	New supporting and associated facilities will facilitate access to the area, which will result in human in-migration to the area in search of work and economic opportunities. This will lead to an increase in hunting pressure and increase road traffic collisions etc. although as the main population of kob are located within the MFNP, the impact will be low and not enough to result in change in conservation status of the species or habitat.	Increased Project induced-migration leading to an increase in hunting pressure and increase road traffic collisions etc. Increase in road traffic and human in-migration into the area will impact the small numbers of kob that live outside of MFCA. Increased road traffic will create barrier effects and increase potential road mortality. In-migration to the area may increase habitat loss, fire risk, disease transmission and poaching pressure. These impacts will be low and may be permanent.	Disturbance and habitat loss and increased Project induced-migration leading to an increase in hunting pressure and increase road traffic collisions etc. Decommissioning works for supporting and associated facilities will lead to moderate degradation of habitat and/or disturbance to small numbers of kob living outside of protected areas. However, these impacts are unlikely to affect the main population of kob living in MFNP and thus the effects will be insignificant.

Uganda Kob, *Kobus kob thomasi*				
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	This species is associated with savanna habitats and the MFNP in particular. Issues of habitat loss and disturbance will affect kob close to the actual construction areas within the MFNP. Habitat loss and degradation, barrier effects along with disturbance, increased poaching pressure, vehicle collisions, fire risk and zoonotic disease transfer will be the main impacts to kob as a result of the Project. Works during the site clearance and construction phases are likely to disturb this species such that it avoids these areas whilst works are on-going. There may also be barrier effects where well pads are located close together. Most well pads are located in open savanna areas, which represent preferred habitat for this species. Therefore, there is a requirement to ensure that disturbance and barrier effects on this species are managed and minimised as much as possible during all phases of the project, particularly during the early construction phases when there will be extensive clearance of vegetation and subsequently linear trenching for flow lines. The avoidance studies undertaken as part of this project have sought to avoid lekking sites altogether and place well pads as far from lekking sites as practicable. It is possible that lekking take places when grass is short but not too dry, for example at the start of wet seasons, when the grass turns green, but before it has grown too high after burning. . One study undertaken in QENP, recorded large seasonal variation in the number of kob utilizing leks. This variation could result from optimal timing of calving, from condition-dependent oestrus, or from other seasonally varying costs or benefits. Male and female numbers were strongly related to grass greenness, receptive females numbers significantly but less strongly related to greenness, and calves unrelated to any seasonal variable. Analyses showed male numbers increased with females and greenness, and females increased with males, female density, and grass height. Thus, oestrus may be dependent on condition but females do not appear to calve during the optimal season, and males apparently time their territory tenure based on both the reproductive benefits and the nutritional costs (Deutsch and Ofezu 2008). Lekking seems to occur in June (possibly July) and works near identified leks should therefore be avoided as much as practicable during these months Kob should be further monitored to gain a better understanding of their behaviour within MFCA.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat within the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for kob this loss can be defined as significant during Site Preparation and Enabling Works, Construction and Pre-Commisioning and Operation phases of the Project. **Population changes** The kob population is increasing steadily and the additional mitigation measures proposed should avoid pressures on species population. **Disturbance** Disturbance will be minimised although there will still be some impacts associated with all phases, particularly from the presence of people and vehicle movements within the park. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. The existence of infrastructure in the landscape may still create some barrier effects, where well pads are located close to each other, during the operation phase. During the decommissioning phase, barrier effects will be minimised, although there will still be disturbance throughout this phase, which will diminish gradually as sites are restored. However, associated oil roads will remain and present a significant barrier effect post decommissioning. In-combination effects are not considered in assessing the residual impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			

Uganda Kob, *Kobus kob thomasi*				
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of kob habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a moderate residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance.	There will be temporary degradation of kob habitat in MFNP, along with increased disturbance (visual/ noise/ vibration), increased vehicle traffic, and an increase in fire risks. This will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and an increase in hunting pressure. However, these can be significantly reduced if mitigation is well-managed and effective.	There will be degradation of kob habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration), and potentially increased hunting pressure, and increased fire risks, which will lead to moderate residual significance impacts. Residual impacts will be a loss of habitat and temporary disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on Uganda kob populations within MFNP.	There will be temporary degradation of kob habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased hunting pressure, and fire risks, resulting in moderate impact significance. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Medie Mops Bat, *Mops congicus*
Trevor's Free-tailed bat, *Mops trevori*
Savanna / Helios Pipestrelle, *Neoromicia helios*
Russet free-tailed bat, *Chaerephon russata*

Mammals	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
Medje Mops Bat	EN	1e	**D**	Budongo Forest Reserve	HIGH
Trevor's Free-tailed Bat	EN	1e	**D**	Budongo Forest Reserve, Semliki National Park, Wakiso District	HIGH
Savanna/Helios Pipistrelle	CR	1e (possible)	**D**	Hoima District (Buhamba), corridor wetlands between Wambabya and Budongo Forest Reserves	HIGH
Data Deficient and Not Evaluated species					
Russet free-tailed bat (*Chaerephon russata*)	DD (IUCN NT)	Possibly 1e	Unknown	This species may potentially qualify as Critical Habitat under criterion 1e. However, very little is known about this bat, which is generally considered to be associated with tropical forest habitats (D).	HIGH

Medje Mops Bat, *Mops congicus*

Trevor's Free-tailed bat, *Mops trevori*

Savanna / Helios Pipestrelle, *Neoromicia helios*

Russet free-tailed bat, *Chaerephon russata*

SPECIES OVERVIEW

Biodiversity significance

These species have been grouped because they are all bat species associated with forest habitat and are therefore likely to be vulnerable to the same types of impacts.

Congo Free-tailed Bat / Medje Mops Bat, is globally LC and nationally EN. This species has been patchily recorded in Central Africa. It is found from southern Cameroon, east into the northern part of the Democratic Republic of the Congo and western Uganda, where it is known only from the Budongo Forest.

The species is not subject to protection in Uganda and is threatened in parts of its range by habitat loss, largely resulting from logging activities and conversion of land to agricultural use. This species is associated with mature tropical lowland moist forest and as noted Budongo Forest is the only area where it is known in Uganda.

Trevor's Free-tailed Bat, is globally DD and nationally EN. This species has been patchily recorded in parts of West and Central Africa. In Uganda it occurs in Budongo Forest Reserve, Semliki National Park and Wakiso District. Uganda is estimated to hold 5% of the global population of this species of bat, although there have been no recent records.

The species is not subject to protection in Uganda and is threatened in parts of its range by habitat loss, largely resulting from logging activities and conversion of land to agricultural use. This species is a forest savannah mosaic specialist and Budongo is one of few places in Uganda where suitable habitat is present.

Savanna/Helios Bat Pipistrelle is globally DD and nationally EN. This East African species has been recorded from Djibouti, southern Somalia, southern Sudan, northeastern Uganda, Kenya and northern Tanzania. IN Uganda it has been recorded in Hoima District (Buhamba), corridor wetlands between Wambabya and Budongo Forest Reserves. The species is not subject to protection in Uganda but current threats are unknown.

Russet free-tailed bat, is globally DD and is not included in the Uganda Red List. It is a little known species has only been recorded from five, widely dispersed, localities spread from Tai National Park in Côte d'Ivoire across Africa to the Hell's Gate Canyon National Park in Kenya. The IUCN does not

Medje Mops Bat, *Mops congicus* **Trevor's Free-tailed bat, *Mops trevori*** **Savanna / Helios Pipestrelle, *Neoromicia helios*** **Russet free-tailed bat, *Chaerephon russata***	
	identify this as a species present in Uganda, however, This species is associated with tropical forests habitats and would be vulnerable to habitat loss and logging in these areas. The CHA did not assign a DMU and the Landscape Context is not defined, although as it is a forest species it could be associated with Landscape Context D (Tropical High Forest).
Species Ecology	Little is known about the ecology of these species of bats
Habitat Preference	These bats species are associated with Landscape Context D, including Budongo Forest, and other forests.
Population & Trends	Unknown.
Summary of state of knowledge	Very little is known about the ecology and population of these bats. A survey would be required to determine if bats are roosting or foraging close to well pads and flowlines prior to vegetation clearance. Therefore, the precautionary principle should be adopted when assessing the direct and indirect impacts of Project activities on these bats.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** These species is associated with Landscape Context D (Tropical High Forest). The Tilenga Project Footprint does not include these areas and is therefore expected to result in minimum direct impacts. **Population changes** Increased Project activity may impact on population growth due to disturbance and loss of suitable habitat (e.g. seasonal wetlands). **Disturbance** Project activities (noise, vibration and artificial lighting) in the landscape may potentially increase levels of disturbance for bats, especially if these activities take place at night. **Barrier effects** Widening or realignment of oil roads through forest areas is likely to be associated with an increase in project-traffic on roads, which may create barrier effects.
Potential Impacts - indirect	There are potential indirect impacts on forests and other areas due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Loss, degradation or fragmentation of species habitat** Induced Project access and in-migration is likely to attract people to the wider area and this may lead to land-use change, leading to habitat loss and degradation. **Population changes** Increased human activity within forest areas may impact on population growth due to disturbance (noise and artificial lighting) and loss of suitable habitat. **Disturbance** Induced population changes in the landscape may potential increase levels of disturbance for bats. Increased artificial light levels and night working may also disturb these species, as will loss or degradation of seasonal wetlands over which they may feed. **Barrier effects** Widening or realignment of oil roads through forest areas is likely to lead to an increase in (non-project) traffic on roads, which may create barrier effects. Land use changes where forests areas are lost or fragmented is likely to also create barriers to movement of bats.

Medje Mops Bat, *Mops congicus* **Trevor's Free-tailed bat, *Mops trevori*** **Savanna / Helios Pipestrelle, *Neoromicia helios*** **Russet free-tailed bat, *Chaerephon russata***				
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Only a small proportion of these bat species populations are expected to be impacted during this phase, probably corresponding to less than 5% for each species, given the limited extent of direct impacts, the smaller duration of this phase which would also limit the effect of indirect impacts. As these bats inhabit forests outside of the MFCA, they are less likely to be impacted during this phase. Change during this phase will result in a Moderate significant impact on bats and/or their habitat. This impact will be mainly temporary.	Direct impacts are unlikely to affect bat species roosting or foraging in the forests outside the MFCA; however indirect impacts are expected to be more significant due to in-migration and land-use change, possibly affecting bats at the population level if mitigation measures are not implemented. Therefore, less than 10% of the population of these bat species could be affected through direct and indirect impacts, notably through loss of trees for roosting, and loss or degradation to foraging areas (e.g wetlands), and disturbance, such as noise, vibration and artificial lighting and fire risks. Many people will move to the area during the construction phase to work for the Project or in search of work and economic opportunities. This will increase the potential indirect impacts, through a possible increase in demand for land. Road improvements and pipeline construction will likely result in moderate habitat degradation and/or	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Project in-migration will likely result in moderate habitat degradation or disturbance, and increased risk of fire, leading to reduction in species population, habitat functionality, or protected site integrity, including connectivity. Impact likely to result in change in conservation status of the species or habitat. The direct impact will be medium term, lasting between 5 and 10 years (the time for vegetation to grow back), but indirect impacts related to induced access and in-migration may be permanent. Without mitigation, no more than 10% of the bat population could be affected during this phase through habitat loss or degradation and disturbance.	During this decommissioning phase, indirect impacts will be the most significant. It is expected that less than 10% these bat species population could be impacted through habitat degradation and disturbance as well as habitat loss from land-use change. Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction in habitat coverage or functionality, or protected site integrity, including connectivity. The direct impact will be low significance, lasting between 5 and 10 years, but indirect impacts of in-migration may be permanent.

Medje Mops Bat, *Mops congicus* **Trevor's Free-tailed bat, *Mops trevori*** **Savanna / Helios Pipestrelle, *Neoromicia helios*** **Russet free-tailed bat, *Chaerephon russata***				
		disturbance, and improve access to the area. This will in turn affect several bat species living outside of protected areas, potentially leading to a reduction in their numbers and to a potential loss of habitat and connectivity. Impacts might last beyond that phase.		
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
In-combination effects				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. These bat species occupy a wide range of habitats, mostly outside of the park in forest areas. Increased disturbance and habitat loss to potential roosting sites will have an effect on these bats species, if their roosts, commuting lines or preferred feeding habitats lie within the Project works area.	Construction of supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. Increased Project induced-migration leading to land-use change will further disrupt the roosting, foraging, commuting and social behaviour of bats, leading to a population loss.	Increased Project induced-migration leading to land-use change will further disrupt the roosting, foraging, commuting and social behaviour of bats, leading to a population loss. This may lead to a disruption of roosting, foraging, commuting and social behaviour of these bats, leading to a population loss.	The decommissioning phase will lead to disturbance and habitat loss, especially if these activities take place at night. Increased disturbance and habitat loss to potential roosting sites will have an effect on these bats species, if their roosts or preferred feeding habitats lie with the Project works area. This may lead to a disruption of roosting, foraging, commuting and social behaviour of these bats, leading to a population loss.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	These bat species are associated with forest habitats and areas with trees as they tend to use tree-lines to navigate at night. Many of the bat species known or recorded in the area feed over water, where insects congregate, and therefore any activities that impact on water resources may affect these species. Lighting at sites can deter bats at night and interfere with commuting behaviours. On the other hand, lighting which attracts insects can also attract bats, although this may make them more vulnerable to predators. Induced changes in populations and the pressures that they create on the landscape could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Long term strategies to protect and enhance forest habitats, reconnect fragments and prevent detrimental land use changes will have to be developed.			

RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact (all phases)	**Loss, degradation or fragmentation of species habitat** Should long term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures on forest habitats to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats, if effective, should reduce or avoid pressures on species population. **Disturbance** Mitigation to protect habitats and reduce human access generally should reduce or avoid pressures on disturbance. **Barrier effects** Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier effects. In order to limit disturbance to roosting, commuting, foraging bats, lighting should be non-obtrusive and directional; directed away from trees during widening of oil roads. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Residual Impact	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be minor loss and degradation of habitat affecting several bats species during this phase, together with disturbance artificial lighting/ noise/ vibration). This is expected to lead to a low significance residual impacts after effective additional mitigation are implemented by the Project. Residual impacts will be loss roosting potential, foraging habitat and connectivity affecting several bat species populations.	Degradation of bat habitat, together with increased disturbance (artificial lighting/ noise/ vibration), project induced access and in-migration will result in moderate significant impact. Particular attention will need to be placed on minimising effect of Project works taking place at night, when bats are active. Residual impacts will include direct and indirect habitat loss leading to a loss in roosting potential, foraging habitat and connectivity affecting several bat species populations. If mitigation is well-managed and effective, then minimum impacts should occur on the population of these species of bats in this area .	Indirect impacts are expected to be the most significant during this phase. Degradation of habitat, due to increased traffic Project induced access and in-migration will result in moderate significant impacts. Residual impacts will include direct and indirect habitat loss leading to a loss in roosting potential, foraging habitat and connectivity affecting several bat species populations. If mitigation is well-managed and effective, then minimum impacts should occur on the population of these species of bats in this area.	Impacts should be reduced during the decommissioning phase, as the size of the Project will decrease and less workers will be present on-site. Degradation of habitat, together with increased disturbance (artificial lighting/noise/ vibration), due to project induced in-migration will have a moderate significance impact; however mitigation measures should be effective when reaching this phase of the Project and restoration activities should start to be effective as well. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Charming Thicket Rat, *Hamnomys venustus*
Ugandan Lowland Shrew, *Crocidura selina*
Uganda Mangabey, *Lophocebus ugandae*

Mammals	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the study area.					
Charming Thicket Rat	VU	Poss. 2b (Tier 2)	Unknown	Unknown, probably lowland forest.	MEDIUM
Ugandan Lowland Shrew	DD	1e & poss. 2e (Tier 2)	**D**	Recorded in lowland forest	HIGH
Uganda Mangabey	LC	Wb (Tier 2)	**D**	Bugoma Forest	MEDIUM

Charming Thicket Rat, *Hamnomys venustus*

Ugandan Lowland Shrew, *Crocidura selina*

Uganda Mangabey, *Lophocebus ugandae*

SPECIES OVERVIEW

Biodiversity significance	**These species have been assessed together because although they belong to different taxa, they occupy a similar range of habitats, which are vulnerable to the same set of impacts.** **Charming Thicket Rat** is globally VU and nationally DD. It is endemic to the montane regions of the Albertine Rift Valley and has been recorded in Uganda from a comparatively small area from East Ruwenzori as well as recently in Karuma WR. There is no information on it protection status in Uganda and threats and pressures include forest habitats within the range of this species that are threatened by logging operations and the conversion of land to agricultural and other uses. As records are so sparse it is not possible to assign a Landscape Context to it. **Ugandan Lowland Shrew** is globally DD and nationally DD. It has been recorded from three lowland forests in Uganda (including the locality of Mabira Forest, lowland forest). This species has been assigned to Landscape Context D (Tropical High Forest). **Uganda Mangabey** is globally LC and nationally VU. It is an endemic old world monkey species and has been recorded in Kibale National Park, Bugoma Forest Reserve, Mabira ForestReserve, Mpanga Forest Reserve, Sango Bay Forest Reserve, Mukono District (Bujuko) and Wakiso District (Bukasa). There are no reliable estimates of numbers and there is no information on protected status. These monkeys are almost strictly arboreal and inhabit low and medium altitude tropical rainforest. The MFCA and Murchison-Semliki forests corridor can be considered the DMU for this species (DMU3, though it is confined to Bugoma Forest and fragments of forest in connectivity with it. As its distribution is wider than Bugoma Forest Reserve, making this Landscape Context is D.
Species Ecology	**Charming Thicket Rat** is associated with thickets in montane primary and secondary forests. It is not known if the species can persist outside of forested areas. **Ugandan Lowland Shrew** Not much is known about it and it is probably uncommon in Uganda. Threats include logging and forest fragmentation. **Uganda Mangabey** is mainly known from Bugoma and small forests around Bugoma and there probably are less than 2000 individuals. The species is threatened by agricultural encroachment and other ecologically destructive activities and its habitat is also under pressure from illegal timber cutting.
Habitat Preference	Forest habitats, include Landscape Context D.
Population & Trends	Unknown, probably declining.
Summary of state of knowledge	Very little is known about the ecology and population of the Charming thicket rat and Ugandan lowland shrew. Although better known, there is little information on the ecology of the Ugandan Mangabey. Therefore, the precautionary principle should be adopted when assessing the direct and

Charming Thicket Rat, *Hamnomys venustus* **Ugandan Lowland Shrew, *Crocidura selina*** **Uganda Mangabey, *Lophocebus ugandae***				
	indirect impacts of Project activities on these species.			
POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** These species are generally associated with Landscape Context D (Tropical High Forest). The Tilenga Project Footprint does not include these areas and so these forest areas are unlikely to be impacted directly. **Population changes** Increased Project activity may impact on population growth due to disturbance. **Disturbance** Project vehicles travelling along oil roads is likely to create disturbance and is likely to increase the risks of vehicle-animal impacts, leading to road kills. **Barrier effects** Widening or realignment of oil roads through forest areas is likely to be associated with an increase in project-traffic on road, which may create barrier effects.			
Potential Impacts - indirect	This would be associated with land use changes and degradation of habitats. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Loss, degradation or fragmentation of species habitat** Project induced access and in-migration is likely to lead to people moving into the area looking for work and economic opportunities. This would be associated with land use changes, forest loss and degradation of habitats. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on these species during this phase. **Population changes** Increased and uncontrolled human activity within forest areas may impact on population growth due to disturbance, loss of suitable habitat or disease. There is likely to be an increase in poaching, leading to animals being caught in snares and traps. These indirect impacts are likely to lead to a population loss of these species. **Disturbance** Induced population changes in the landscape may potential increase levels of disturbance for these species. People moving through the forests in search of forest resources are likely to disturb these species. **Barrier effects** Widening or realignment of oil roads through forest areas is likely to lead to an increase in (non-project) traffic on roads, which may create barrier effects. Land use changes where forests areas are lost or fragmented are likely to also create barriers to movement of bats.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Only a small proportion of these species populations are expected to be impacted during this phase,	Direct impacts are unlikely to affect species inhabiting forests outside the MFCA; however	This is the longest Project phase, with potentially significant impacts if effective	During this decommissioning phase, indirect impacts will be the

Charming Thicket Rat, *Hamnomys venustus* **Ugandan Lowland Shrew, *Crocidura selina*** **Uganda Mangabey, *Lophocebus ugandae***				
	probably corresponding to less than 5% for each species, given the limited extent of direct impacts, the smaller duration of this phase which would also limit the effect of indirect impacts. As these species inhabit forests outside of the MFCA, they are less likely to be impacted during this phase. Change during this phase will result in a Low significant impact on these species and/or their habitat. This impact will be mainly temporary.	indirect impacts are expected to be more significant due to in-migration and land-use change, possibly affecting these species at population level if mitigation measures are not implemented. Therefore, between 10% and 20% of the population of these species could be affected through direct and indirect impacts, notably through loss of habitat and degradation, and disturbance, such as noise, vibration and fire risks. Road improvements and pipeline construction will likely result in moderate habitat degradation, fire risks, and/or disturbance, and improve access to the area. This will in turn affect species living outside of protected areas, potentially leading to a reduction in their numbers and to a potential loss of habitat and connectivity. Impacts might last beyond that phase.	mitigation measures have not already be put in place during earlier phases of the Project. Project in-migration will likely result in moderate habitat degradation or disturbance, fire risks, leading to reduction in species population, habitat functionality, including connectivity. Without mitigation, between 10% and 20% of these species populations could be affected during this phase through habitat loss or degradation and disturbance which could result in change in conservation status of these species and/or habitat. The direct impact will be medium term, lasting between 5 and 10 years (the time for vegetation to grow back), but indirect impacts related to induced access and in-migration may be permanent.	most significant. It is expected that between 10% and 20% of these species population could be impacted during this phase through habitat degradation and disturbance, increased and continued pressure from indirect impacts, such as habitat loss from land-use change. Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction habitat coverage or functionality, or protected site integrity, including connectivity. The impact will be low significance, lasting between 5 and 10 years, but indirect impacts of in-migration may be permanent.
Potential Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
In-combination effects				
Risk of in-combination effects	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are expected to be less significant during this Phase, as few workers will be present within the Project area and limited vegetation clearance will take place. Site clearance will take	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on mangabeys, in particular, and their habitat. A significant	Indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on these species and their habitat. A significant impact on the	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works for supporting and associated

Charming Thicket Rat, *Hamnomys venustus* **Ugandan Lowland Shrew, *Crocidura selina*** **Uganda Mangabey, *Lophocebus ugandae***				
	place for supporting and associated facilities, leading to minor degradation and disturbance of habitat. Impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	impact on the population of all three species could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilities will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat, as well as in increase in hunting and a reduction in habitat connectivity should could lead to reduction in the all three species populations. Impacts likely to result in change in conservation status of the species or habitat.	mangabey population could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact these species populations at first in non-protected areas, which will in turn increase pressure and isolate population contained within protected areas. Increased road traffic will create barrier effects and increase potential road mortality. In-migration to the area may increase habitat loss, fire risk, disease transmission, hunting pressure and human-wildlife conflict. These effects may be permanent.	facilities will lead to moderate degradation of habitat and/or disturbance of ecological function. Impact likely to affect these species and their habitat.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	These forest dwelling species will be affected more from indirect impacts than direct. Induced changes in local human population (in-migration) and associated environmental pressures (deforestation through illegal agriculture and logging, illegal hunting /poaching/ snares and zoonotic disease transmission) on the landscape will be more significant for these species than the direct impacts within the Project Footprint. General and species specific mitigation measures address potential impacts under Project control, however given the high significance of in-combination effects, the Project will also need to plan and implement mitigation measures at the landscape level. Long-term strategies to protect and enhance forest habitat, reconnect fragmented populations and prevent detrimental land use changes should be developed.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact (all phases)	**Loss, degradation or fragmentation of species habitat** Should long term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats and reduce poaching, if effective, should reduce or avoid pressures on species population. **Disturbance** Mitigation to protect habitats and reduce poaching and human access generally should reduce or avoid pressures on disturbance. **Barrier effects** Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier			

Charming Thicket Rat, *Hamnomys venustus* **Ugandan Lowland Shrew, *Crocidura selina*** **Uganda Mangabey, *Lophocebus ugandae***				
	effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Residual Impact	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be minor loss and degradation of habitat affecting these species during this phase, together with visual/disturbance noise/ vibration). This is expected to lead to a low significance residual impacts after effective additional mitigation are implemented by the Project. Residual impacts will be loss and degradation of habitat and connectivity.	Degradation of habitat, together with increased disturbance (visual/noise/ vibration). Project induced access and in-migration will result in moderate significant impacts. Residual impacts will include direct and indirect habitat loss leading to loss and degradation of habitat and increased poaching pressure. If mitigation is well-managed and effective, then minimum impacts should occur on population of these species.	Indirect impacts are expected to be the most significant during this phase. Degradation of habitat, due to Project induced access and in-migration will result in moderate significant impacts. Residual impacts will include direct and indirect habitat loss leading to a loss in roosting potential, foraging habitat and connectivity affecting these species populations. If mitigation is well-managed and effective, then minimum impacts should occur on the population of these species.	Impacts should be reduced during the decommissioning phase, as the size of the Project will decrease and less workers will be present on-site. Degradation of habitat, together with increased disturbance (artificial lighting/noise/ vibration), due to project induced in-migration will have a moderate significance impact; however mitigation measures should be effective when reaching this phase of the Project and restoration activities should start to be effective as well. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Hippopotamus *Hippopotamus amphibious*						
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Other Notable Species (not CHQS)						
Hippopotamus	VU	N/A	A	C	Present in MFNP and Ramsar site.	MEDIUM
Hippopotamus *Hippopotamus amphibious*						
SPECIES OVERVIEW						
Biodiversity significance	**Hippopotamus** is globally VU and nationally VU. They are a large, mostly herbivorous, semiaquatic mammal native to sub-Saharan Africa. It is a widespread species associated with aquatic habitats and is present within MFNP, the Ramsar site, the Lake Albert and Bugungu WR. It is therefore associated with Landscape Contexts A (MFNP) and C (Lake Albert, rivers and wetlands).					
Species Ecology	Different from all other large land mammals, hippopotamus are of semiaquatic habits, spending the day in lakes and rivers. They can be found in both savannah and forest areas. Preferred habitat requires enough water to submerge in and grass nearby. Larger densities of the animals inhabit quiet waters with mostly firm, smooth sloping beaches. Males may be found in very small numbers in rapid waters in rocky gorges. Hippopotamus leave the water at dusk and travel inland, sometimes up to 10 km (6 mi), to graze on short grasses, their main source of food. They spend four to five hours grazing and can consume 68 kg (150 lb) of grass each night.					
Habitat Preference	Hippopotamus centre on aquatic habitats but do come ashore to graze, particularly at night. They can be found quite far from the River Nile in large wallows and wetlands within the interior of the park, as well as in denser areas of vegetation within the Ramsar and close to the river's edge.					
Population & Trends	Hippopotamus is widespread across Africa, with an estimated population (IUCN 2006) of between 125,000 to 150,000. In Uganda it is concentrated in Queen Elizabeth NP and MFNP. Hippopoatmus are not difficult to survey from the air; however, aerial surveys can give a measure of relative abundance from one survey to the next. The aggregated estimate for MFCA is 1,975 hippopotamus + 318 (SE). This is slightly lower than the estimate of 2,014 hippopotamus in 2005, but greater than estimates since then. In general, we conclude that the hippo population of MFCA is increasing slowly. In the TEP Uganda/ FFI surveys, it is calculated that EA1/1A hosts 58% of MFCA's hippopotamus, and these are mainly in the Nile.					
Summary of state of knowledge	There is little data on the ecology of hippopotamus within MFNP. A survey should be conducted to monitor the impact of direct and indirect disturbance to hippopotamus.					
POTENTIAL IMPACTS: ALL PROJECT PHASES						
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** Hippopotamus prefer permanent and seasonal wetlands and suitable grazing areas nearby. The project may result in the loss or fragmentation of seasonal wetlands within the MFNP where well pads, access roads and flow lines will be constructed. In addition, activities within the Victoria Nile, where infrastructure will be placed, may lead to possible unplanned releases/spills of chemicals, loss of marginal vegetation and increased sediment loading, leading to degradation of water quality and aquatic habitats within the Nile and other watercourses. During Site Preparation and Enabling Works and Construction and Pre-Commissioning, habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. However, project activities during this phase may result in loss of connectivity between these habitats due to trenching and flowline construction activities, as well as degradation of this connecting habitat. During the operation phase, all construction and new land take should have been completed. However, there is still potential for habitat to be affected by erosion and runoff spreading into areas outside of the immediate project footprint thereby affecting the habitat.					

Hippopotamus *Hippopotamus amphibious*	
	Population changes Reduction in foraging area, water quality issues or increased disturbance from river traffic or other sources in may impact on species population. Human activity within the MFNP may impact on population of hippopotamus, particularly where activities may disrupt wetland habitats. **Disturbance** Impacts from disturbance may include presence of people, noise, vibration (e.g. from HDD), river traffic and other project elements. As with other species, the greatest potential for disturbance is likely to be during HDD, construction of the jetty, Water Abstraction Station and other associated buildings, pilling, earth moving, flowline trenching and other excavations. Any construction water vessels (barges) are likely to increase disturbance and risk of collisions, with hippopotamus. **Barrier effects** The project may prevent, at various stages, hippopotamus accessing seasonal wetlands, certain sections of the river and /or preferred grazing areas. This would be particularly the case where long sections of excavation for flowlines were left open creating obstacles for movement of this species. Site clearance and construction of well pads, access roads and flow lines may create barrier effects for grazing hippopotamus. It is likely that individuals will be deterred from using certain routes between preferred habitats during periods where there is more intense activity and more people are present in the landscape. During operation of the well pads, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced. During operation phase, barrier effects are likely to be limited to the existence of well pads and other infrastructure in the Project Area. There may still be some deterrent to movement where movement routes pass close to or between well pads, particularly where these are located close together. During decommissioning, barrier effects are likely to be similar to the site clearance phase and, where pipelines are to be removed, the pre-commissioning phase.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project induced human in-migration to the area is likely to lead to people settling in the area and subsequently land-use change, leading to habitat loss and degradation. There may be an increase in human waste (e.g. plastic and human excrement etc.) that could end up polluting aquatic habitats. **Population changes** Project induced human in-migration is likely to lead to an increase in poaching pressure. As more humans settle in the area, many are likely to take to agriculture. This may bring them into conflict with hippopotamus, if these animals are attracted to crops and destroy them. This may then lead to farmers retaliating and attempting to kill hippopotamus in the area. A study in MFNP found that hippopotamus where the most common species killed by poachers (31.2% of poached carcasses found). Hippopotamus were ranked by local communities as the most problematic species (33%) over elephant, lion and leopards (Ref 14-A26). As more people settle in the area, the number of vehicles on roads is likely to increase. This may lead to an increase in vehicle-animal collisions and serious injuries or fatalities. **Disturbance** Project induced human in-migration to the area may lead to an increase in poaching and disturbance. Hippopotamus may be directly targeted for poaching or may get caught in wire snares meant for catching other species, resulting in serious injuries or death. There may be an increase in human-wildlife, leading to community revenge killings of hippopotamus. **Barrier effects** As more people settle in the area, the number of vehicles on roads is likely to increase, which may create barrier effects.

Hippopotamus *Hippopotamus amphibious*				
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact Magnitude	Site preparation, including vegetation clearance, during this phase will result in the loss or fragmentation of key habitat for hippopotamus, especially seasonal wetlands. In addition, activities within the Victoria Nile may affect water quality and loss of fringing vegetation where infrastructure will be placed. Up to 15% of this species local population is expected to be directly impacted during this phase. During this phase, habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. Change during this phase will result in a Moderate significant impact on hippopotamus and/or their habitat. This impact will be mainly temporary.	This phase will result in the degradation of key hippopotamus habitat, especially seasonal wetlands within the MFNP where well pads, access roads and flow lines will be constructed. Hippopotamus leave the water at dusk and travel long distances to graze on short grasses. Construction of Flowlines may cause temporary barrier effects and disruption to this behaviour. In addition, activities within the Victoria Nile (jetty) may affect water quality and loss of fringing vegetation where infrastructure will be placed. During this phase, habitat will be temporarily lost due to construction of flow lines and also the land required for the HDD Nile Crossing activities. There will be disturbance (visual/noise/vibration) which will affect hippopotamus behaviour. There may be possible unplanned releases/spills of fuel, chemicals, loss of marginal vegetation leading to an increase in sediment loading, leading to degradation of water quality and aquatic habitats (Nile and other watercourses).	This phase will result in disturbance to hippopotamus (noise, vibration, visual and ferry crossings). Indirect impacts could be significant during this phase, especially related to in-migration and induced access, which could further increase pressure on hippopotamus and their habitat. A significant impact could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact hippopotamus, creating barrier effects (road traffic) and increasing potential road mortality. Induced human in-migration to the area may lead to an increase in poaching and disturbance. Hippopotamus may be directly targeted for poaching or may get caught in wire snares meant for catching other species, resulting in serious injuries or death. There may be an increase in human – animal conflicts, leading to community	Impacts during this phase should be less significant than the previous phases, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat (terrestrial and aquatic) and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic may be irreversible.

Hippopotamus *Hippopotamus amphibious*				
		Project vehicles will increase the number of vehicle traffic on oil roads and this may result in increased vehicle-animal collisions which could lead to injury/kill. Induced human in-migration to the area may lead to an increase in poaching and disturbance. Hippopotamus may be directly targeted for poaching or may get caught in wire snares meant for catching other species, resulting in serious injuries or death. There may be an increase in human-wildlife conflicts, leading to community revenge killings of hippopotamus. As humans move into the area, vehicle traffic will also increase, further increasing the risk of vehicle-animal collisions. These direct and indirect impacts may affect hippopotamus at the population level if mitigation measures are not implemented. Therefore population could be affected through direct and indirect impacts; notably through habitat loss, degradation, loss of connectivity, increased disturbance, road collisions and hunting pressure. Impacts might last beyond that phase.	revenge killings of hippopotamus. Up to 20% of the population could be affected through direct and indirect impacts; Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss and hunting pressure. These effects may be permanent.	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**INSIGNIFICANT**	**LOW**	**LOW**	**INSIGNIFICANT**
Justification of in-combination sensitivity	Site clearance supporting and associated facilities, are unlikely to impact on	Supporting and associated facilities will facilitate access to the area, which will result in human in-	Increased Project induced-migration leading to an increase in hunting pressure	Disturbance and habitat loss and increased Project induced-migration

Hippopotamus *Hippopotamus amphibious*				
	hippopotamus population, as these works will not go through habitat suitable for hippopotamus.	migration to the area in search of work and economic opportunities. This will lead to an increase in hunting pressure and increase road traffic collisions etc. although as the main hippopotamus population are located within the MFNP, the impact will be low and not enough to result in change in conservation status of the species or habitat.	and increase road traffic collisions etc. An increase in road traffic and human in-migration into the area may lead to an increase in poaching pressure on hippopotamus in MFCA. Increased road traffic will create barrier effects and increase potential road mortality, and may increase habitat loss and fire risk. These impacts will be low but may be permanent.	leading to an increase in hunting pressure and increase road traffic collisions etc. Decommissioning works for supporting and associated facilities will lead to moderate degradation of habitat and/or disturbance to small numbers of hippopotamus living outside of protected areas However, these impacts are unlikely to affect the hippopotamus population living in MFCA and thus the effects will be insignificant.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Protection of water resources and wetlands are the key mitigation. It will also be necessary to schedule works to minimise barrier effects, particularly for works that are close the river. Sensitivity of hippopotamus to low frequency vibration is not well understood and it is possible that piling and the actual drilling activities (HDD) will affect hippopotamus. Mitigation for this will including slow start / ramping up of activity and ensure that the HDD rig is placed on the south side of the river, minimising the footprint within the Ramsar north of the Nile and into the MFNP. Issues of habitat loss and disturbance and habitat loss will affect this species close to the actual construction areas within the MFNP. There is a risk that water quality and aquatic habitats could be adversely affected through unplanned releases/spills of fuel, chemicals. Loss of marginal vegetation may lead to an increase in erosion and sediment loading. Drainage Management Plans, Waste Management Plans, Chemical Storage Plans, and vehicle refuelling protocols and locations, will need to be closely adhered to as part of the CESMP during all phases of the project. This species grazes in grassland areas and works during the site preparation and construction phases may disturb this species such that it avoids the construction areas whilst works are on-going. There may also be barrier effects where well pads are located close together or where linear excavations prevent hippopotamus from moving to the river and/or back again. Within MFNP hippopotamus are the most common species killed by poachers (31.2% of poached carcasses found). They are also ranked by local communities as most problematic species (33%) over elephant, lion and leopards (Ref. 14-A26). Hippopotamus and the elephant are considered among the most problematic and dangerous animals for their size but also due to their ability to destroy comparatively larger crop fields even in single raids (Ref. 14-A26) Induced human in-migration to the area may lead to an increase in poaching and disturbance. Hippopotamus may be directly targeted for poaching or may get caught in wire snares meant for catching other species, resulting in serious injuries or death. As hippopotamus are feared by communities as a dangerous animal and crop raider, this leads to human–animal conflict, leading to community taking revenge and hippopotamus being killed. During the Commissioning and Operations phase, mitigation requirements will be very similar to the previous phases.			

Hippopotamus *Hippopotamus amphibious*				
	During decommissioning, mitigation requirements will be very similar to the site clearance phase. Effective restoration may take time and will require monitoring and remedial action to ensure that it is effective.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** There will be temporary loss or fragmentation of habitats but after the construction phase when the pipelines will be built this loss will be restored and rectified. There should not be any significant impacts during Commissioning and Operations phase. Decommissioning will probably not affect hippopotamus, other than through increased traffic, as pipelines and other buried infrastructure are likely to be left in suite once oil production has ceased. Although the Project will mean direct loss of habitat within the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. **Population changes** Human activity within the MFNP may impact on population growth. However, this is not likely to be significant and mitigation should avoid pressures on species population throughout all phases. Following mitigation there should be no significant impacts on population of this species. **Disturbance** Disturbance will be minimised although there will still be some impacts associated with this phase, particularly from the presence of people and vehicle movements within the park and around the lake and wetlands. Mitigation should minimise disturbance during all stages of the project. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. Once construction works have been completed there will be no significant residual barrier effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Increased disturbance and habitat loss and temporary barrier effects. These effects will result in insignificant residual impact significance.	Increased Project induced-migration leading to an increase in disturbance, temporary degradation of terrestrial habitats and to water quality and aquatic habitats, barrier effects, injuries and mortality due directly to poaching and retaliation killings (human-wildlife conflict) and indirectly from snares/ traps laid for other species and an increase in road traffic collisions etc. However if mitigation is well-managed and	Increased Project induced-migration leading to an increase in disturbance, injuries and mortality due to poaching and retaliation killings (human-wildlife conflict), and indirect hunting (snares/ traps laid for other species) and an increase in road traffic collisions etc. However if mitigation is well-managed and effective, then minimum impacts should occur on the hippopotamus	Disturbance and habitat loss and increased Project induced-migration leading to an increase of injuries and mortality due to poaching and retaliation killings (human-wildlife conflict), and indirect hunting (snares/ traps laid for other species) and an increase in road traffic collisions etc. These effects will result in low significance impacts.

Hippopotamus *Hippopotamus amphibious*				
		effective, these effects will result low residual impact significance. However, these effects will last for the duration of the Phase and can be significantly reduced if mitigation is well-managed and effective.	population of MFNP. These effects will result in Low residual impact significance.	Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**INSIGNIFICANT**	**LOW**	**LOW**	**LOW**

Leopard, *Panthera pardus*					
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Other Notable Species (not CHQS)					
Leopard	VU	N/A	A B D F	Recorded in MFNP.	MEDIUM

Leopard, *Panthera pardus*	
SPECIES OVERVIEW	
Biodiversity significance	Leopard is globally NT and nationally VU. Leopards are widely distributed across Africa but populations have become reduced and isolated, and their distribution does not now conform to their historic range. The main threats to leopards are anthropogenic including hunting, loss of habitat ranges and prey opportunities. Although this species is globally NT, it has been included in this assessment as it is listed as Vulnerable (VU) on the Ugandan Red List, and is an apex predator, as well as a charismatic species of particular stakeholder concern.
Species Ecology	Leopards occur in the widest range of habitats among any of the Old World Cats (Ref.14.A33). Their diet is related to prey availability and presence of larger competitors. Generally, Leopards prefer medium-sized ungulate prey (10- 40 kgs) where available. They have a highly varied diet, however, feeding on insects, reptiles, birds and small mammals up to large ungulates. Though the leopard as a species has the reputation of being a generalist, often individuals will become adept specialists for a particular prey item. Leopard home range size varies with prey availability and habitat structure. Leopards have the largest ranges within arid and semi-arid environs where prey density is low. The largest recorded Leopard ranges include the Central Kalahari (mean = 2,182 km², (Ref 14.A34). In the Study Area leopards have been recorded in Bugungu WR. In addition, leopards were recorded by Tilenga ESIA team at well pads JBR-02 and JBR-09 during surveys in 2016/2017. Leopard in the Study Area is associated with Landscape Contexts A (MFNP), B (savanna corridor) and D (Tropical high forest) but as they are quite varied in their habitat requirements may be present in other terrestrial landscape contexts (e.g. F (Mixed landscape).
Habitat Preference	Habitat preferences are wide and depend on the presence of prey species, generally medium sized ungulates. Within the MFNP leopards seem to prefer wooded areas where they can gain cover and can rest in trees, dragging their kills up to avoid being pushed off the kill by hyenas. Leopards have mainly been sighted in the Buligi circuit area in north west MFNP but this is likely to be due to higher UWA patrol effort. Most of the sightings are concentrated around UWA ranger patrol posts in the park, and UWA suspects there to be relatively high leopard densities in the centre of the park where there are infrequent patrols.
Population & Trends	Population numbers within the MFNP and wider area are unknown, but are presumed to be relatively stable within the park, although declining outside.
Summary of state of knowledge	There is limited detailed data available on the population status of leopards in MFNP. Therefore the precautionary principle should be adopted for this species when considering mitigation. A study on the leopard population within the Park and wider landscape should be conducted prior to Project works commencing to determine population, distribution and ranging. Further monitoring should be conducted throughout the project to monitor the effects on this species from Project direct and indirect activities.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** Construction of project infrastructure within the MFNP will result in direct loss of some trees, which may impact on territories of leopard. Leopard prey species are likely to be impacted by loss of habitat and disturbance, which will be detrimental to leopard, and may lead to them shifting territories.

Leopard, *Panthera pardus*				
	Population changes Project vehicles operating within the MFNP may impact on population levels of leopard. This may lead to increased vehicle-animal collisions and serious injuries or fatalities. **Disturbance** Leopards may be disturbed by the presence of Project staff in the landscape, Project vehicle movements and noise from various stages of the project. The greatest potential for disturbance is likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well pad clearance, flowline trenching and other excavations. **Barrier effects** Site clearance and construction of well pads, access roads and flow lines may create barrier effects for leopard as they traverse the landscape. During operation of the well pads, where the level of activity is likely to be considerably less and where there are no open excavations from flowlines or other construction, the barrier effects should be considerably reduced. During decommissioning, barrier effects are likely to be similar to the site clearance phase and, where pipelines are to be removed, the pre-commissioning phase.			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Leopards are associated with Landscape contexts A (MFNP), B (Savanna Corridor), D (Tropical High Forest) and F (Mixed habitats). There are potential indirect impacts on forests and other habitat used by leopards within these landscape contexts. Project-associated induced access and in-migration is likely to lead to human population changes, where workers and their dependents and others are likely to move to the area or are likely to be attracted in search of work, creating settlements, and possibly increasing the demand for land for agricultural purposes. Increased human presence within the park may disturb the availability and ranging of leopard preferred prey species, resulting in leopards having to hunt further away from their territories bringing them potentially into competition with others. This could lead to aggression, potential serious injury or even mortality, especially among males. Habitat loss is expected to be more significant in non-protected areas at first, but pressure is likely to increase on protected areas as forest resources become scarce. **Population changes** Project induced access and in-migration is likely to increase the number of people living in the area. This is likely to lead to an increase in domestic animals/livestock (dogs, sheep, goats, cows, pigs etc.) in the area. If these livestock are allowed to roam free and unprotected in areas inhabited by leopard, then they are likely to be predated by leopard. This will increase the threat of human-wildlife conflict, where communities retaliate and attempt to kill problem animals through poison, snares, traps and by directly hunting them leading to a leopard population loss. **Disturbance** Leopards are likely to be disturbed by the presence of people and vehicle movement and noise in the landscape. This may cause them to move territories, which may bring them into conflict with other leopards. This could lead to aggression, injury and possible mortality, especially among males. **Barrier effects** Widening or realignment of oil roads is likely to lead to increased (non-project) vehicle traffic and may create barrier effects.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**

Leopard, *Panthera pardus*				
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Up to 20% of this species population is expected to be directly impacted during this phase. Indirect impacts during this phase are likely to be negligible. During this phase, minor habitat degradation or disturbance of leopard habitat and disturbance to leopard prey species is expected. Some leopards may be affected and displaced into neighbouring territories, which may result in the loss of some leopards (especially adult males and young). This impact will be mainly temporary.	Leopard have a wide distribution throughout the park, and relatively high adaptability and tolerance to disturbance (compared to other predators such as lion). Direct impacts are likely to affect the leopard population in MFNP through habitat degradation, loss of connectivity, disturbance (visual, noise, vibration), project vehicle-animal collisions, change in prey availability, and competition between individual leopards. Project induced access and in-migration will lead to a number of indirect impacts (increased habitat loss, disturbance, zoonotic disease transmission, fire risk, hunting, human-wildlife conflict. fatalities (poisoning, snares/traps etc.) and vehicle-animal collisions). These direct and indirect impacts may affect leopard at the population level if mitigation measures are not implemented. Impacts might last beyond that phase.	Although direct impacts will be reduced, indirect impacts could be significant during this phase, especially related to in-migration and induced access which could increase pressure on leopard and their habitat. Significant impact on the leopard could be expected, especially if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Increase in road traffic and human in-migration into the area will impact leopard, creating disturbance and barrier effects and increasing potential road mortality. Although direct impacts will be reduced during this phase, in-migration to the area may increase habitat loss, fire risk, disease transmission, prey species availability, and human-wildlife conflict. Some of these effects may be permanent.	Impacts during this phase should be less significant, as there will be less workers and less Project-related traffic. Decommissioning works will lead to moderate degradation of habitat and/or disturbance of ecological function. Impacts of new human settlements, new/ improved roads and increased traffic will be irreversible.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**MEDIUM**	**MEDIUM**	**LOW**
Justification of in-combination sensitivity	Leopards occupy a wide range of habitats, including outside of the	Construction of supporting and associated facilities will cause disturbance,	Increased Project induced-migration leading to an increase of injuries and	Disturbance and habitat loss and increased Project induced-migration

Leopard, *Panthera pardus*				
	Park. Site clearance for supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. Increased disturbance and habitat loss to leopard and prey species, and temporary barrier effects.	habitat loss and degradation, especially if these activities take place at night. Increased Project induced-migration leading to an increase of injuries and mortality due to poisoning/snares/ traps and increase road traffic collisions etc.	mortality due to poisoning /snares/ traps and increase road traffic collisions etc.	leading to an increase of injuries and mortality due to poisoning /snares/ traps and increase road traffic collisions etc.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Leopards are found throughout the MFNP as well as outside of the park and have a preference for wide habitats, although the more enclosed habitats make it easier for them to ambush prey. The main impact on leopards, in addition to human interactions, is if prey species are displaced though temporary or permanent loss of habitat or impacts on wallows, watering holes and other wetlands areas near the delta, where prey may congregate. In those cases the leopards will most likely move to where the prey species are. Project works (drilling and operations) will cause disturbance, to leopards and also to their preferred prey species, which could result in leopards moving into the territories occupied by other leopards. This may lead to increased population loss, especially among adult males and young. Being mainly nocturnal, any night time Project activities will be especially disruptive to leopard behaviour, if this activity falls within a leopard's territory however night time activity within MFNP will be limited. An increase in vehicle traffic from Project construction vehicles and indirectly through in-migration will create disturbance to leopards and also to their preferred prey species. Vehicles speeds whilst driving through the park will be restricted to reduce dust emissions and avoid vehicle-animal collisions. Indirect impacts will also be potentially significant. Recent assessments show MFPA capacity to manage threats is not yet optimal. Building capacity takes time and therefore must start well in advance of forecast indirect impacts.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Although the Project will mean direct loss of habitat with the MFNP, mitigation should prevent loss or damage to habitat outside of the project footprint. Nevertheless, as this represents core habitat for prey species for leopard this loss can be defined as significant. **Population changes** The leopard population is likely to be declining and the additional mitigation measures proposed should avoid acceleration of that decline. **Disturbance** This will be minimised although there will still be disturbance through this phase, particularly from the presence of people and vehicle movements within the park. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. During operation, existence of infrastructure in the landscape may still create some barrier effects, where			

Leopard, *Panthera pardus*				
	well pads are located close to each other. During decommissioning, barrier effects will be similar to the site clearance phase and, where pipelines are to be removed, the pre-commissioning phase. Scheduling of works should consider preventing barrier effects as much as practicable. . In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be temporary degradation of leopard habitat in MFNP, together with increased disturbance (visual/ noise/ vibration). This will result in a low residual significance impact. Residual impacts will be a temporary loss of habitat and disturbance to leopards and prey species.	There will be temporary degradation of leopard habitat in MFNP, along with increased disturbance (visual/ noise/ vibration) to leopards and to prey species, increased competition among individual leopards which could lead to increased injury/kill, increased vehicle traffic, and an increase in fire risks. This will result in a low residual significance impact. Residual impacts will be a loss of habitat and temporary disturbance and an increase in human – wildlife conflict leading to mortalities. However, these can be significantly reduced if mitigation is well-managed and effective.	There will be degradation of leopard habitat due to Project induced in-migration. There will be increased disturbance (visual/ noise/ vibration) to leopard and prey species, increased inter-species competition, and potentially increased injuries/mortality from human-wildlife conflict, and increased fire risks, which will result in a low residual significance impact. Residual impacts will be a loss of habitat and disturbance and possible population loss, however if mitigation is well-managed and effective, then minimum impacts should occur on the leopard population of MFNP.	There will be temporary degradation of leopard habitat in MFNP, increased disturbance (visual/ noise/ vibration), and increased injuries/mortality from snares, and fire risks, which will result in a low residual significance impact. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Giant pangolin, *Smutsia gigantean*						
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Other Notable Species (not CHQS)						
Giant pangolin	CR	N/A	B	D	Has been recorded in Bugungu WR, Budongo & Buliisa CA.	MEDIUM
Giant pangolin, *Smutsia gigantean*						
SPECIES OVERVIEW						
Biodiversity significance	**Giant pangolin** is globally VU and nationally CR. It has recently been included in Appendix I of CITES.					
Species Ecology	Giant pangolin occur in lowland tropical moist and swamp forest, and in forest-savanna-cultivation mosaic habitats. It feeds exclusively on ants and termites. A terrestrial nocturnal species, animals spend the daytime resting under piles of plant debris, in thickets, under fallen tree roots, in partially opened termite mounds, or in burrows. In addition to habitat loss through deforestation and logging, pangolin are subject to widespread exploitation for bushmeat and traditional medicine. In the Study Area pangolin is associated with Bugungu WR, Budongo FR and savanna areas.					
Habitat Preference	Landscape Contexts B (savanna corridor) and D (Tropical High Forest)					
Population & Trends	Populations are likely to be declining due to hunting for bushmeat, traditional medicines and for export. Forest habitats are continually under threat and loss of habitat is likely to be major factor in their decline.					
Summary of state of knowledge	There is limited detailed data available on the giant pangolin status of leopards in MFNP. Therefore the precautionary principle should be adopted for this species when considering mitigation.					
POTENTIAL IMPACTS: ALL PROJECT PHASES						
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** This species is associated with Landscape contexts B (Savanna Corridor) and D (Tropical High Forest). The Tilenga Project Footprint does not include these areas directly so direct impacts on this species are unlikely. **Population changes** Widening or realignment of oil roads through forest and other areas is likely to increase vehicle traffic and potential vehicle-animal collisions, which may lead to minor road casualties. **Disturbance** Widening or realignment of oil roads through forest and other areas may create disturbance due to Project vehicles on oil road. **Barrier effects** Widening or realignment of oil roads through forest and other areas is likely to increase vehicle traffic which may create barrier effects.					
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** New Project oil roads and other access improvements in the region are likely to lead to improved access and in-migration. People are likely to be attracted to the wider area in search of employment and other economic opportunities. This is likely to have indirect impacts on this species through habitat loss and degradation due to increased human settlement and subsequent land-use change. **Population changes** Human activity within forest and other areas are very likely to impact on population stability of pangolin due to poaching, disturbance, loss of suitable habitat, increased fire risk and disease. **Disturbance** Induced human population changes in the landscape may potential increase levels of disturbance for pangolin. There is likely to be an increase in vehicles traffic on oil roads, which would increase the					

Giant pangolin, *Smutsia gigantean*				
	risk of vehicle-animal collisions and road kills. **Barrier effects** Widening or realignment of oil roads through forest and other areas is likely to increase the amount of non-project related traffic on roads, which may create barrier effects. Land use changes where forests areas are lost or fragmented is also likely to create barriers to movement and dispersal of pangolin.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**LOW**	**LOW**	**LOW**	**LOW**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact Magnitude	Only a small proportion of the giant pangolin population are expected to be impacted during this phase, probably corresponding to less than 10% for each species, given the limited extent of direct impacts, the smaller duration of this phase which would also limit the effect of indirect impacts. During this phase, minor habitat degradation or disturbance is expected. Change during this phase will result in a Moderate significant impact on pangolin and/or their habitat. This impact will be mainly temporary.	Direct impacts will lead to loss of habitat and degradation in the area of works; however indirect impacts are expected to be more significant due to in-migration and land-use change, possibly affecting pangolin at the population level if mitigation measures are not implemented. Therefore, between 10% and 20% of the population of this species could be affected through direct and indirect impacts, notably through loss of habitat or degradation and disturbance (noise, vibration and artificial lighting) and an increase in fire risks. Many people will move to the area during the construction phase to work for the Project or in search of work and economic opportunities. This will increase the potential indirect impacts, through a possible increase in demand for land. Road improvements and pipeline construction will likely result in	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Project in-migration will likely result in moderate habitat degradation or disturbance, an increase in fire risks, and an increase in poaching of pangolin for meat and for trafficking their scales) leading to reduction in species population, habitat functionality, or protected site integrity, including connectivity. Without mitigation, between 10% and 20% of the giant pangolin population could be affected during this phase through habitat loss or degradation and disturbance and impact could result in change in conservation status of the species or habitat. The direct impact will be medium term, lasting between 5 and 10 years (the time for vegetation to grow	During this decommissioning phase, indirect impacts will be the most significant. It is expected that between 10% and 20% of the giant pangolin population could be impacted through habitat degradation and disturbance, increased and continued pressure from indirect impacts, such as habitat loss from land-use change, fire risks and an increased threat of poaching for meat and trafficking for scales. Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction in species habitat coverage or functionality, or protected site integrity, including connectivity, will occur. The impact will be moderate significance, lasting between 5 and 10 years, but indirect impacts of in-migration may be

Giant pangolin, *Smutsia gigantean*				
		moderate habitat degradation and/or disturbance, and improve access to the area. This will in turn lead to an increased threat of poaching for meat and trafficking of pangolin scales, potentially leading to a reduction in their numbers and to a potential loss of habitat and connectivity. Impacts might last beyond that phase.	back), but indirect impacts related to induced access and in-migration may be permanent.	permanent.
Potential Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**MODERATE**	**MODERATE**	**LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. In this landscape, giant pangolins are found in tropical high forests and the savanna corridor. Minor Increased disturbance and habitat loss and degradation may affect pangolin but these are likely to be temporary.	Construction of supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. Increased Project induced-migration leading to land-use change will further increase habitat loss and degradation, disturbance (noise, vibration, artificial lighting), fire risks and poaching pressure leading to a population loss.	Increased Project induced-migration leading to land-use change will further increase habitat loss and degradation, disturbance (noise, vibration, artificial lighting), fire risks and poaching pressure, leading to a population loss.	The decommissioning phase will lead to disturbance and habitat loss, especially if these activities take place at night. Increased disturbance (noise, vibration, artificial lighting), fire risks and increased poaching pressure may lead to a population loss.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Induced changes in populations and the pressures that they create on the landscape could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Long-term strategies to tackle the increasing threat of poaching will need to be developed. As with the other eight species of pangolin inhabiting Africa and Asia, the giant pangolin is subject to heavy hunting pressures. Individuals are hunted for their meat, which may be consumed locally or traded as wild meat, and for their scales, which are used for cultural and ethno-medicinal purposes, including in traditional African medicine, and is regularly recorded in bushmeat markets (Waterman et al. 2014). The species is occasionally recorded in international trade. Intercontinental trade is a growing threat to Africa's pangolins; in 2012 an unknown quantity of Giant Ground Pangolin scales from Guinea were seized by Belgium customs *en route* to China, suggesting there is intercontinental trade in this species from Africa to Asia. As this species appears to be heavily exploited throughout its range, it is likely threatened with extirpation wherever human populations are high or marketing networks along forest roads and rivers are in operation. Its large size, low reproductive rate and terrestrial habits			

Giant pangolin, *Smutsia gigantean*				
	make it particularly vulnerable to over-exploitation (Ref. 14-A35). Key focus should be on raising awareness among communities that it is illegal to hunt pangolin and that they are listed globally as Vulnerable and nationally as Critical. The UWA should have their capacity strengthen to be able to cope with the extra demands of protected species from an ever increasing population and subsequent demand for bushmeat.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Should long term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats and reduce poaching, if effective, should reduce or avoid pressures on species population. **Disturbance** Mitigation to protect habitats and reduce poaching and human access generally should reduce or avoid pressures on disturbance. **Barrier effects** Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be minor loss and degradation of habitat affecting giant pangolin during this phase, together with disturbance (lighting/ noise/ vibration). This is expected to lead to low significance residual impacts after effective additional mitigation are implemented by the Project. Residual impacts will be habitat loss and degradation affecting the population.	Degradation of pangolin habitat, together with increased disturbance (lighting/ noise/ vibration), project induced access and in-migration will result in low significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Particular attention will need to be placed on minimising effect of Project works taking place at night, when this species is active, and reducing the threat of poaching. Residual impacts will include direct and indirect habitat loss and increased poaching pressure. .	Indirect impacts are expected to be the most significant during this phase. Degradation of habitat, due to increased traffic along oil roads. Project induced access and in-migration will result in low significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Residual impacts will include direct and indirect habitat loss and an increase in poaching pressure (for meat and trafficking of scales), which will adversely affect the pangolin population.	Impacts should be reduced during the decommissioning phase, as the size of the Project will decrease and less workers will be present on-site. Degradation of habitat, together with increased disturbance (lighting/noise/ vibration), increased fore risks and increased poaching pressures, due to project induced in-migration will have a moderate significance impact; however mitigation measures should be effective when reaching this phase of the Project and restoration activities should start to be effective as well. This can lead to a low residual significance impacts. Residual impacts are expected to be

Giant pangolin, *Smutsia gigantean*				
				less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**INSIGNIFICANT**	**LOW**	**LOW**	**LOW**

Peters' Mouse *Mus setulosus*
Ethiopian Pygmy Mouse / Mahomet Mouse Mus Mahomet
Bunyoro rabbit *Poelagus marjorita*
Alexander's cusimanse *Crossarchus alexandri*

Mammals	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Other Notable Species (not CHQS)					
Peters' Pygmy Mouse	DD	N/A	A B	Recorded in MFNP and likely to be present in similar habitat outside of the PA.	MEDIUM
Ethiopian Pygmy Mouse / Mahomet Mouse	DD	N/A	A B	Recorded in MFNP, Kabwoya FR and Bugungu WR.	MEDIUM
Bunyoro rabbit	VU	N/A	B	Has been recorded in Bugungu WR, Budongo & Buliisa CA.	MEDIUM
Alexander's cusimanse	VU	N/A	B D	Recorded in Bugungu WR, Budongo & Buliisa CA.	MEDIUM

Peters' Pygmy Mouse *Mus setulosus*

Ethiopian Pygmy Mouse / Mahomet Mouse Mus Mahomet

Bunyoro rabbit *Poelagus marjorita*

Alexander's cusimanse *Crossarchus alexandri*

SPECIES OVERVIEW	
Biodiversity significance	**These species have been assessed together because although they belong to different taxa, they occupy a similar range of habitats, which are vulnerable to similar types of direct and indirect impacts.** **Peters' Pygmy Mouse** is globally LC and nationally DD. This species it has a very wide range, occurring across central Africa and no major threats known. Populations are presumed to be locally common. It is associated with grassland clearings in high forest, or more open woodlands. During the surveys undertaken by Tilenga ESIA team individuals were recorded at various well pad sites indicating association with Landscape Context A (MFNP). **Ethiopian Pygmy Mouse / Mahomet Mouse** is globally LC and nationally DD. It has been recorded in Kabwoya FR and Bugungu WR. Two examples of this species were captured by the Tilenga ESIA ecology team at well pad JBR-09 during 2017. Landscape Context A (MFNP) and B (savanna corridor). **Bunyoro Rabbit** is globally LC and nationally VU. It exists primarily in moist savanna grassland, woodlands with rocky outcrops, and less prominently in forested areas. It has been recorded in Bugungu WR and Buliisa CA and therefore within Landscape Context B (savanna corridor). Population densities and distribution are little known, although it appears to be a widespread species that does not appear to be in decline, and is present in several protected areas. It exists primarily in moist savanna grassland, woodlands with rocky outcrops, and less prominently in forested areas and has been recorded in Bugungu WR and Buliisa CA and therefore within Landscape Context B (savanna corridor). **Alexander's Cusimanse** is globally LC and nationally VU. This species of mongoose is endemic to central Africa, confined to rainforest in DR Congo and also present in western Uganda. Within the Study Area it has been recorded in Bugungu WR, Budongo & Buliisa CA and therefore with Landscape Contexts B (savanna corridor) and D (Tropical High Forest).
Species Ecology	Peters' Mouse is associated with grassland clearings in high forest, or more open woodlands. It is not known if this species is commensal. Mahomet Mouse is globally LC and nationally DD. The species is found in montane forests, scrublands and grasslands. It typically inhabits secondary scrubland and seems to be able to easily adapt to grasslands that have recently been cleared. There are no major threats to this species. The clearance of forest fuel and cropland appears to be a minor threat to the species habitat.

Peters' Pygmy Mouse *Mus setulosus* **Ethiopian Pygmy Mouse / Mahomet Mouse** Mus Mahomet **Bunyoro rabbit** *Poelagus marjorita* **Alexander's cusimanse** *Crossarchus alexandri*	
	Bunyoro Rabbits are nocturnal, hiding during the day in a form in dense vegetation or a hole among rocks and coming out to feed as part of a family group at night. Its diet consists of grasses and flowering plants and it likes the succulent young shoots that sprout from the ground after land has been cleared or burned. When living in proximity to cultivated land, it feeds on rice and peanut plants. They are predated by small to medium sized predators (owls, hawks, servals, genets etc.). Breeding seems to occur at any time of year. The gestation period is about five weeks and one or two altricial young are born in a breeding hole, the entrance of which is loosely blocked with soil or grass. Alexander's Cusimanse is endemic to central Africa, confined to rainforest in DR Congo and also present in western Uganda and is an important bushmeat species in some societies. Within the Study Area it has been recorded in Bugungu WR, Budongo & Buliisa CA and therefore with Landscape Contexts B (savanna corridor) and D (Tropical High Forest).
Habitat Preference	Generally found across various habitats, including savanna (Landscape Contexts A and B) and forest habitats (Landscape Context D).
Population & Trends	Unknown.
Summary of state of knowledge	There is generally little detailed information on these species. A small mammal survey to establish distribution, and population densities should be undertaken within proposed well pad sites. Therefore, the precautionary principle should be adopted when assessing the direct and indirect impacts of Project activities on these species.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** As with other receptors the direct loss of habitats from construction of well pads and pipelines are likely to affect these species. Smaller mammals prefer areas with more cover, such as thicket and bushes, and are less likely to be found in open savanna where there may be insufficient cover. The larger Bunyoro rabbit and Alexander's cusimanse (a kind of mongoose) could be found in more open areas of savanna. **Population changes** Not much is known about population levels of these species. Loss of suitable habitat may affect population levels of these species as well as poaching and other activities. Project vehicles are likely to increase the amount of traffic on oil roads and this could result in vehicle-animal collisions and increased mortality. Fire risks are likely to pose a threat to these species, as they tend to live in dense scrub and thickets. **Disturbance** These species are generally nocturnal, sheltering by day in burrows (the cusimanse also occasionally occupies tree hollows), and are less likely to be disturbed by activities at the project sites. However, artificial lighting and night time works activities (noise/vibration) will disturb these animals if they inhabit areas close to Project area. **Barrier effects** Small mammals may not be able to cross excavations particularly long linear trenches required for pipeline work. In addition, species may become trapped in open excavations and will not survive if there is no way for them to get out. Project vehicles are likely to increase the amount of traffic on oil roads and this could create barriers.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** Project induced in-migration is likey to lead to people settling in the area resulting in land-use change, which is likely to lead to habitat loss and degradation. **Population changes** Project induced in-migration is likely to result in land-use changes and loss of suitable habitat, which may affect population levels of these species. Increased fire risk is likely to pose a threat to these species. As humans settle in the landscape there is likely to be an increase in poaching and other

Peters' Pygmy Mouse *Mus setulosus* **Ethiopian Pygmy Mouse / Mahomet Mouse** Mus Mahomet **Bunyoro rabbit** *Poelagus marjorita* **Alexander's cusimanse** *Crossarchus alexandri*				
	activities. The Bunyoro rabbit and Alexander's cusimanse are particularly at risk from increased poaching for bushmeat, which, if not controlled, could have a significant impact on local populations of these species. Human in-migration are likely to result in an increase in vehicles along oil roads, which could increase the number of vehicle-animal collisions and road kills. More people living in the area could increase the risks of a fire outbreak, which would be a major threat to these species. **Disturbance** Being nocturnal these species are likely to be disturbed by artificial lighting from settlements. As more people move into the area, the number of vehicles will increase, leading to disturbance. **Barrier effects** Land use changes where forests or savanna areas are lost or fragmented are likely to create barriers to movement of species.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Only a small proportion of the population of these species is expected to be impacted during this phase, probably less than 10% for each species, given the limited extent of direct impacts, the smaller duration of this phase which would also limit the effect of indirect impacts. During this phase, minor habitat loss and degradation, and disturbance are expected. Change during this phase will result in a Moderate significant impact on these species and/or their habitat. This impact will be mainly temporary.	Direct impacts are likely to be affecting these species through habitat degradation and disturbance and increased fire risks. Indirect impacts are likely due to in-migration and land-use change, possibly affecting these species at the population level if mitigation measures are not implemented. Therefore, between 10% and 20% of the population of these species could be affected through direct and indirect impacts, notably through loss of habitat and degradation, disturbance, such as noise, vibration and lighting, and fire risks. Impacts might last beyond that phase.	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of the population of these species could be affected during this phase through habitat loss or degradation and disturbance which could result in change in conservation status of these species or their habitat.. Project in-migration will likely result in moderate habitat degradation, increased fire risks, and disturbance, leading to reduction in species population. The direct impact will be medium term,	During this phase, indirect impacts will be the most significant. It is expected that between 10% and 20% of the population of these species will be impacted. During this phase direct impacts will lead to habitat degradation and disturbance. Indirect impacts from Project induced in-migration will lead to increased and continued pressure from impacts, such as habitat loss and fire risk due to land-use change. Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction in habitat coverage or functionality, or

Peters' Pygmy Mouse *Mus setulosus* **Ethiopian Pygmy Mouse / Mahomet Mouse** Mus Mahomet **Bunyoro rabbit** *Poelagus marjorita* **Alexander's cusimanse** *Crossarchus alexandri*				
			lasting between 5 and 10 years (the time for vegetation to grow back), but indirect impacts related to induced access and in-migration may be permanent.	protected site integrity, including connectivity The impact will be low significance, lasting between 5 and 10 years, but indirect impacts of in-migration may be permanent.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
In-combination effects				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause habitat loss and degradation, increased fire risk, and disturbance, especially if these activities take place at night.	Construction of supporting and associated facilities will cause habitat loss and degradation, and disturbance, especially if these activities take place at night. Increased Project induced-migration leading to land-use change will lead to further habitat loss and degradation, poaching, and increased fire risk.	Increased Project induced-migration leading to land-use change will lead to habitat loss and degradation, increased fire risk and poaching. Bunyoro rabbit and Alexander's cusimanse are frequently hunted for bushmeat.	This phase will lead to habitat loss and degradation, increased fire risk, and disturbance especially if these activities take place at night.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	The footprint of works should be minimised to ensure that the smallest project footprint and therefore loss of habitat is achieved. General mitigation to avoid disturbance, poaching and burning of habitats will be enforced. Erosion, run off and spread of soils and contaminants from the sites will also ensure that fringing habitats are not degraded during and following works activities. A maximum length of open trench of 1km will be implemented for the flowlines. Where excavations are left open means of escape, such as ramps, should be put in place so that if any animal falls in they can escape. Sites will be restored as soon as practicable to minimise the time and extent of habitat loss and to allow habitats to regenerate as soon as possible. Discussions with UWA regarding burning regimes will also help to provide cover for species and reduce pressures on them associated with development works. Obtrusive lighting can be a disturbance to many nocturnal animals, interfering with certain behaviour (such as foraging). Lighting will be controlled to minimise light spillage by using directional lighting and avoid light spillage over suitable habitat for these mammals where practicable, such as areas of dense thicket and bush outside the perimeter of the well pad. Lighting can also leave small nocturnal species more vulnerable to predation			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact (all	**Loss, degradation or fragmentation of species habitat** Minimisation of habitat loss should prevent significant impact on these various small mammal			

Peters' Pygmy Mouse *Mus setulosus* **Ethiopian Pygmy Mouse / Mahomet Mouse** Mus Mahomet **Bunyoro rabbit** *Poelagus marjorita* **Alexander's cusimanse** *Crossarchus alexandri*				
phases)	species. Speedy and effects restoration will also assist. **Population changes** Mitigation to protect habitats and reduce poaching, if effective, should reduce or avoid pressures on species populations. **Disturbance** Controls on human presence outside of working areas should reduce and avoid disturbance effects. **Barrier effects** Mitigation such as keeping works on pipeline sections short will minimise barrier effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Residual Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be minor loss and degradation of habitat affecting these species during this phase, together with disturbance lighting/ noise/ vibration). This is expected to lead to an insignificant significance residual impacts after effective additional mitigation are implemented by the Project. Residual impacts will be habitat loss and degradation affecting these species populations.	Degradation of habitat, together with increased disturbance (lighting/ noise/ vibration), project induced access and in-migration will result in a low significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Particular attention will need to be placed on minimising effect of Project works taking place at night, when these species are active. Residual impacts will include direct and indirect habitat loss leading to habitat loss and degradation, increased fire risk and poaching affecting these species populations. .	Indirect impacts are expected to be the most significant during this phase. Degradation of habitat, due to increased traffic Project induced access and in-migration will result in a low significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Residual impacts will include direct and indirect habitat loss and degradation, increased poaching and fire risks.	Impacts should be reduced during the decommissioning phase, as the size of the Project will decrease and less workers will be present on-site. Degradation of habitat, together with increased disturbance (lighting/noise/ vibration), due to project induced in-migration will generate impact; however mitigation measures should be effective when reaching this phase of the Project and restoration activities should start to be effective as well. This can lead to a low residual significance impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Duke of Abruzzi's Free-tailed Bat, *Chaerephon aloysiisabaudiae*

Bibundi Butterfly Bat, *Glauconycteris Egeria*

Mongalia Free-tailed Bat, *Mops demonstrator*

Light winged Lesser House Bat, *Scotoecus albofuscus*

Silvered Bat, *Glauconycteris argentata*

Mammals	Uganda Red List	PS6 Criterion	Landscape Context		General Location	Receptor Sensitivity
Other Notable Species (not CHQS)						
Duke of Abruzzi's Free-tailed Bat	VU	N/A	B	D	Recorded from lowland tropical moist and dry forest, including Wambabya Forest	MEDIUM
Bibundi Butterfly Bat	DD	N/A	B	D	Recorded in Bugungu WR and Budongo FR	MEDIUM
Mongalla Free-tailed Bat	VU	N/A	B	D	Found in open and dry savanna and Saharan grasslands. Recorded in Wambabya FR.	MEDIUM
Light winged Lesser House Bat	DD	N/A	A	B	Recorded in MFNP.	MEDIUM
Silvered bat	VU	N/A	B	D	Found in open and dry savanna and Saharan grasslands. Recorded in Wambabya FR.	MEDIUM

Duke of Abruzzi's Free-tailed Bat, *Chaerephon aloysiisabaudiae*

Bibundi Butterfly Bat, *Glauconycteris Egeria*

Mongalla Free-tailed Bat, *Mops demonstrator*

Light-winged Lesser House Bat, *Scotoecus albofuscus*

Silvered Bat, *Glauconycteris argentata*

SPECIES OVERVIEW

Biodiversity significance	**These species have been grouped because they are all bat species associated with forest habitat and are therefore likely to be vulnerable to the same types of indirect impacts.** **Duke of Abruzzi's Free-tailed Bat** is globally LC and nationally VU and has been recorded in west and central Africa. In the project area it has been recorded at Wambabya FR. This species has been recorded from lowland tropical moist and dry forest, dry savanna and more marginally from moist savanna and therefore with Landscape Contexts B (savanna corridor) and D (Tropical High Forest). **Bibundi Butterfly Bat** is globally DD and nationally DD. Little is known about the natural history of this species but it appears to be associated with forests and has been recorded in Bugungu WR and Budongo FR. On this basis it may be associated with Landscape Contexts B (savanna corridor) and D (Tropical High Forest). **Mongalla Free-tailed Bat** is globally LC and nationally VU. This bat has been patchily recorded from West Africa and Central to East Africa. This species is found in open and dry savanna and Saharan grasslands. It might be associated with large rivers, especially in the north eastern part of the range. Main threats are habitat loss. This species was recorded in Wambabya FR and therefore may be associated with Landscape Contexts B (savanna corridor) and D (Tropical High Forest). **Light-winged Lesser House Bat** is globally DD and nationally DD. This species has been recorded over much of West Africa and East Africa, with some records from Central Africa. Its natural history is not well known but may be associated with woodlands and savanna. During the surveys undertaken by Tilenga ESIA team individuals were recorded at well pads JBR-03 and JBR-06, indicating association with Landscape Context A (MFNP) and B (savanna corridor). **Silvered Bat** is globally LC and nationally DD. This species has been recorded across east and central Africa. Individuals have been recorded from lowland tropical moist forest and moist savanna habitats. During the surveys undertaken by Tilenga ESIA team individuals were recorded at well

Duke of Abruzzi's Free-tailed Bat, *Chaerephon aloysiisabaudiae* **Bibundi Butterfly Bat,** *Glauconycteris Egeria* **Mongalla Free-tailed Bat,** *Mops demonstrator* **Light-winged Lesser House Bat,** *Scotoecus albofuscus* **Silvered Bat,** *Glauconycteris argentata*	
	pads JBR-08 and JBR-08. This species is likely to be associated with Landscape Context A (MFNP) and B (savanna corridor) but may also be associated with Landscape Context D.
Species Ecology	Little is known about the ecology of these bats; however they are all threatened by habitat loss. Mongalla Free-tailed Bat is known to often roost in fissures and cracks of tree trunks (including *Vitex doniana*) and large branches of savanna trees.
Habitat Preference	These bat species are generally associated with savanna and forest habitats. Once of these species (Light-winged Lesser House Bat) was recorded within the MFNP during field surveys in 2017.
Population & Trends	Unknown.
Summary of state of knowledge	Very little is known about the ecology and population of these bats. It is not known if the species can persist in degraded, or secondary, forest habitats. A survey would be required to determine if bats are roosting or foraging close to well pads and flowlines prior to vegetation clearance. Therefore, the precautionary principle should be adopted when assessing the direct and indirect impacts of Project activities on these bats.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** There may be loss or degradation of habitats, including seasonal wetlands, which are important feeding areas for these bats. **Population changes** Increased human activity within savanna may impact on population growth due to disturbance, loss of suitable habitat or disease. **Disturbance** Increased light levels and night working may disturb these species if there are roosts, foraging or commuting flight lines that intercept well pads, flowlines and oil roads. Obtrusive artificial lighting may attract invertebrate species, which may disrupt foraging behaviour and food availability for these bats. If flying invertebrates are attracted to Project lighting then this may attract bats, leaving them more vulnerable to predation from night predators (e.g. owls, bat hawk (*Macheiramphus alcinus*)). **Barrier effects** Widening or realignment of oil roads through forest areas is likely to be associated with increased Project related traffic, which may create barrier effects. Land use changes where savanna areas are lost or fragmented are likely to also create barriers to movement of bats.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** These species is associated with savanna and forest landscapes. The Project Footprint does not generally include forest areas but there are potential indirect impacts on forests and other areas due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land-use change and degradation of habitats. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Increased and uncontrolled human activity within savanna and forest areas may impact on population growth due to disturbance and loss of suitable habitat. If trees containing roosts are cleared then this is likely to impact on the bat population. **Disturbance** Induced population changes in the landscape may potential increase levels of disturbance for bats. Increased artificial light levels may also disturb these species, as will loss or degradation of seasonal wetlands over which they may feed.

Duke of Abruzzi's Free-tailed Bat, *Chaerephon aloysiisabaudiae* **Bibundi Butterfly Bat,** *Glauconycteris Egeria* **Mongalla Free-tailed Bat,** *Mops demonstrator* **Light-winged Lesser House Bat,** *Scotoecus albofuscus* **Silvered Bat,** *Glauconycteris argentata*				
	Barrier effects Widening or realignment of oil roads through forest areas is likely to lead to an increase in non-project related traffic on roads, which may create barrier effects. Land use changes where forests or savanna areas are lost or fragmented are likely to will also create barriers to movement of bats.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Potential Direct Impact	**LOW**	**LOW**	**LOW**	**LOW**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Only a small proportion of these bat species populations are expected to be impacted during this phase, probably corresponding to less than 10% for each species, given the limited extent of direct impacts, the smaller duration of this phase which would also limit the effect of indirect impacts. During this phase, minor habitat degradation or disturbance of potential bat roosting and foraging habitat is expected. Change during this phase will result in a Low significant impact on bats and/or their habitat. This impact will be mainly temporary.	Direct impacts are likely to be affecting several bat species roosting or foraging in the area of works; however indirect impacts are expected to be more significant due to in-migration and land-use change, possibly affecting bats at the population level if mitigation measures are not implemented. Therefore, between 10% and 20% of the population of these bat species could be affected through direct and indirect impacts, notably through loss of trees for roosting, and loss or degradation to foraging areas (e.g wetlands), and disturbance, such as noise, vibration and lighting. Road improvements and pipeline construction will likely result in moderate habitat degradation and/or disturbance, and improve access to the area. This will in turn affect several bat species living inside and outside of	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Project in-migration will likely result in moderate habitat degradation or disturbance, leading to reduction in species population, habitat functionality, or protected site integrity, including connectivity. Without mitigation, between 10% and 20% of the bat population could be affected during this phase through habitat loss or degradation and disturbance. And could result in change in conservation status of the species or habitat. The direct impact will be medium term, lasting between 5 and 10 years (the time for vegetation to grow back), but indirect impacts related to induced access and in-	During this decommissioning phase, indirect impacts will be the most significant. It is expected that between 10% and 20% of these bat species population could be impacted during this phase through habitat degradation and disturbance, increased and continued pressure from indirect impacts, such as habitat loss from land-use change. Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction in species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Impacts likely to affect several bat species and their habitat. The impact will be low significance, lasting between 5 and 10 years, but indirect impacts of in-migration may be permanent.

Duke of Abruzzi's Free-tailed Bat, *Chaerephon aloysiisabaudiae* **Bibundi Butterfly Bat,** *Glauconycteris Egeria* **Mongalla Free-tailed Bat,** *Mops demonstrator* **Light-winged Lesser House Bat,** *Scotoecus albofuscus* **Silvered Bat,** *Glauconycteris argentata*				
		protected areas, potentially leading to a reduction in their numbers and to a potential loss of habitat and connectivity. Impacts might last beyond that phase.	migration may be permanent.	
Potential Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
In-combination effects				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. These bat species occupy a wide range of habitats, mostly outside of the park in forest areas (Bugungu, Wambabya and Budongo) as well as savanna areas within the Park and savanna corridor. Increased disturbance and habitat loss to potential roosting sites will have an effect on these bats species, if their roosts or preferred feeding habitats lie with the Project works area.	Construction of supporting and associated facilities will cause disturbance, habitat loss and degradation, especially if these activities take place at night. Increased Project induced-migration leading to land-use change will further disrupt the roosting, foraging, commuting and social behaviour of bats, leading to a population loss.	Increased Project induced-migration leading to land-use change will further disrupt the roosting, foraging, commuting and social behaviour of bats, leading to a population loss. This may lead to a disruption of roosting, foraging, commuting and social behaviour of these bats, leading to a population loss.	The decommissioning phase will lead to disturbance and habitat loss, especially if these activities take place at night. Increased disturbance and habitat loss to potential roosting sites will have an effect on these bats species, if their roosts or preferred feeding habitats lie with the Project works area. This may lead to a disruption of roosting, foraging, commuting and social behaviour of these bats, leading to a population loss.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Most bat species are associated with savanna and forest habitats and areas with trees as they tend to use tree-lines to navigate at night. Many of the bat species known or recorded in the area feed over wetlands/water, where insects congregate, and therefore any activities that impact on water resources and seasonal wetlands may affect these species. Lighting at sites can deter bats at night and interfere with commuting, foraging and roosting behaviours. On the other hand, lighting which attracts insects can also attract bats, although this may make them more vulnerable to predators (e.g. owls, bat hawks). Induced changes in populations and the pressures that they create on the landscape could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Long term strategies to protect and enhance forest habitats, reconnect fragments and prevent detrimental land use changes will have to be developed.			

RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact (all phases)	**Loss, degradation or fragmentation of species habitat** Should long term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats, if effective, should reduce or avoid pressures on species population. **Disturbance** Mitigation to protect habitats and reduce poaching and human access generally should reduce or avoid pressures on disturbance. **Barrier effects** In order to limit disturbance to roosting, commuting, foraging bats, lighting should be non-obtrusive and directional; directed away from trees during widening of oil roads. Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Residual Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	There will be minor loss and degradation of habitat affecting several bats species during this phase, together with disturbance lighting/ noise/ vibration). This has been assessed as having an insignificant significance residual impacts after effective additional mitigation are implemented by the Project. Residual impacts will be loss of roosting potential, foraging habitat and connectivity affecting several bat species populations.	Degradation of bat habitat, together with increased disturbance (lighting/ noise/ vibration), project induced access and in-migration will result in a low significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Particular attention will need to be placed on minimising effect of Project works taking place at night, when bats are active. Residual impacts will include direct and indirect habitat loss leading to a loss in roosting potential, foraging habitat and connectivity affecting several bat species populations.	Indirect impacts are expected to be the most significant during this phase. Degradation of habitat, due to increased traffic Project induced access and in-migration will result in a low significance of residual impacts if effective mitigation measures are implemented early on in the Project phase. Residual impacts will include direct and indirect habitat loss leading to a loss in roosting potential, foraging habitat and connectivity affecting several bat species populations.	Impacts should be reduced during the decommissioning phase, as the size of the Project will decrease and less workers will be present on-site. Degradation of habitat, together with increased disturbance (lighting/noise/ vibration), due to project induced in-migration will have a moderate significance impact; however mitigation measures should be effective when reaching this phase of the Project and restoration activities should start to be effective as well. This can lead to a low residual significance impacts. Residual impacts are expected to be less significant for this phase if direct and indirect impacts have been well-managed throughout previous phases of the Project.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Birds

Nahan's Partridge, *Ptilopachus nahani*						
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species						
Nahan's Partridge	VU	VU	1ae, 2b	D	Found in tropical forest, probably outside the direct Project footprint	HIGH

Nahan's Partridge, *Ptilopachus nahani*	
SPECIES OVERVIEW	
Biodiversity significance	Nahan's Partridge is a globally VU and nationally VU species which is known is known from a few localities in the eastern Democratic Republic of the Congo in central and western Uganda in Budongo, Bugoma and Mabira Forest Reserves. Bugoma supports a high density of this partridge and the local population has remained stable since the 1990s. Budongo-Bugoma forests could hold 50% or more of the global population (see Ref 14.A16).
Species Ecology	It is found in lowland primary forest, preferring riverine or swampy areas. In Uganda, it occurs in both unlogged and logged forest, including mixed forest subject to moderate logging and/or disturbance, or where natural gaps occur. Records from forest edge and non-forest habitats may refer to dispersing or feeding birds. It prefers to forage in areas of dense understorey with a tall, dense canopy and sparse ground vegetation. Dense canopy cover indicates mature forest containing suitable breeding and roosting sites, and a dense understorey indicates the presence of preferred feeding habitat; two habitat characteristics that rarely coincide. It searches the leaf-litter for invertebrates, shoots, seeds and bulbs and probably picks invertebrates from low vegetation (Ref 14.A36). It is highly territorial and breeds throughout the year, though mainly towards the beginning of the rainy season. Most nests are placed on the ground between the buttresses of large trees (Ref 14.A36). The main threats are therefore from forest clearance, habitat fragmentation and poaching.
Habitat Preference	Nahan's Partridge is a strict forest specialist but may be found in logged or unlogged areas. Dense canopy cover indicating mature forest contains suitable breeding and roosting sites but a dense understorey indicates the presence of preferred feeding habitat This species is associated with Landscape context D (Tropical High Forest).
Population & Trends	Recent surveys estimated the population in Uganda to be 44,038 (95% CI: 32,827-59,079) is fairly common in Budongo Forest. The species' range is in decline throughout its highly fragmented distribution (Ref 14.A360.
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required).
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Barrier effects** Widening or realignment of oil roads through habitat areas favoured by this species is likely to be associated with an increase in project traffic on road, which may create barrier effects.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** This species is associated with Landscape Context D (Tropical High Forest). The Tilenga Project Footprint does not include these areas but there are potential indirect impacts on forests and other areas due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats, as well as increased poaching. New oil roads and other access improvements in the region are likely to enable people to

Nahan's Partridge, *Ptilopachus nahani*				
	enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Nahan's Partridge habitat areas may impact on population growth due to poaching, disturbance and loss of suitable habitat. **Disturbance** Induced population changes in the landscape may potential increase levels of disturbance for Nahan's Partridge. **Barrier Effects** Landuse changes where forests areas are lost or fragmented are also likely to create barriers to movement and dispersal of Nahan's Partridge.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Minor habitat degradation or disturbance of Nahan's Partridge habitat. Less than 10% of species population could be impacted during this phase however change will not be enough to result in change in conservation status of the species or the habitat. This impact will be temporary and reversible.	Road improvements and pipeline construction will likely result in moderate habitat degradation and/or disturbance, leading to reduction in species habitat functionality, protected site integrity, including connectivity. Between 10% and 20% of Nahan's Partridge population could be affected by the impact through habitat degradation, disturbance and poaching, which could result in a change in conservation status of the species or habitat. The impact will last the duration of the project, and can be reversed to baseline levels within 5 years once activity has ceased.	Increase in road traffic and Project in-migration will likely result in moderate habitat degradation or disturbance, leading to a reduction in the habitat functionality, or protected site integrity, including connectivity. Between 10% and 20% of Nahan's Partridge populations could be affected by the impact through habitat degradation, disturbance and increased hunting which could result in a change in conservation status of the species or habitat. The impacts will be medium term, lasting between 5 and 10 years, and some impacts can be reversed to baseline levels within 5 years once activity has ceased. However the indirect impacts of in-migration may be permanent.	Decommissioning works will likely result in moderate habitat degradation or disturbance, reduction habitat coverage or functionality, or protected species integrity, including connectivity. Between 10% and 20% of Nahan's Partridge populations could be affected by the impact through habitat degradation, disturbance and increased hunting which could result in change in conservation status of the species or habitat. The impact will be low to medium term, lasting between 5 and 10 years, and can be revered to baseline levels within 5 years once activity has ceased. However the direct impacts of in-migration may be permanent.
Potential Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-	**LOW**	**LOW**	**LOW**	**LOW**

Nahan's Partridge, *Ptilopachus nahani*				
combination effects				
Justification of in-combination sensitivity	Vegetation removal for the supporting and associated facilities, leading to minor degradation and disturbance of Nahan's Partridge. Impact will not be sufficient to result in change in conservation status of the species or habitat. This impact will be temporary and reversible.	Construction works and human in-migration due to supporting and associated facilities will lead to low degradation of habitat and/or disturbance of ecological function. Impacts likely to result in change in conservation status of the species or habitat.	Increase in road traffic and human in-migration into the area will impact Nahan's Partridge populations in Bugoma. Increased road traffic will create barrier effects. In-migration to the area may increase fire risk and hunting pressure. These effects may be permanent.	Decommissioning works of supporting and associated facilities will lead to low degradation of habitat and/or disturbance of ecological function. Impact likely to result in change in conservation status of the species or habitat. Impact of new roads leading to accessibility to remote forest areas and barrier effects may be permanent. .
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Induced changes in human populations and the pressures that they create on the landscape could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Mitigation relating to protection of forest habitat and prevention of hunting/poaching are the key elements. Long term strategies to protect and enhance forest habitats, reconnect fragments and prevent detrimental land use changes will have to be developed.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	**Loss, degradation or fragmentation of species habitat** Should long term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats and reduce poaching, if effective, should reduce or avoid pressures on species population. **Disturbance** Mitigation to protect habitats and reduce poaching and human access generally should reduce or avoid pressures on disturbance. **Barrier effects** Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Mitigation to improve forest connectivity and fire risks will reduce the risk of change in conservation of the species and/or habitat; the residual impact is low and will be a	Mitigation to reduce fire risks, hunting pressure and other types of indirect human disturbance will reduce the risk of change in conservation status of	Mitigation to reduce fire risks, hunting pressure and other types of indirect human disturbance will reduce the risk of change in conservation status of	Mitigation to reduce fire risks, hunting pressure and other types of indirect human disturbance will reduce the risk of change in conservation status of

Nahan's Partridge, *Ptilopachus nahani*				
	temporary loss of habitat and disturbance to Nahan's Partridge habitat.	the species and/or habitat. Residual impacts will be moderate residual impact significance.	the species and/or habitat. Residual impacts will be moderate residual impact significance.	the species and/or habitat. Residual impacts will be a moderate residual impact significance.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

White-backed Vulture, *Gyps africanus*						
Birds	**Status (Uganda Red list)**	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species						
White-backed Vulture	EN	CR	1ce	**A**	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint; however aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components.	HIGH

White-backed Vulture, *Gyps africanus*	
SPECIES OVERVIEW	
Biodiversity Significance	White-backed Vulture is a globally CR and nationally EN species. It is the most widespread and common vulture in Africa, although it is now undergoing rapid declines. However, Uganda appears to have a relatively stable population which makes it very important in a global context. The species has also declined in Sudan and South Sudan, Somalia and Kenya, but is apparently more stable in Ethiopia, Uganda (short-term increases) and across southern Africa where an estimated 40,000 individuals remain (Ref 14.A36). The species is concentrated in Queen Elizabeth National Park and MFNP and is rare outside of these protected areas. In the study area White-backed Vultures are mainly associated with Acacia woodland within MFPA but there are also occasional records from Kabwoya WR.
Species Ecology	Primarily a lowland species of open wooded savanna, particularly areas of Acacia. It requires tall trees for nesting. However it has also been recorded nesting on electricity pylons in South Africa. A gregarious species congregating at carcasses, in thermals and at roost sites. It nests in loose colonies (Ref 14.A36]. In terms of breeding phenology White-backed Vultures usually breed at the start of the dry season (November/December). The incubation period is 56-58 days. The species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning. In East Africa, the primary issue is poisoning (particularly from the highly toxic pesticide carbofuran), which occurs primarily outside protected areas; the large range sizes of this species puts them at significant risk as it means they inevitably spend considerable time outside protected areas (Ref 14.A36). Electrocution on powerlines is also a problem in parts of its range, and it is vulnerable to nest harvesting or disturbance by humans (Ref 14.A36).
Habitat Preference	White-backed Vulture is associated with Landscape Context A (MFPA). Primarily a lowland species of open wooded savanna, particularly areas of Acacia.
Population & Trends	The national population estimate for White-backed Vulture is c1000-2,600 birds (Ref. 14.A37). Within Uganda, there are records of breeding from Murchison Falls National Park in January and September. Also, one record from Queen Elizabeth National Park in August (Ref. 14.A38).
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required). However, ongoing avoidance ecological monitoring should be used to inform mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts (Direct)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas (likely to use habitat within and outside the MFPA); therefore there is the potential for foraging within areas associated with

White-backed Vulture, *Gyps africanus*				
	Landscape context A (MFPA) and elsewhere. The impact on the savanna habitat associated with Landscape context A will be due to direct loss of habitats from the site preparation and construction phases of the project.			
Project Impacts (Indirect)	**Loss, degradation or fragmentation of species foraging habitat** This would be associated with land use changes and degradation of habitats, as well as increased persecution and direct poisoning and indirect poisoning (eg. a by-product of poisoning of lions and other predators). New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within White-backed Vulture foraging habitat areas may impact on population growth due to persecution, poisoning and loss of suitable habitat for wild ungulates.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Field surveys have indicated that no nests are present close to the proposed locations of Project components; therefore no significant loss of suitable nesting sites is anticipated. During this phase, minor degradation of ungulate habitat is expected. A small proportion of the species population is expected to be indirectly impacted during this phase; this is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	Indirect impacts are expected to be more significant than direct impacts, possibly affecting White-backed Vultures at the population level if mitigation measures are not implemented. Therefore, it is possible that 10% and 20% of the White-backed Vulture population could be affected through indirect impacts, notably through increases in human activity within foraging habitat areas and therefore the potential for increased incidences of persecution and poisoning. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	This is the longest project phase, with potentially more significant impacts if effective mitigation measures have not already been put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of the White-backed Vulture population could be affected during this phase through indirect impacts relating to potential increases in human activity within foraging habitat (new oil roads and other access improvements in the region will enable people to enter more easily and impact on this receptor during this phase) and therefore the potential for increased incidences of persecution and poisoning. Minor degradation of ungulate habitat is likelyhowever this is only likely to result in direct impacts to less than 10% of the White-backed Vulture population. (the precautionary principle has been applied in this assessment due	During this phase, indirect impacts will be the most significant, as the Project footprint will have already been cleared (reducing direct impacts). This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts during the decommissioning phase on vulture species)

White-backed Vulture, *Gyps africanus*				
			to the difficulties assessing indirect impacts on vulture species)	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of In-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to check for nests and to avoid disturbance of roosting and nesting birds, where encountered. Activities that prevent reduction of disturbance of prey species will also be effective mitigation. Developing a Community Awareness Program is considered to be a key component of the mitigation strategy as poisoning is a known threat to vulture populations.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	When the mitigation measures are taken into account, particularly within the MFNP, then impacts on this vulture species will be minimised.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Magnitude (Mag.)	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of	The operational phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of	The decommissioning phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of

White-backed Vulture, *Gyps africanus*				
	persecution and poisoning. However, there is a high level of uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	persecution and poisoning. However, there is a high level of uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Rüppell's (Rueppell's) Vulture, *Gyps rueppelli*						
Birds	**Status (Uganda Red List)**	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species						
Rüppell's Vulture	EN	CR	1ce	A B D	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint, **however aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components**.	HIGH

Rüppell's (Rueppell's) Vulture, *Gyps rueppelli*	
SPECIES OVERVIEW	
Biodiversity Significance	Rüppell's Vulture is a globally CR and nationally EN species. The CHA has ascribed this species to Landscape Contexts A (MFNP), B (savanna corridor) and D (tropical high forest) which indicates its widespread occurrence within the study area. No Rüppell's Vulture nests have been recorded close to areas where project infrastructure will be placed. Data (for Africa) suggests this species has experienced a very rapid population decline of 97% (range: 94-99%) over three generations (56 years) (Ref. 14.A36)
Species Ecology	This species breeds mainly in colonies on cliff faces and escarpments at a broad range of elevations. In Kenya, the number of nests at a colony may be inversely related to rainfall in the previous year, and timing of nesting varies from year to year (Ref. 14.A36) The species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning.
Habitat Preference	In the study area Rüppell's Vultures are mainly associated with Acacia woodland within MFPA where it frequents open areas of Acacia woodland, grassland and montane regions (recorded during 5 point counts in MFNP during surveys). There is no suitable nesting habitat for this species within the project area.
Population & Trends	Known to be declining in Uganda but population unknown.
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required). However, ongoing avoidance ecological monitoring should be used to inform mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts (Direct)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA) and Landscape Context B (savanna corridor). The Tilenga Project Footprint interacts with this area and therefore potential direct impacts associated with the project could occur here. The impact on the savanna habitat due to loss of habitat from site clearance and construction works has the potential to lead to a reduced availability of carrion.
Project Impacts (Indirect)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA) and Landscape Context B

Rüppell's (Rueppell's) Vulture, *Gyps rueppelli*				
	(savanna corridor). The Tilenga Project Footprint interacts with this area and therefore potential indirect impacts associated with the project could occur here. The impact on the savanna habitat due to human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and populations of wild ungulates, and has the potential to lead to a reduced availability of carrion. This would be associated with land use changes and degradation of habitats, as well as increased persecution and direct / indirect poisoning (eg. a by-product of poisoning of lions and other predators). New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Rüppell's Vulture foraging habitat areas may impact on population growth due to persecution, poisoning and loss of suitable habitat for wild ungulates.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Field surveys have indicated that no nests are present close to the proposed locations of Project components; therefore no significant loss of suitable nesting sites is anticipated. During this phase, minor degradation of ungulate habitat is expected. A small proportion of the species population is expected to be indirectly impacted during this phase; this is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	Indirect impacts are expected to be more significant than direct impacts, possibly affecting this species at the population level if mitigation measures are not implemented. Therefore, it is possible that between 10% and 20% of the population could be affected through indirect impacts, notably through increases in human activity within foraging habitat areas and therefore the potential for increased incidences of persecution and poisoning. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	This is the longest project phase, with potentially more significant impacts if effective mitigation measures have not already been put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of the population could be affected during this phase through indirect impacts relating to potential increases in human activity within foraging habitat (new oil roads and other access improvements in the region will enable people to enter more easily and impact on this receptor during this phase) and therefore the potential for increased incidences of persecution and poisoning. Minor degradation of ungulate habitat is likely, however this is only likely to result in direct impacts to less than 10% of the population. (the precautionary principle has been applied in this assessment due to the difficulties	During this phase, indirect impacts will be the most significant, as the Project footprint will have already been cleared (reducing direct impacts). This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts during the decommissioning phase on vulture species).

Rüppell's (Rueppell's) Vulture, *Gyps rueppelli*				
			assessing indirect impacts on vulture species)	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of In-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to check for nests and to avoid disturbance of roosting and nesting birds, where encountered. Activities that prevent reduction of disturbance of prey species will also be effective mitigation. Developing a Community Awareness Program is considered to be a key component of the mitigation strategy as poisoning is a known threat to vulture populations.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Assuming mitigation measures are taken into account, particularly within the MFNP then impacts on this vulture species should be minimised.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude (Mag.)	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and	The operational phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of uncertainty with this	The decommissioning phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of uncertainty with this

Rüppell's (Rueppell's) Vulture, *Gyps rueppelli*				
	poisoning. However, there is a high level of uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	poisoning. However, there is a high level of uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	assessment and there is the potential for residual impacts if control measures have not been implemented effectively.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Hooded Vulture, *Necrosyrtes monachus*							
Birds	**Status (Uganda Red List)**	**IUCN**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species							
Hooded Vulture	EN	CR	1c	**A**	**B**	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint, **however aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components**.	HIGH

Hooded Vulture, *Necrosyrtes monachus*	
SPECIES OVERVIEW	
Biodiversity Significance	Hooded Vulture is globally CR and nationally EN. This species is widespread in sub-Saharan Africa and in Uganda the population has declined outside of protected areas although it is reportedly stable within National Parks. Within MFNP it occurs in low but important numbers, mainly found in open grassland, forest edge, and wooded savanna.
Species Ecology	The species is often associated with human settlements north of the Equator, but is also found in open grassland, forest edge, wooded savanna, desert and along coasts. It feeds mainly on carrion, but also takes insects (and will congregate in large numbers during insect emergences). In West Africa and Kenya it breeds throughout the year. It is an arboreal nester and its incubation period lasts 46-54 days, followed by a fledging period of 80-130 days. Young are dependent on their parents for a further 3-4 months after fledging (Ref. 14.A36). Main threats include non-target poisoning, capture for traditional medicine, persecution and bushmeat.
Habitat Preference	Within the Study Area this species is present within Landscape Contexts A (MFNP) and B (savanna corridor); this habitat is used for foraging. No vulture nests have been recorded close to areas where project infrastructure will be placed.
Population & Trends	Following evidence of declines across its range, the total population has been estimated at a maximum of 197,000 individuals (Ref. 14.A36). Population estimates for four protected areas in Uganda (Lake Mburo NP, Murchison Falls CA, Queen Elizabeth NP & Kidepo Valley NP) are 20-146 birds (Ref. 14.A37).
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required). However, ongoing avoidance ecological monitoring should be used to inform mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts (Direct)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA) and B (savanna corridor). The Tilenga Project Footprint interacts with this area and therefore potential direct impacts associated with the project could occur here. The impact on the savanna habitat due to loss of habitat from site clearance and construction works has the potential to lead to a reduced availability of carrion.
Project Impacts (Indirect)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA) and B (savanna corridor). The Tilenga Project Footprint interacts with this area and therefore potential indirect impacts associated

Hooded Vulture, *Necrosyrtes monachus*				
	with the project could occur here. The impact on the savanna habitat due to loss of habitat from human as well as human population changes induced by the Project, where worker economic dependents and others are attracted, may impact on habitats and populations of wild ungulates, has the potential to lead to a reduced availability of carrion. This would be associated with land use changes and degradation of habitats, as well as increased persecution and poisoning. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Hooded Vulture foraging habitat areas may impact on population growth due to persecution, direct/indirect poisoning and loss of suitable habitat for wild ungulates.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Field surveys have indicated that no nests are present close to the proposed locations of Project components; therefore no significant loss of suitable nesting sites is anticipated. During this phase, minor degradation of ungulate habitat is expected. A small proportion of the species population is expected to be indirectly impacted during this phase; this is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	Indirect impacts are expected to be more significant than direct impacts, possibly affecting this species at the population level if mitigation measures are not implemented. Therefore, it is possible that between 10% and 20% of the population could be affected through indirect impacts, notably through increases in human activity within foraging habitat areas and therefore the potential for increased incidences of persecution and poisoning. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	This is the longest project phase, with potentially more significant impacts if effective mitigation measures have not already been put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of the population could be affected during this phase through indirect impacts relating to potential increases in human activity within foraging habitat (new oil roads and other access improvements in the region will enable people to enter more easily and impact on this receptor during this phase) and therefore the potential for increased incidences of persecution and poisoning. Minor degradation of ungulate habitat is likely, however it is only likely to result in direct impacts to less than 10% of the population. (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture	During this phase, indirect impacts will be the most significant, as the Project footprint will have already been cleared (reducing direct impacts). This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts during the decommissioning phase on vulture species)

Hooded Vulture, *Necrosyrtes monachus*				
			species).	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of In-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to check for nests and to avoid disturbance of roosting and nesting birds, where encountered. Activities that prevent reduction of disturbance of prey species will also be effective mitigation. Developing a Community Awareness Program is considered to be a key component of the mitigation strategy as poisoning is a known threat to vulture populations.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Assuming mitigation measures are taken into account, particularly within the MFNP then impacts on this vulture species should be minimised.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude (Mag.)	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and poisoning. However, there is a high level of	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and poisoning. However, there is a high level of	The operational phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of uncertainty with this assessment and there is the potential for	The decommissioning phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of uncertainty with this assessment and there is the potential for

Hooded Vulture, *Necrosyrtes monachus*				
	uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	uncertainty with this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	residual impacts if control measures have not been implemented effectively.	residual impacts if control measures have not been implemented effectively.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

White-headed Vulture, Trigonoceps occopitalis							
Birds	**Status (Uganda Red List**	**IUCN**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species							
White-headed Vulture	CR	CR	1c	A	B	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint, **however aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components**.	HIGH
White-headed Vulture, *Trigonoceps occopitalis*							
SPECIES OVERVIEW							
Biodiversity Significance	White-headed Vulture is a globally CR and nationally CR species. This species has a large range in sub-Saharan Africa and in Uganda the population accounts for around 5% of global numbers where it is found in Kidepo, Semliki, Lake Mbura and MFNP. Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape Context A (MFPA) and also B (Savanna Corridor). The Tilenga Project Footprint interacts with this area and therefore potential direct and indirect impacts associated with the project could occur here.						
Species Ecology	The species prefers mixed, dry woodland at low altitudes, generally avoiding human habitation indicating sensitivity to human presence (Ref 14.A28). The species is thought to be a long-lived resident that maintains a territory. It nests and roosts in trees, most nests being in *Acacia* spp. or baobabs. The egg is laid a couple of months after rains have finished and the dry season is underway, which would normally during approximately December/January) (Ref. 14.A36). Threats include habitat loss and associated reduction of prey species (medium sized ungulates). Poisoning and other human actions also affect these species. There are records of breeding birds deserting nests in areas of high human disturbance (Ref 14.A39).						
Habitat Preference	The CHA defined this species as being associated with Landscape Contexts A (MFNP) and B (savanna corridor); this habitat is used for foraging.						
Population & Trends	Population estimates for four protected areas in Uganda (Lake Mburo NP, Murchison Falls CA, Queen Elizabeth NP & Kidepo Valley NP) are 44-187 birds (Ref. 14.A37). There are no recent records outside of MFNP.						
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required). However, ongoing avoidance ecological monitoring should be used to inform mitigation planning.						
POTENTIAL IMPACTS: ALL PROJECT PHASES							
Potential Impacts (Direct)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas (this species uses savannah habitat within and outside the MFPA); therefore there is the potential for foraging within areas associated with Landscape context A (MFPA) and B (savanna corridor). The Tilenga Project Footprint interacts with this area and therefore potential direct impacts associated with the project could occur here. The impact on the savanna habitat due to loss of habitat from site clearance and construction works may impact on habitats and populations of wild ungulates and has the potential to lead to a reduced						

White-headed Vulture, *Trigonoceps occopitalis*				
	availability of carrion.			
Project Impacts (Indirect)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA) and B (savanna corridor). The Tilenga Project Footprint interacts with this area and therefore potential indirect impacts associated with the project could occur here. The impact on the savanna habitat due to loss of habitat from human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and populations of wild ungulates, has the potential to lead to a reduced availability of carrion. This would be associated with land use changes and degradation of habitats, as well as increased persecution and direct poisoning and indirect poisoning (e.g. a by-product of poisoning of lions and other predators). New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within White-headed Vulture foraging habitat areas may impact on population growth due to persecution, poisoning and loss of suitable habitat for wild ungulates.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Field surveys have indicated that no nests are present close to the proposed locations of Project components; therefore no significant loss of suitable nesting sites is anticipated. During this phase, minor degradation of ungulate habitat is expected. A small proportion of the species population is expected to be indirectly impacted during this phase; this is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	Indirect impacts are expected to be more significant than direct impacts, possibly affecting White-headed Vultures at the population level if mitigation measures are not implemented. Therefore, it is possible that between 10% and 20% of the White-backed Vulture population could be affected through indirect impacts, notably through increases in human activity within foraging habitat areas and therefore the potential for increased incidences of persecution and poisoning. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect	This is the longest project phase, with potentially more significant impacts if effective mitigation measures earlier phases of have not already been put in place during the Project. Without mitigation, between 10% and 20% of the White-headed Vulture population could be affected during this phase through indirect impacts relating to potential increases in human activity within foraging habitat (new oil roads and other access improvements in the region will enable people to enter more easily and impact on this receptor during this phase) and therefore the potential for increased incidences of persecution and poisoning. Minor habitat degradation of ungulate habitat is	During this phase, indirect impacts will be the most significant, as the Project footprint will have already been cleared (reducing direct impacts). This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts during the decommissioning phase on vulture species)

White-headed Vulture, *Trigonoceps occopitalis*				
		impacts on vulture species).	likely, however it is only likely to result in direct impacts to less than 10% of the White-backed Vulture population (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of In-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to check for nests and to avoid disturbance of roosting and nesting birds, where encountered. Activities that prevent reduction of disturbance of prey species will also be effective mitigation. Developing a Community Awareness Program is considered to be a key component of the mitigation strategy as poisoning is a known threat to vulture populations.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Assuming mitigation measures are taken into account, particularly within the MFNP then impacts on this vulture species should be minimised.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**

White-headed Vulture, *Trigonoceps occopitalis*				
Magnitude (Mag.)				
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and poisoning. However there is a high level of uncertainty with this assessment and there is the potential for significant residual impacts if control measures have not been implemented effectively.	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and poisoning. However there is a high level of uncertainty with this assessment and there is the potential for significant residual impacts if control measures have not been implemented effectively.	The operational phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However there is a high level of uncertainty with this assessment and there is the potential for significant residual impacts if control measures have not been implemented effectively.	The decommissioning phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However there is a high level of uncertainty with this assessment and there is the potential for significant residual impacts if control measures have not been implemented effectively.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Lappet-faced Vulture, *Torgos tracheliotus*						
Birds	**Status (Uganda Red list)**	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species & Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint						
Lappet-faced Vulture	CR	EN	1e	**A**	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint, **however aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components**.	HIGH

Lappet-faced Vulture, *Torgos tracheliotus*	
SPECIES OVERVIEW	
Biodiversity Significance	Lappet-faced Vulture is a globally EN and nationally CR species. The total population (in Africa) is estimated to be declining at a very rapid rate. This species breeds in many African countries although its breeding range is decreasing. Approximately 6% of the global population occurs in Uganda, mainly in MFNP (Ref 14.A38).
Species Ecology	The species ranges widely when foraging and is mainly a scavenger, feeding predominantly on any large carcasses or their remains. It builds solitary nests (containing just one egg), often in Acacia (its distribution sometimes being limited by these trees' distribution but also in *Balanites* and *Terminalia*. In Mozambique, egg-laying occurs from late April until mid-August, with a peak in May and June (a nest found in Oman contained a small chick in early March, and thought to have fledged in mid-June) (Ref. 14.A38). The species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning.
Habitat Preference	The species inhabits dry savanna, arid plains, deserts and open mountain slopes. The species is associated with Landscape Context A (MFNP) and is likely to forage in savannah outside this area. No vulture nests have been recorded close to areas where project infrastructure will be placed.
Population & Trends	National population estimates for Lappet-faced Vulture are c160-500 birds (Ref. 14.A37).
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required). However, ongoing avoidance ecological monitoring should be used to inform mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts (Direct)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA. The Tilenga Project Footprint interacts with this area and therefore potential direct associated with the project could occur here. The impact on the savanna habitat due to loss of habitat from site clearance and construction works may impact on habitats and populations of wild ungulates, has the potential to lead to a reduced availability of carrion. This would be associated with land use changes and degradation of habitats, as well as increased persecution and poisoning. New oil roads and other access improvements in the region are likely to

Lappet-faced Vulture, *Torgos tracheliotus*				
	enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Lappet-faced Vulture foraging habitat areas may impact on population growth due to persecution, poisoning and loss of suitable habitat for wild ungulates.			
Project Impacts (Indirect)	**Loss, degradation or fragmentation of species foraging habitat** Vultures may forage over a large area outside protected areas; therefore there is the potential for foraging within areas associated with Landscape context A (MFPA. The Tilenga Project Footprint interacts with this area and therefore potential indirect impacts associated with the project could occur here. The impact on the savanna habitat due to loss of habitat from human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and populations of wild ungulates, and has the potential to lead to a reduced availability of carrion. This would be associated with land use changes and degradation of habitats, as well as increased persecution and poisoning. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Lappet-faced Vulture foraging habitat areas may impact on population growth due to persecution, poisoning and loss of suitable habitat for wild ungulates.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Field surveys have indicated that no nests are present close to the proposed locations of Project components; therefore no significant loss of suitable nesting sites is anticipated. During this phase, minor degradation of ungulate habitat is expected. A small proportion of the species population is expected to be indirectly impacted during the site preparation and construction phase; this is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture	Indirect impacts are expected to be more significant than direct impacts, possibly affecting this species at the population level if mitigation measures are not implemented. Therefore, it is possible that between 10% and 20% of the population could be affected through indirect impacts, notably through increases in human activity within foraging habitat areas and therefore the potential for increased incidences of persecution and poisoning. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties	This is the longest project phase, with potentially more significant impacts if effective mitigation measures have not already been put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of the population could be affected during this phase through indirect impacts relating to potential increases in human activity within foraging habitat (new oil roads and other access improvements in the region will enable people to enter more easily and impact on this receptor during this phase) and therefore the potential for increased incidences of persecution and poisoning. Minor degradation of ungulate habitat is	During this phase, indirect impacts will be the most significant, as the Project footprint will have already been cleared (reducing direct impacts). This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts during the decommissioning phase on vulture species)

Lappet-faced Vulture, *Torgos tracheliotus*				
	species).	assessing indirect impacts on vulture species). .	likely, however it is only likely to result in direct impacts to less than 10% of the population (the precautionary principle has been applied in this assessment due to the difficulties assessing indirect impacts on vulture species).	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of In-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities. This is likely to correspond to less than 10% but the magnitude of impact has been assessed as Low (the precautionary principle has been applied in this assessment due to the difficulties assessing cumulative impacts on vulture species).
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to check for nests and to avoid disturbance of roosting and nesting birds, where encountered. Activities that prevent reduction of disturbance of prey species will also be effective mitigation. Developing a Community Awareness Program is considered to be a key component of the mitigation strategy as poisoning is a known threat to vulture populations.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Assuming mitigation measures are taken into account, particularly within the MFNP then impacts on this vulture species should be minimised.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude (Mag.)	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**

Lappet-faced Vulture, *Torgos tracheliotus*				
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and poisoning. However, there is a high level of uncertainty wit this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant potential for increased incidences of persecution and poisoning. However, there is a high level of uncertainty wit this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	The operational phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of uncertainty wit this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.	The decommissioning phase has a negligible potential for insignificant increases in incidences of persecution and poisoning. However, there is a high level of uncertainty wit this assessment and there is the potential for residual impacts if control measures have not been implemented effectively.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Grey Crowned Crane, *Balearica regulorum*						
Birds	**Status (Uganda Red List)**	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species						
Grey Crowned Crane	EN	EN	1e	C	In the MFNP, mainly along the Lake Albert shoreline and fringing wetlands, close to the Project footprint (Landscape Context C), May also occurs in Landscape Context A, B and E).	HIGH
Grey Crowned Crane, *Balearica regulorum*						
SPECIES OVERVIEW						
Biodiversity Significance	Grey Crowned Crane is a globally and a nationally EN species which occurs in the MFNP and has experienced very rapid (global) declines during the past 45 years (Ref. 14.A36); therefore the receptor sensitivity value that has been assigned to this species is Very High. Landscape Context C (Lake Albert; rivers and wetlands) holds 10% of the national population of this species; this is considered consistent with the aforementioned receptor sensitivity evaluation and also qualifies the area as Critical Habitat. Grey Crowned Crane is Cites Accepted (Current Listing: Appendix II) (Ref 14-A40).Three nesting/breeding birds were recorded in *Cyperus papyrus* habitat at the River Nile during the 2014 Ramsar Bird Surveys (Ref. 14-A41).					
Species Ecology	Grey Crowned Crane occurs in MFCA, and in wetlands and seasonal swamps along the shores of Lake Albert, where it prefers marshes, areas with tall emergent vegetation and temporary pools, open riverine woodland, shallow flooded plains with adjacent grasslands, open savanna and cultivated areas. This species is not migratory although it may make variable local and seasonal movements depending on the abundance and distribution of food, nest-sites and rainfall. The timing of breeding varies in relation to the rains, with the breeding of East African populations peaking during dry periods (December to February, normally), but with the breeding of populations in the drier parts of southern Africa peaking during wet periods (Ref. 14.A36). The species is threatened by the loss and degradation of wetland breeding areas through drought-related changes in land-use, drainage, as well as through the heavy use of agricultural pesticides, uncontrolled grass and deep litter fires in the breeding and groundwater extraction, leading to changes in hydrological regimes. The species is also threatened by live-trapping (for trade), egg-collecting and hunting (Ref. 14.A36). Cranes are also vulnerable to injury and death through collision with overhead wires.					
Habitat Preference	The species inhabits wetlands such as marshes, pans and dams with tall emergent vegetation, riverbanks, open riverine woodland, shallowly flooded plains and temporary pools with adjacent grasslands (i.e. seasonally inundated wetlands), open savannas, croplands, pastures, fallow fields and irrigated areas. It shows a preference for short to medium height open grasslands adjacent to wetlands for foraging and breeds within or at the edges of wetlands especially in marshes with water 1 m deep and with emergent vegetation 1m above the water. It roosts in water along rivers or in marshes, or perches on nearby trees. (Ref. 14.A36). The core area for this species is wetland and inundated grassland habitat within MFNP in Landscape Context C (Lake Albert, rivers and wetlands). Most of the recorded breeding sites are in the south-western part of the country (i.e. remote from the project area), and in swamps along the River Nile (i.e. within Landscape Context C). The species also occurs in Landscape Contexts A (Bugungo), B (Buliisa) and E (Nebbi) (Ref 14-A42).					
Population & Trends	This species occurs in eastern and southern Africa although in many areas, including Uganda, populations have suffered rapid declines due to loss of breeding habitat. 500-8,000 individuals are believed to be in Uganda (Ref. 14.A36). Landscape Context C (Lake Albert; rivers and wetlands) holds 10% of the national population of this species (Ref. 14-A28) and is considered to be the core area for this species in terms of this assessment. Three nesting/breeding birds were recorded in *Cyperus papyrus* habitat at the River Nile during the 2014 Ramsar Bird Surveys (Ref. 14-A41),					

Grey Crowned Crane, *Balearica regulorum*				
	however the exact population of Grey Crowned Crane within the project area is not known.			
Summary of state of knowledge	The status of Grey Crowned Crane within the Project footprint at the River Nile (HDD pipeline crossing and ferry facility) is fairly well known (3 nesting birds were recorded here during the Nature Uganda (20140 surveys of the Ramsar site (Ref. 14.A41). However, the status and population of Grey Crowned Crane in the Project footprint within Landscape Context C (Lake Albert, rivers and wetlands) has not been accurately determined. The use of habitat in Landscape Context Areas A, B and E by Grey Crowned Crane has also not been determined. Further pre-construction surveys are required to inform mitigation planning as provided in the species mitigation section below.			
POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts (Direct)	**Habitat loss, degradation and fragmentation of species habitat** This species is associated with Landscape Context C (Lake Albert, rivers and wetlands). The Tilenga Project footprint overlaps with this area and there are potential impacts on Lake Albert, rivers and wetlands due to construction activities such as the HDD pipeline crossing of the Nile, the construction and operation of the Victoria Nile Ferry crossing and the construction and operation of a water abstraction facility on the shore of Lake Albert. There is the potential for the direct loss of seasonal wetlands both north and south of the Nile (in Landscape Contexts A and B). There is potential for loss or degradation of wetland habitat utilised by Grey Crowned Crane due to erosion, accidental spillage of fuels/hazardous substances and uncontrolled release of suspended solids during the construction and operational phase. **Disturbance** There is the potential that this species could be affected by noise and visual disturbance from construction activities (eg. associated with HDD), as well as presence of humans in the landscape. This disturbance could result in the displacement of breeding and foraging birds from areas within the construction footprint of the proposed development.			
Potential Impact (indirect)	**Habitat Loss and Degradation** Population changes induced by the Project, where worker economic dependents and others are attracted to the wider area due to increased accessibility (from the upgraded and new roads) may impact on habitats and species populations. This would be associated with land use changes and degradation of habitats (for example increased cattle grazing, use of pesticides and increased potential for uncontrolled fires), as well as increased disturbance (for example as a result of fishing or shooting activities). New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase (for example increase the likelihood of capture for the wild bird trade). **Population changes** There is the potential of Grey crowned Crane mortality from collisions with powerlines/communication lines.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Of the direct impacts listed, habitat loss and degradation within Landscape Context C is considered to be the most important. Of this, the water abstraction plant and	Of the direct impacts listed, habitat degradation and disturbance within Landscape Context C are considered to be the most important. Specifically, the	The risks arising from the operational phase would be the potential for increased exploitation (capture for the wild bird trade) and habitat degradation within	The risks arising from the decommissioning phase would be habitat degradation within Landscape Context C. Using Table 14-11, the following scores were

Grey Crowned Crane, *Balearica regulorum*				
	ferry facility have the largest impact. Using Table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – the construction of the water abstraction plant and ferry facility will be completed within 5 years; and Permanence: Low – the abstraction plant/ferry facility could be removed within 2 years.	temporary degradation of habitats arising from the installation of the pipes and disturbance in case Lake Water abstraction requires construction of the floating platform. Using table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect conservation status; Duration: Low – the construction will be completed with 5 years; and Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration.	Landscape Context C (for example: via increased cattle grazing, use of pesticides and increased potential for uncontrolled fires). Using table 14-11 – the following scores were achieved: Scope: Medium - Up to 20%of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – any impact will be temporary and short term Permanence – Low – infrastructure could be removed within 2 years resulting in at least 90% restoration	achieved: Scope: Medium - Up to 20%of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration – Low – any impact will be temporary and short term; Permanence: Low
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Although the extent of site clearance and disturbance arising from multiple projects would be proportionally greater, it is unlikely that greater than 10% of the Grey Crowned Crane population would be affected by the additional projects.	Although the extent of construction and disturbance arising from multiple projects would be proportionally greater, it is unlikely that greater than 10% of the Grey Crowned Crane population would be affected by the additional projects.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, should not impact Grey Crowned Crane.	The decommissioning of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, should not impact Grey Crowned Crane.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	The general and specific mitigation actions that are of critical importance for mitigating impacts on this species will be implemented. In-combination effects are not considered in assessing the residual impact.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary	Other than the	Other than the	The operational phase	The operational phase

Grey Crowned Crane, *Balearica regulorum*				
justification for residual impact assessment	unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance.	unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance, detrimental land-use changes and, persecution.	will result in insignificant increases in disturbance, detrimental land use changes and persecution only	will result in insignificant increases in disturbance only
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Madagascar Pond-heron, *Ardeola idea*						
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species						
Madagascar Pond-heron	EN	EN	1ce	C	In the MFNP, mainly along the Lake Albert shoreline and fringing wetlands close to the Project footprint	HIGH

Madagascar Pond-heron, *Ardeola idea*	
SPECIES OVERVIEW	
Biodiversity significance	Madagascar Pond-heron is a globally EN and nationally EN species and a small non-breeding population occurs in Landscape Context C (Lake Albert, rivers and wetlands). A rapid and on-going (global) population decline is suspected (Ref. 14.A36). The receptor sensitivity value which has been assigned is therefore Very High.
Species Ecology	This species breeds in Madagascar where it is not common but has a large non-breeding range in central and east Africa, where it is a regular visitor to freshwater wetlands. There are regular observations of this species along the shores of Lake Albert. It migrates westward in May, and returns to its breeding range in October (Ref. 14.A36). Therefore it occurs in Uganda between May and October. It feeds on fish, insects and small invertebrates, as well as frogs and small reptiles including skinks and geckos (Ref. 14.A36). Principal threats are drainage of wetlands and loss of habitats.
Habitat Preference	The preferred non-breeding habitat for this species is freshwater wetland habitat. The species is associated with Landscape Context C (Lake Albert, rivers and wetlands).
Population & Trends	The global breeding population is estimated to number 2,000-6,000 individuals, roughly equivalent to 1,300-4,000 mature individuals. Whilst the species remains fairly widespread, populations are low, and increasing exploitation at breeding sites is likely to increase the rate of population decline. As a result, a rapid and on-going population decline is suspected (Ref. 14.A36).
Summary of state of knowledge	There is no data available on the national population (Ref. 14.A43); however, the species is a regular visitor in very small numbers to lakeshores throughout Uganda.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss, Degradation and Fragmentation** This species is associated with Landscape Context C (Lake Albert, rivers and wetlands). The Tilenga Project Footprint includes this area and there are potential direct impacts on Lake Albert, rivers and wetlands due intrusion from construction activities such as the HDD, ferry piers and activities. Loss of territory within the Ramsar may also affect these species as well as loss of seasonal wetlands both north and south of the Nile. There is potential for loss or degradation of wetland habitat utilised by this species due to accidental spillage of fuels/hazardous substances and uncontrolled release of suspended solids during the construction phase. **Disturbance** There is the potential that this species could be affected by noise and visual disturbance from construction activities associated with directional drilling, as well as presence of humans in the landscape. This disturbance could result in the displacement of breeding and foraging birds from areas within the construction footprint of the proposed development.
Potential Impacts -	**Habitat Loss, Degradation and Fragmentation**

Madagascar Pond-heron, *Ardeola idea*				
indirect	This species is associated with Landscape Context C (Lake Albert, rivers and wetlands). The Tilenga Project Footprint includes this area and there are potential indirect impacts on Lake Albert, rivers and wetlands due population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats, as well as increased disturbance. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within pond heron habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Direct Impact	**LOW**	**LOW**	**LOW**	**LOW**
Magnitude of Potential Indirect Impact	The impacts relating to habitat loss/degradation and disturbance within Landscape Context C are localised and are relatively small in comparison to the abundance of suitable habitat for this species in the wider landscape. Using Table 14-11, the following scores were achieved: Scope: Medium – less than 20% of the population affected; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – the construction of the ferry facility will be completed within 5 years; and Permanence: Negligible – the ferry facility could be removed within 2 years.	The impacts relating to the temporary degradation of habitats arising from the installation of the pipes and disturbance in case Lake Water Abstraction requires construction of the floating platform within Landscape Context C are localised and are relatively small in comparison to the abundance of suitable habitat for this species in the wider landscape. Using Table 14-11, the following scores were achieved: Scope: Medium – less than 20% of the population affected; Severity: Low – minor impacts, not sufficient to affect conservation status; Duration: Low – the construction will be completed within 5 years; and Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration.	The risks arising from the operational phase would be the potential for habitat degradation and disturbance within Landscape Context C (for example: via use of pesticides and increased potential for uncontrolled fires). Using table 14-11 – the following scores were achieved: Scope: Medium – less than 20% of the population affected; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – any impact will be temporary and short term; and Permanence – Low – infrastructure could be removed within 2 years resulting in at least 90% restoration	The risks arising from the decommissioning phase would be habitat degradation within Landscape Context C. Using Table 14-11, the following scores were achieved: Scope: Medium – less than 20% of the population affected; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration – Low – any impact will be temporary and short term; Permanence: Negligible
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Madagascar Pond-heron, *Ardeola idea*				
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater, there is no reasonable likelihood that greater than 10% of the Madagascar Pond-heron population would be affected by the additional projects.	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater there is no reasonable likelihood that greater than 10% of the Madagascar Pond-heron population would be affected by the additional projects.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, is not expected to impact on the population of Madagascar Pond-heron.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, is not expected to impact on Madagascar Pond-heron beyond a temporary increase in disturbance.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	The loss of Madagascar Pond-heron habitat is relatively small in comparison to its likely abundance within the wider lakeside landscape. Impacts relating to disturbance are also expected to be localised and not significant. However, large areas of habitat can be degraded through accidental spill events and land use changes associated with human in-migration. The mitigation is designed to minimise these risks.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	When the mitigation measures are taken into account then impacts on Madagascar Pond-heron will be minimised. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance.	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance.	The operational phase will result in insignificant increases in disturbance and habitat degradation only.	The decommissioning phase will result in insignificant increases in disturbance only.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Pallid Harrier, *Circus macrourus*							
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint							
Pallid Harrier	CR	NT	1e	A	B	Recorded within MFNP	HIGH

Pallid Harrier, *Circus macrourus*	
SPECIES OVERVIEW	
Biodiversity significance	Pallid Harrier occurs as a wintering bird in Uganda, where it is largely confined to the Albertine Rift, Kipedo and Karamoja. The wintering population in Uganda is considered to exceed 1% of the global population based on information generated from the Uganda National Red List (Ref. 14-A44). The project site is not globally significant for this species (i.e. does not sustain >10% of the global population). However, the Savannah Corridor Landscape Context (B) is estimated to hold 10% or more of the national population, making it Tier 2 Critical Habitat for the species under Criterion 1e (Ref. 14-A44); therefore the receptor sensitivity is categorized as High. The species is listed as CR on the Uganda Red List but is only categorized as Near Threatened on the IUCN Red List (rather than any of the IUCN 'threatened' categories). It also has a generally widespread winter distribution across large parts of central and eastern Africa and is not endemic to Uganda.
Species Ecology	The species is migratory, with most birds wintering in sub-Saharan Africa or south-east Asia. They leave their breeding grounds in the Palearctic between August and November and return from their wintering areas in Africa in March and April (Ref. 14-A36). Therefore, they are unlikely to occur in Uganda between late April and early September. Home ranges in winter are variable (for example 10- 448km^2 Ref. 14-A45]). Small mammals and locusts are important prey for Pallid Harrier. On its wintering grounds it is thought to be negatively affected by the use of harmful pesticides, rodenticides and other toxic chemicals, although this requires further research, and by the loss of grassland due to burning, cutting and overgrazing. Over-grazing and burning are increasing in the Study Area and the quality of the habitat for the species is therefore expected to be declining in the baseline situation.
Habitat Preference	In the study area the species mainly uses savanna, grasslands and wetlands in winter. The CHA has defined the Landscape Contexts A (MFNP) and B (Savanna Corridor).
Population & Trends	Pallid Harrier is a globally NT and nationally CR species. This species breeds in the steppes of Asiatic Russia, Kazakhstan and China with small populations elsewhere in the Black Sea and Caspian Sea areas. During winter a minority of the population is an Afrotropical migrant including to Uganda, where the wintering populations exceeds 1% of the global population (globally 9,000 to 15,000 pairs). The species occurs throughout the Albertine Rift using mainly wetlands, savanna and grasslands in winter. There is no specific population data available for the Murchison Falls- Albert Wetland System IBA. The IBA factsheet population estimate for Pallid Harrier states that this species is 'present' in Murchison Falls- Albert Wetland System IBA (Ref. 14.A46).
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning (i.e. no further data required).
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** Pallid Harrier occurs within suitable habitat within Landscape Context A (MFPA) and there is the potential for it to occur in B (Savanna Corridor). The Tilenga Project Footprint interacts with these areas and therefore potential direct associated with the construction and operational phase of the project could occur here. Site preparation (clearance) and construction works could potentially result in the permanent loss of

Pallid Harrier, *Circus macrourus*				
	Pallid Harrier foraging and roosting habitat. **Disturbance** There is the potential that this species could be affected by noise and visual disturbance from construction activities. This disturbance could result in the displacement of foraging/roosting birds from areas within the construction footprint of the proposed development.			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** The impact on the savanna habitat due to human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and populations of Pallid Harrier. This would be associated with land use changes and degradation of habitats, as well as increased poaching. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Pallid Harrier habitat areas may impact on population growth due to loss of suitable habitat and potential increases in the use of harmful pesticides, rodenticides and other toxic chemicals due to changes in land use.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Site Preparation and Enabling Works have the potential to result in the temporary and short term loss of harrier habitat. However, when considering the availability of similar savannah and grassland habitat within the local area, and the relatively large home range typically used by this species, the proportion of habitat lost is not anticipated to be sufficient to affect the ability of bird populations to survive or result in a change in conservation status. Based on this assessment the following scores were achieved using Table 14-11 : Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient	Construction and Pre-Commissioning works have the potential to result in the temporary and short term loss of harrier habitat. However, when considering the availability of similar savannah and grassland habitat within the local area, and the relatively large home range typically used by this species, the proportion of habitat lost is not anticipated to be sufficient to affect the ability of bird populations to survive or result in a change in conservation status. Based on this assessment the following scores were achieved using Table 14-11: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact;	There is the potential that harriers could be affected by permanent noise and visual disturbance from operational activities associated with the project. However, there are large areas of savannah and grassland habitat that should be able to support any birds which may be displaced. Therefore only minor disturbance of ecological function is anticipated which is unlikely to result in a change in conservation status (ie. (Low – minor impacts, not sufficient to affect the conservation status). Long term indirect impacts relating to the potential for increased levels of human activity/land use changes are difficult to quantify but are assigned as low adverse. A precautionary approach has been taken with this	There is the potential that harriers could be affected by noise and visual disturbance from decommissioning activities. However, there are large areas of savannah and grassland habitat that should be able to support any birds which may be displaced. Therefore only minor disturbance of ecological function is anticipated which is unlikely to result in a change in conservation status (ie. (minor impacts, not sufficient to affect the conservation status).

Pallid Harrier, *Circus macrourus*				
	to affect the conservation status; Duration: Low - construction will be temporary	Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low - construction will be temporary.	assessment.	
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.	Based on the relatively large home range for this species and the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.	Based on the relatively large home range for this species and the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	All the general mitigation measures as listed will be implemented.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	No significant residual impacts are expected. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Mitigation should allow safeguarding the ornithological resource (non-breeding population of Pallid Harrier). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on a good knowledge of the size of the population of harriers using the Savannah Corridor Landscape Context area, an	Mitigation should allow safeguarding the ornithological resource (non-breeding population of Pallid Harrier). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on a good knowledge of the size of the population of harriers using the Savannah Corridor Landscape Context area, an	Mitigation should allow safeguarding the ornithological resource (non-breeding population of Pallid Harrier). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on a good knowledge of the size of the population of harriers using the Savannah Corridor Landscape Context area, an	Mitigation should allow safeguarding the ornithological resource (non-breeding population of Pallid Harrier). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on a good knowledge of the size of the population of harriers using the Savannah Corridor Landscape Context area, an

Pallid Harrier, *Circus macrourus*				
	understanding of when the species is absent in Uganda and also the specific threats to this species are widely known.	understanding of when the species is absent in Uganda and also the specific threats to this species are widely known.	understanding of when the species is absent in Uganda and also the specific threats to this species are widely known.	understanding of when the species is absent in Uganda and also the specific threats to this species are widely known.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

African Crowned Eagle, *Stephanoaetus coronatus*						
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the project footprint						
African Crowned Eagle	EN	NT	1e	**D**	Known from Budongo and Bugoma Forest Reserves	HIGH

African Crowned Eagle, *Stephanoaetus coronatus*	
SPECIES OVERVIEW	
Biodiversity significance	African Crowned Eagle is nationally EN but is only globally NT and is widespread in sub-Saharan Africa. Therefore the receptor sensitivity value which has been assigned to this species is High.
Species Ecology	African crowned eagle It generally prefers forest habitats, such as gallery forest, dense woodland, forest gorges in savanna or grassland and alien tree plantations (such as Eucalyptus and pine). The egg-laying season is from July-May, peaking from August-October. The incubation period is about 49-51 days and fledging period is approximately 110-115 days. The young are reliant on their parents for food for 9-11 months longer before becoming fully independent (Ref. 14-A47). It shows dietary plasticity and can feed on a diversity of prey (although maybe almost entirely mammals) (Ref. 14.A36). This species is threatened by persecution through trapping, shooting and nest destruction, competition for prey from humans, and habitat loss through deforestation. The decline is currently not thought to be more severe, owing to the species' tolerance of modified habitats (Ref. 14.A36).
Habitat Preference	African Crowned Eagle inhabits forest, woodland, savanna and shrubland, as well as some modified habitats, such as plantations and secondary growth. It shows high resilience to heavy deforestation and degradation in some areas. The species is associated with sites such as Budongo FR and Bugoma FR, which places it in Landscape Context D (Tropical High Forest).
Population & Trends	In South Africa there may have been a 14% decline in range over the past c.25 years, using data from the Southern African Bird Atlas Projects (Ref. 14.A36). The population in Uganda is unknown.
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	This species is associated with Landscape context D (Tropical High Forest). The Tilenga Project Footprint does not include these areas hence is expected to result in minimum direct impacts. **Barrier effects** Widening or realignment of oil roads through habitat areas favoured by this species is likely to be associated with an increase in project traffic on road, which may create barrier effects. However this species is tolerant of modified habitat and therefore potential adverse impacts relating to barrier effects may be reduced.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** There are potential indirect impacts on forests and other areas due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats, as well as increased persecution. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within African Crowned Eagle habitat areas may impact on population growth due to

African Crowned Eagle, *Stephanoaetus coronatus*				
	persecution, disturbance and loss of suitable habitat. **Disturbance** Induced population changes in the landscape may potential increase levels of disturbance for African Crowned Eagle. **Barrier effects** Land use changes where forests areas are lost or fragmented are also likely to create barriers to movement and dispersal of African Crowned Eagle. However this species is tolerant of modified habitat and therefore potential adverse impacts relating to barrier effects may be reduced.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Minor habitat degradation or disturbance of African Crowned Eagle habitat. Change during this phase will not be enough to result in change in conservation status of the species or the habitat. This impact will be temporary and reversible.	Road improvements and construction of supporting and associated facilities will likely result in minor habitat degradation and/or disturbance and persecution, leading to reduction in habitat functionality, protected site integrity, including connectivity. Between 10% and 20% of African Crowned Eagle population could be affected by the impact through habitat degradation, disturbance and persecution which could result in a change in conservation status of the species or habitat. . The impact will last the duration of the project, and can be reversed to baseline levels within 5 years once activity has ceased. The species' tolerance of modified habitats has been considered in this assessment	Increase in road traffic and Project in-migration will likely result in minor habitat degradation and/or disturbance and persecution, leading to a reduction in the habitat functionality, or protected site integrity, including connectivity. Between 10% and 20% of African Crowned Eagle populations could be affected by the impact through habitat degradation, disturbance and increased persecution which could result in a change in conservation status of the species or habitat. The impacts will be medium term, lasting between 5 and 10 years, and some impacts can be reversed to baseline levels within 5 years once activity has ceased. However the indirect impacts of in-migration may be permanent. The species' tolerance of modified habitats has been considered in this assessment	Decommissioning works will likely result in minor habitat degradation or disturbance, reduction in habitat coverage or functionality, or protected species integrity, including connectivity, will occur. Between 10% and 20% of African Crowned Eagle populations could be affected by the impact through habitat degradation, disturbance and increased hunting which could result in change in conservation status of the species or habitat. The impact will be low to medium term, lasting between 5 and 10 years, and can be revered to baseline levels within 5 years once activity has ceased. However the indirect impacts of in-migration may be permanent. The species' tolerance of modified habitats has been considered in this assessment.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

African Crowned Eagle, *Stephanoaetus coronatus*				
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Vegetation removal and construction works for the supporting and associated facilities, leading to minor degradation and disturbance of African Crowned Eagle. Impact will not be sufficient to result in change in conservation status of the species or habitat. This impact will be temporary and reversible.	Construction works and human in-migration indirectly due to supporting and associated facilities will lead to low degradation of habitat, instances of persecution and/or disturbance of ecological function. Impacts could result in change in conservation status of the species or habitat.	Increase in road traffic and human in-migration into the area will impact African Crowned Eagle populations in Bugoma. Increased road traffic will create barrier effects. In-migration to the area may increase fire risk and the risk of persecution. These effects may be permanent.	Decommissioning works of supporting and associated facilities will lead to low degradation of habitat and/or disturbance of ecological function. Impact likely to result in change in conservation status of the species or habitat. Impact of new roads leading to accessibility to remote forest areas and barrier effects may be permanent.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation relating to protection of forest habitat and prevention of persecution are the key elements of the mitigation. Induced changes in human populations and the pressures that they create on the landscape could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Long term strategies to protect and enhance forest habitats and prevent persecution will have to be developed.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	**Loss, degradation or fragmentation of species habitat** Should long term strategies be agreed, implemented, monitored and maintained then there is potential for overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats and reduce persecution, if effective, should reduce or avoid pressures on species population. **Disturbance** Mitigation to protect habitats and reduce persecution and human access generally should reduce or avoid pressures on disturbance. **Barrier effects** Initiatives to reconnect forest fragments and to prevent further fragmentation should mitigate barrier effects. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact	Mitigation to improve forest connectivity and fire risks will reduce	Degradation of African Crowned Eagle habitat, together with	Degradation of habitat, together with increased barrier	Degradation of habitat, together with increased barrier

African Crowned Eagle, *Stephanoaetus coronatus*				
assessment	the risk of change in conservation of the species and/or habitat; the residual impact is low and will be a temporary loss of habitat and disturbance to African Crowned Eagle habitat.	increased disturbance (visual/noise), barrier effects from roads due to increased traffic and persecution pressure from project induced in-migration will result in a moderate adverse impact. Mitigation to reduce fire risks, persecution pressure and other types of indirect human disturbance will reduce the risk of moderate adverse change in conservation status of the species and/or habitat.	effects from roads due to increased traffic and persecution pressure from project induced in-migration will result in high adverse impact. Mitigation to reduce fire risks, hunting pressure and other types of indirect human disturbance will reduce the risk of moderate adverse change in conservation status of the species and/or habitat.	effects from roads due to increased traffic and persecution pressure from project induced in-migration will result in moderate adverse impact. Mitigation to reduce fire risks, persecution pressure and other types of indirect human disturbance will reduce the risk of moderate adverse change in conservation status of the species and/or habitat.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Black-rumped Buttonquail, *Turnix nanus*							
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Nationally-threatened Tier 2 Critical Habitat-qualifying Species though							
Black-rumped Buttonquail	EN	LC	1e (possible)	A	B	Grassland	HIGH

Black-rumped Buttonquail, *Turnix nanus*	
SPECIES OVERVIEW	
Biodiversity significance	Black-rumped Buttonquail is nationally EN but only is globally LC. It has a very large range although in sub-Saharan Africa although it is declining due to habitat loss and fragmentation (open grassland). The global population size has not been quantified, but the species is described as uncommon to locally common (Ref. 14.A36). Approximately 5% of the global population is located in Uganda.
Species Ecology	This species is very shy and skulking. Analysis of the distribution map (*Turnix nanus* Birdlife International factsheet (Ref. 14.A36). shows this species occurs in the southern half of Uganda to the south of Lake Albert/Kampala, i.e. outside the Project footprint. However there is suitable habitat for this species within the Project area and it is considered likely that birds occurring in MFNP and along Lake Albert refer to passage rather than to breeding birds. Laying occurs in most months, but locally during or at the end of the rainy season around November (Ref. 14.A46). Black-rumped Buttonquail is threatened by habitat destruction and unsustainable levels of exploitation (Ref. 14.A36).
Habitat Preference	This species occurs in MFNP and along Lake Albert in wooded grassland habitat. The CHA has defined the Landscape Context for this species as A (MFNP) and B (Savanna Corridor).
Population & Trends	The global population size has not been quantified, but the species is described as uncommon to locally common (Ref. 14.A36). Approximately 5% of the global population is located in Uganda.
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning. Pre-construction surveys for nesting birds will be undertaken (refer to general mitigation measures 14.16-14.20 below) however no further detailed surveys are required.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** There is the potential for Black-rumped Buttonquail to occur within areas associated with Landscape context A (MFPA) and B (Savanna Corridor). The Tilenga Project Footprint interacts with these areas and therefore potential direct impacts associated with the site clearance, construction and operational phase of the project could occur here due to breeding and foraging habitat loss. **Disturbance** There is the potential that this species (for example breeding birds) could be affected by noise and visual disturbance from construction. **Barrier effects** Widening or realignment of oil roads through habitat areas favoured by this species may create barrier effects.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** The impact on the savanna habitat due to human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and populations of Black-rumped Buttonquail. This would be associated with land use changes and degradation of habitats, as well as increased poaching. New oil roads and other access

Black-rumped Buttonquail, *Turnix nanus*				
	improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Black-rumped Buttonquail habitat areas may impact on population growth due to poaching and loss of suitable habitat. **Barrier effects** Widening or realignment of oil roads through habitat areas favoured by this species may create barrier effects.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	The receptor is likely to refer to passage (rather than breeding) birds which are likely to be less vulnerable to direct and indirect impacts (habitat degradation/ disturbance/increased hunting) and therefore there is no reasonable likelihood that more than 10% of the population will be affected. This impact will be temporary and reversible.	The receptor is likely to refer to passage (rather than breeding) birds which are likely to be less vulnerable to direct and indirect impacts (habitat degradation/disturbance/increased hunting) and therefore there is no reasonable likelihood that more than 10% of the population will be affected.	The receptor is likely to refer to passage (rather than breeding) birds which are likely to be less vulnerable to indirect impacts (habitat degradation/disturbance/increased hunting) and therefore there is no reasonable likelihood that more than 10% of the population will be affected.	The receptor is likely to refer to passage (rather than breeding) birds which are likely to be less vulnerable to impacts (habitat degradation/disturbance/increased hunting) and therefore there is no reasonable likelihood that more than 10% of the population will be affected.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Justification of in-combination sensitivity	There is no reasonable likelihood that more than 10% of the Black-rumped Buttonquail population would be affected by the supporting and associated facilities.	There is no reasonable likelihood that more than 10% of the Black-rumped Buttonquail population would be affected by the supporting and associated facilities.	There is no reasonable likelihood that more than 10% of the Black-rumped Buttonquail population would be affected by the supporting and associated facilities.	There is no reasonable likelihood that more than 10% of the Black-rumped Buttonquail population would be affected by the supporting and associated facilities.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Although it is considered that breeding birds are unlikely to be encountered, mitigation will comprise the requirement to check for nests and to avoid disturbance of birds, where encountered. Mitigation relating to protection of wooded grassland habitat and prevention of hunting/poaching are the key elements of the mitigation.			

RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	No significant residual impact is expected. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Mitigation will allow safeguarding the ornithological resource (non-breeding [passage] population of Black-rumped Buttonquail). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on an understanding of the species East African breeding/ passage range and also the specific threats to this species are widely known.	Mitigation will allow safeguarding the ornithological resource (non-breeding [passage] population of Black-rumped Buttonquail). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on an understanding of the species East African breeding/ passage range and also the specific threats to this species are widely known.	Mitigation will allow safeguarding the ornithological resource (non-breeding [passage] population of Black-rumped Buttonquail). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on an understanding of the species East African breeding/ passage range and also the specific threats to this species are widely known.	Mitigation will allow safeguarding the ornithological resource (non-breeding [passage] population of Black-rumped Buttonquail). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based on an understanding of the species East African breeding/ passage range and also the specific threats to this species are widely known.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Denham's Bustard, *Neotis denhami*						
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Denham's Bustard	CR	NT	1e	A	Grassland	HIGH

Denham's Bustard, *Neotis denhami*	
SPECIES OVERVIEW	
Biodiversity significance	Denham's Bustard is only globally NT but is nationally CR. This species is widely present throughout Africa although it is declining. Approximately 2% of the global population occurs in Uganda, where the species is now mainly confined to MFNP, formerly having been more widespread.
Species Ecology	Denham's Bustard inhabits grasslands, grassy Acacia-studded dunes, fairly dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains. It feeds on insects, small vertebrates and plant material. The breeding season is variable and consequently unclear, perhaps indicating opportunism in reaction to rainfall (Ref. 14.A36). The main threat appears to be conversion of grassland and light woodland to agriculture. Hunting is a problem in eastern and southern Africa. Collisions with power lines may be a significant threat in parts of the range, particularly South Africa. Accidental poisoning by agricultural pesticides may also be a threat to birds foraging on farmland (Ref. 14.A36).
Habitat Preference	The CHA defined this species in terms of Landscape Context A (MFNP). Surveys undertaken for this ESIA have observed Denham's Bustard in open grassland near to JBR-05 and JBR-08 near Pakuba Airstrip.
Population & Trends	Approximately 2% of the global population occurs in Uganda, where the species is now mainly confined to MFNP. The population within the Project footprint is unknown.
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning. Pre-construction surveys for nesting birds will be undertaken (refer to general mitigation measures 14.16-14.20 below) however no further detailed surveys are required.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** There is the potential for Denham's Bustard to occur within areas associated with Landscape context A (MFPA). The Tilenga Project Footprint interacts with these areas and therefore potential direct impacts associated with the Site Preparation and Enabling Works, Construction and Pre-Commissioning and Pre-Commissioning and Oerations phase of the project could occur here. Construction and site clearance works could potentially result in the permanent loss of Denham's Bustard breeding and foraging habitat. **Disturbance** There is the potential that this species (for example breeding birds) could be affected by noise and visual disturbance from construction. **Barrier effects** Widening or realignment of roads through habitat areas favoured by this species may create barrier effects.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** There is potential indirect impact on the savanna habitat due to human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and populations of Denham's Bustard. This would be associated with land use changes and degradation of habitats, as well as increased hunting. New oil roads and other access

Denham's Bustard, *Neotis denhami*				
	improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Denham's Bustard habitat areas may impact on population growth due to hunting and loss of suitable habitat. In addition, **t**here is the potential of bustard mortality from collisions with powerlines/communication lines.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Site Preparation and Enabling Works have the potential to result in the temporary and short term loss of Denham's Bustard habitat. There is the potential for disturbance to nesting birds. Based on this assessment the following scores were achieved using Table 14-11 : Scope: Medium – no more than 20% of the population could potentially be affected; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low Permanence: Negligible - construction will be temporary	Construction and Pre-Commissioning works have the potential to result in the temporary and short term loss of Denham's Bustard habitat. However, when considering the availability of similar savannah and grassland habitat within the local area the proportion of habitat lost is not anticipated to be sufficient to result in a change in conservation status. Based on this assessment the following scores were achieved using Table 14-11: Scope: Medium – no more than 20% of the population affected; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low Permanence: Negligible - construction will be temporary.	There is the potential that Denham's Bustard could be affected by permanent noise and visual disturbance from operational activities associated with the project. However, there are large areas of savannah and grassland habitat that should be able to support any birds which may be displaced. Therefore only minor disturbance of ecological function is anticipated which is unlikely to result in a change in conservation status (ie. (no more than 20% of the population affected). Long term indirect impacts relating to the potential for the increased levels of human activity/land use changes are difficult to quantify but are assigned as low adverse. A precautionary approach has been taken with this assessment.	There is the potential that Denham's Bustard could be affected by noise and visual disturbance from decommissioning activities. However, there are large areas of savannah and grassland habitat that should be able to support any birds which may be displaced. Therefore only minor disturbance of ecological function is anticipated which is unlikely to result in a change in conservation status (ie. (no more than 20% of the population affected). .
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-	There is no	There is no	There is no	There is no

Denham's Bustard, *Neotis denhami*				
combination sensitivity	reasonable likelihood that more than 10% of the Denham's Bustard population would be affected by the additional projects.	reasonable likelihood that more than 10% of the Denham's Bustard population would be affected by the additional projects.	reasonable likelihood that more than 10% of the Denham's Bustard population would be affected by the additional projects.	reasonable likelihood that more than 10% of the Denham's Bustard population would be affected by the additional projects.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to check for nests and to avoid disturbance of birds, where encountered. Mitigation to reduce hunting pressure and collision with power-lines/cables will be implemented.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	When the mitigation measures are taken into account then impacts on Denham's Bustard will be minimised. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Mitigation will allow safeguarding the ornithological resource (Denham's Bustard). The proposed mitigation measures have a reasonable likelihood of success. Residual impacts will be a temporary loss of habitat and disturbance.	Mitigation will allow safeguarding the ornithological resource (Denham's Bustard). The proposed mitigation measures have a reasonable likelihood of success. Residual impacts will be a loss of habitat and temporary disturbance and an increase in hunting pressure. However, these can be significantly reduced if mitigation is well-managed and effective.	Mitigation will allow safeguarding the ornithological resource (Denham's Bustard). The proposed mitigation measures have a reasonable likelihood of success. Residual impacts will be a loss of habitat and possible population decline due to increased hunting pressure associated with indirect impacts, however if mitigation is well-managed and effective, then minimum impacts should occur on Denham's Bustard populations within landscape Context C.	The proposed mitigation measures have a reasonable likelihood of success. Residual impacts are expected to be less significant for this phase if direct and direct impacts have been well-managed throughout previous phases of the project.
Residual Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Fox Kestrel, *Falco alopex*						
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Tier 2 Critical habitat-qualifying Species thought likely to occur in/near the Project footprint						
Fox Kestrel	EN	LC	1e	**A**	*Acacia* savannah and thicket, especially where there are rocky hills	HIGH

Fox Kestrel, *Falco alopex*	
SPECIES OVERVIEW	
Biodiversity significance	Fox Kestrel is a nationally EN species but is only globally LC and therefore a High receptor sensitivity value has been assigned to this species. In Uganda it has been recorded in MFNP and the West Nile area.
Species Ecology	This species breeds on rocky hills which are generally less impacted by habitat degradation than other habitats. The species is vulnerable to habitat degradation through wood harvesting and overgrazing as well as exposure to pesticides (Ref. 14.A36). Laying is variable locally, but typically during the wet or late dry seasons: Apr–Jul in Kenya. Large insects, small mammals, lizards and small birds reported as prey (Ref. 14.A48). Fox Kestrel is a globally LC and nationally EN species. It breeds in the savanna regions south of the Sahara from Mali eastwards as far as Ethiopia and north-west Kenya. In Uganda it has been recorded in MFNP and the West Nile area, where it tends to be present in dry thickets and Acacia savanna, particularly where there are rocky hills.
Habitat Preference	In the study area, the species is mainly associated with Acacia woodland within MFPA (ie. Landscape Context A).
Population & Trends	The population is estimated to number 1,000-10,000 individuals, roughly equating to 670-6,700 mature individuals. The population is suspected to be stable in the absence of evidence for any declines or substantial threats (Ref. 14.A36).
Summary of state of knowledge	The available data is considered suitable to inform mitigation planning. Pre-construction surveys for nesting birds will be undertaken (refer to general mitigation measures below) however no further detailed surveys are required.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** There is the potential for Fox Kestrel to occur within areas associated with Landscape context A (MFPA). The Tilenga Project Footprint interacts with these areas and therefore potential direct impacts associated with the construction and operational phase of the project could occur here. Construction and site clearance works could potentially result in the permanent loss of Fox Kestrel breeding and foraging habitat. **Disturbance** There is the potential that this species (for example breeding birds) could be affected by noise and visual disturbance from construction.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** There is potential indirect impact on the savanna habitat due to human population changes induced by the Project, where worker economic dependents and others are attracted to the wider area and may impact on habitats and populations of Fox Kestrel. This would be associated with land use changes and degradation of habitats, as well as increased hunting. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this

Fox Kestrel, *Falco alopex*				
	receptor during this phase. **Population changes** Human activity within Fox Kestrel habitat areas may impact on population growth due to loss and degradation of suitable habitat and potential for greater exposure to pesticides due to land use changes.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact (Magnitude)	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Site Preparation and Enabling Works have the potential to result in the temporary and short term loss of Fox Kestrel habitat. However, when considering the availability of similar savannah and grassland habitat within the local area, the proportion of habitat lost is not anticipated to be sufficient to result in a change in conservation status. Based on this assessment the following scores were achieved using Table 14-11 : Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – Permanence: Low - construction will be temporary	Construction and Pre-Commissioning works have the potential to result in the temporary and short term loss of Fox Kestrel habitat. However, when considering the availability of similar savannah and grassland habitat within the local area the proportion of habitat lost is not anticipated to be sufficient to result in a change in conservation status. Based on this assessment the following scores were achieved using Table 14-11: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low Permanence: Low - construction will be temporary.	There is the potential that Fox Kestrel could be affected by permanent noise and visual disturbance from operational activities associated with the project. However, there are large areas of savannah and grassland habitat that should be able to support any birds which may be displaced. Therefore only minor disturbance of ecological function is anticipated which is unlikely to result in a change in conservation status (ie. (minor impacts, not sufficient to affect the conservation status). Long term indirect impacts relating to the potential for the increased levels of human activity/land use changes are difficult to quantify but are assigned as low adverse. A precautionary approach has been taken with this assessment.	There is the potential that Fox Kestrel could be affected by noise and visual disturbance from decommissioning activities. However, there are large areas of savannah and grassland habitat that should be able to support any birds which may be displaced. Therefore only minor disturbance of ecological function is anticipated which is unlikely to result in a change in conservation status (ie. (minor impacts, not sufficient to affect the conservation status).
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-	**LOW**	**LOW**	**LOW**	**LOW**

Fox Kestrel, *Falco alopex*				
combination effects				
Justification of in-combination sensitivity	Based the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.	Based on the availability of similar suitable habitat within the wider area, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.	Based the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.	Based on the availability of similar suitable habitat within the locality, it is considered that the development is not likely to significantly affect the integrity of the population alone or in-combination with the supporting and associated facilities.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	All the mitigation measures listed will be implemented.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	No significant residual impacts are expected. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Mitigation will allow safeguarding the ornithological resource (Fox Kestrel). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based an understanding of when the species is likely to be breeding and also the specific threats to this species are widely known.	Mitigation will allow safeguarding the ornithological resource (Fox Kestrel). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based an understanding of when the species is likely to be breeding and also the specific threats to this species are widely known.	Mitigation will allow safeguarding the ornithological resource (Fox Kestrel). The proposed mitigation measures have a reasonable likelihood of success; this assessment is based an understanding of when the species is likely to be breeding and also the specific threats to this species are widely known.	The proposed mitigation measures have a reasonable likelihood of success; this assessment is based an understanding of when the species is likely to be breeding and also the specific threats to this species are widely known.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Pel's Fishing Owl, *Scotopelia peli*						
Birds	**Status (Uganda Red List)**	**IUCN Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the project footprint						
Pel's Fishing Owl	EN	LC	1e	**A**	Riverine woodland	HIGH

Pel's Fishing Owl, *Scotopelia peli*	
SPECIES OVERVIEW	
Biodiversity significance	Pel's Fishing Owl is globally LC and nationally EN. It is thought that fewer than 100 birds occur in Uganda and within the study area these are present in MFNP, where they prefer large rivers with overhanging vegetation and riverine forests
Species Ecology	Pel's Fishing Owl occurs in forests along lakes and slower moving rivers, where it hunts frogs and fish at night. This species breeds mostly during the dry season (November to February), when water is shallow and clear, and fish are more easily detected. The nest is a natural hollow or cavity in an old tree near water. Incubation lasts around 32 days. Usually only one chick survives, and fledges at 68-70 days and young remain in the parental territory for 6-9 months (Ref. 14.A49). The species is vulnerable to human disturbance, habitat degradation, water pollution and overfishing can deplete food supplies.
Habitat Preference	A resident breeding species along large rivers with overhanging vegetation or riverine forests in MFPA. The CHA has defined presence along the Rivers Waiga and Wambabya. However, the Landscape Context has been defined as A (MFNP).
Population & Trends	The global population size has not been quantified, but the species is reported to be common in most of its range. The population is suspected to be stable in the absence of evidence for any declines or substantial threats (Ref. 14.A36).
Summary of state of knowledge	There is no available information regarding the size and distribution of the population of Pel's Fishing Owl associated with the Project footprint at the Victoria Nile (Murchison Falls National Park). The location of roosting sites used by this uncommon and elusive species are likely to vary and therefore detailed population specific survey for this species is considered unlikely to provide suitable additional data to inform mitigation planning (i.e. no further data is required). However, pre-construction surveys for nesting birds will be undertaken (refer to general mitigation measures 14.16-14.20 below).
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Disturbance** There is a low likelihood that construction activities associated with the HDD pipeline crossing and the construction and operation of the ferry facility within the River Nile could result in disturbance to this species. **Population Changes** Construction activities could result in the degradation of waterbodies. Siltation of the water and accidental spill events could affect the water quality.
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** There are potential indirect impacts on forests and other areas due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats, as well as increased potential for disturbance. New oil roads and other access improvements in the region are likely to

Pel's Fishing Owl, *Scotopelia peli*				
	enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Pel's Fishing Owl habitat areas may impact on population growth due to poaching, disturbance, depletion of prey due to increased potential for pollution and loss of suitable habitat. **Disturbance** Induced population changes in the landscape may potential increase levels of disturbance for Pel's Fishing Owl. **Barrier effects** Landuse changes where forests areas are lost or fragmented will also create barriers to movement and dispersal of Pel's Fishing Owl.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	The impacts relating to habitat loss/degradation and disturbance within Landscape Context A are localised and are relatively small in comparison to the abundance of suitable habitat for this species in the wider landscape. Using Table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact ; Severity: Low - minor impacts, not sufficient to affect conservation status ; Duration: Low – the construction of the ferry facility will be completed within 5 years; and Permanence: Low – the ferry facility could be removed within 2 years.	The impacts relating to the temporary degradation of habitats arising from the installation of the pipes and disturbance in case Lake Water Abstraction requires construction of the floating platform within Landscape Context A are localised and are relatively small in comparison to the abundance of suitable habitat for this species in the wider landscape. Using Table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect conservation status; Duration: Low – the construction will be completed with 5 years; and Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration.	The risks arising from the operational phase would be the potential for habitat degradation and disturbance within Landscape Context A (for example: via use of pesticides and increased potential for uncontrolled fires). Using table 14-11 – the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – any impact will be temporary and short term; and Permanence – Low – infrastructure could be removed within 2 years resulting in at least 90% restoration	The risks arising from the decommissioning phase would be habitat degradation within Landscape Context A. Using Table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration – Low – any impact will be temporary and short term; Permanence: Low

Pel's Fishing Owl, *Scotopelia peli*				
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater, there is no reasonable likelihood that greater than 10% of the Pel's Fishing Owl population would be affected by the additional projects.	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater there is no reasonable likelihood that greater than 10% of the Pel's Fishing Owl population would be affected by the additional projects.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, is not expected to impact on the population of Pel's Fishing Owl.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, is not expected to impact on Pel's Fishing Owl beyond a temporary increase in disturbance.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	The loss of Pel's Fishing Owl habitat is relatively small in comparison to its likely abundance within the wider landscape. Impacts relating to disturbance are also expected to be localised and not significant. However, large areas of habitat can be degraded through accidental spill events and land use changes associated with human in-migration. The mitigation is designed to minimise these risks.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of residual Impact	When the mitigation measures are taken into account, particularly within the MFNP, then impacts on Pel's Fishing Owl will be minimised. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance.	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance.	The operational phase will result in insignificant increases in disturbance and habitat degradation only.	The decommissioning phase will result in insignificant increases in disturbance only.
Residual Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**

Shoebill, *Balaeniceps rex*						
Birds	**Status (Uganda Red List)**	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint						
Shoebill	EN	VU	1e	C	Seasonally flooded marshes, papyrus, reeds and grasses	HIGH

Shoebill, *Balaeniceps rex*	
SPECIES OVERVIEW	
Biodiversity Significance	Shoebill is globally VU but is nationally EN and the Ramsar site and wetland along Lake Albert are important for this species. Therefore the receptor sensitivity value assigned for this species is High.
Species Ecology	Shoebill breeds and forages in seasonally flooded marshes where vegetation is dominated by a mixture of Papyrus Cyperus papyrus, reeds (eg Phragmites), cattails (Typha species) and grasses. It breeds solitarily, usually maintaining a density of fewer than three nests per square kilometre. The breeding season is long. Eggs are laid at the end of the rains (generally around November), as waters start to recede, and chicks fledge towards the end of the dry season (Birdlife International 2017d). The species is mainly threatened by habitat destruction and degradation.
Habitat Preference	Shoebill breeds and forages in seasonally flooded marshes where vegetation is dominated by a mixture of Papyrus Cyperus papyrus, reeds (e.g Phragmites), cattails (Typha species) and grasses. The species is associated with Landscape Context C (Lake Albert, rivers and wetlands).
Population & Trends	The species is widely but locally distributed in large swamps from South Sudan to Zambia where the global population estimate is around 5,000-8,000 individuals. The Uganda population is estimated at 100-150 individuals where the Murchison Falls-Nile Delta Ramsar Site and wetlands along Lake Albert and Semliki are key sites. The Ramsar site and wetlands along Lake Albert are important for this species. A total of 40 individuals were estimated in 1998/9 within the Murchison Falls Ramsar site on the stretch from the falls to the delta (Ref. 14.A50). Two foraging registrations (presumably referring to individual birds) were recorded at the River Nile during the 2014 Ramsar Bird Surveys (Ref. 14-A41). This was based on the grid references for Shoebill as detailed in the aforementioned Nature Uganda report; these were plotted by Tilenga ESIA team using GIS. However the exact population of Shoebill within the Project footprint is not known.
Summary of state of knowledge	An estimation of the population within Murchison Falls Ramsar site was made 20 years ago and more recent data is not available. The status of Shoebill within the Project footprint at the River Nile (HDD pipeline crossing and ferry facility) was assessed in 2014 (2 registrations of foraging birds were recorded within approx.. 2km of the HDD pipeline route during the Nature Uganda [2014] surveys of the Ramsar site (Ref. 14.A41)). However, the current status and population of Shoebill in the Project footprint within Landscape Context C (Lake Albert, rivers and wetlands) has not been accurately determined. Further pre-construction surveys are required to inform mitigation planning as provided in the species mitigation section below.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts (Direct)	**Habitat Loss and Degradation** This species is associated with Landscape Context C (Lake Albert, rivers and wetlands). The Tilenga Project Footprint includes this area and there are potential direct impacts on Lake Albert, rivers and wetlands due intrusion from construction activities such as the HDD, ferry piers and activities. Loss of territory within the Ramsar may also affect these species as well as loss of seasonal wetlands both north and south of the Nile. There is potential for loss or degradation of wetland habitat utilised by this species due to accidental spillage of fuels/hazardous substances and uncontrolled release of suspended solids during the construction phase. **Disturbance** There is the potential that this species could be affected by noise and visual disturbance from construction activities associated with directional drilling, as well as presence of humans in the

Shoebill, *Balaeniceps rex*				
	areas within the construction footprint of the proposed development.			
Potential Impact (indirect)	**Habitat Loss and Degradation** There are potential indirect impacts on Lake Albert, rivers and wetlands, due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats, as well as increased disturbance. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within Shoebill habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Of the direct impacts listed, habitat loss/ degradation and disturbance within Landscape Context C is considered to be the most important, associated with the water abstraction and ferry facilities. Using Table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – the construction of the water abstraction plant and ferry facility will be completed within 5 years; and Permanence: Low – the abstraction and ferry facilities could be removed within 2 years.	Of the direct impacts listed, habitat degradation and disturbance within Landscape Context C are considered to be the most important, associated with the temporary degradation of habitats arising from the installation of the pipes and disturbance in case Lake Water Abstraction requires construction of the floating platform. Using table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect conservation status; Duration: Low – the construction will be completed with 5 years; and Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration.	The risks arising from the operational phase would be the potential for habitat degradation and disturbance within Landscape Context C . Using table 14-11 – the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration: Low – any impact will be temporary and short term Permanence – Low – infrastructure could be removed within 2 years resulting in at least 90% restoration	The risks arising from the decommissioning phase would be the potential for habitat degradation within Landscape Context C. Using Table 14-11, the following scores were achieved: Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; Severity: Low – minor impacts, not sufficient to affect the conservation status; Duration – Low – any impact will be temporary and short term; Permanence: Low
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**

Shoebill, *Balaeniceps rex*				
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Although the extent of site clearance and disturbance arising from multiple projects would be proportionally greater, it is unlikely that greater than 10% of the Shoebill population would be affected by the additional projects.	Although the extent of construction and disturbance arising from multiple projects would be proportionally greater, it is unlikely that greater than 10% of the Shoebill population would be affected by the additional projects.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, should not impact Shoebill.	The decommissioning of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, should not impact Shoebill.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	The general and specific mitigation actions that are of critical importance for mitigating impacts on this species will be implemented. In-combination effects are not considered in assessing the residual impact.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance.	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance and detrimental land-use changes. However, it is likely that this species will be vulnerable to indirect impacts due to human population changes and associated pressures.	The operational phase will result in insignificant increases in disturbance and detrimental land use changes. However, it is likely that this species will be vulnerable to indirect impacts due to human population changes and associated pressures.	The operational phase will result in insignificant increases in disturbance only. However, it is likely that this species will be vulnerable to indirect impacts due to human population changes and associated pressures.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

African skimmer, *Rynchops flavirostris*							
Birds	**IUCN**	**Uganda red List**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Criterion 3: Migratory and congregatory species							
African skimmer	NT	VU	3 (and possibly 2b)	A	C	A congregatory water-bird, with a regional stronghold in the Albert Nile below Murchison Falls, within the Murchison Falls-Albert Delta Wetland System Ramsar Site. The species feeds here and roosts/nests on dry sandbanks. Also likely to be associated with the Nile Delta (Landscape Context C).	HIGH

African skimmer, *Rynchops flavirostris*	
SPECIES OVERVIEW	
Biodiversity Significance	African skimmer is only listed as an IUCN Red List NT species but is a nationally VU species; therefore the receptor sensitivity value that has been assigned is High. This species is a congregatory waterbird, with a regional stronghold in the Albert Nile below Murchison Falls, within the Murchison Falls-Albert Delta Wetland System Ramsar Site.
Species Ecology	This congregatory waterbird migrates up and down larger rivers, and to and from inland lakes (dispersing widely after the breeding). During the non-breeding season it is more commonly found at lakes (Ref. 14-A51). Breeding occurs in small colonies along broad rivers on large, dry sandbars that are largely free from vegetation. Breeding takes place during the dry season when rivers are at their lowest and sandbars most exposed. This generally occurs from March to June in West and East Africa. The incubation period is c.21 days followed by a fledging period of about four weeks (Ref. 14.A36). This species requires expanses of calm water for feeding (Ref. 14-A51). It is vulnerable to egg-collection and disturbance by boat traffic. Unsustainable fishing also has the potential to disrupt its food supply.
Habitat Preference	African skimmer has a regional stronghold in the River Nile below Murchison Falls, within the Murchison Falls Albert Delta Wetland System Ramsar Site. It is defined with Landscape Context A (MFNP) in the CHA, but is also likely to be associated with the Nile Delta (Landscape Context C).
Population & Trends	Murchison Falls National Park IBA supported 1400 non-breeding individuals in 1999 (Ref. 14.A46). More recent population estimates are not available, however records of congregations of African Skimmer on sandbanks at the River Nile have been plotted by Tilenga ESIA team using grid references detailed in the 2014 Nature Uganda Ramsar survey report (Ref. 14.A41); nesting wasn't recorded so it is assumed that these refer to roosting congregations (numbers of birds were not specified). Nine of the ten registrations were recorded outside the Project footprint at the River Nile within the MFNP; however a single registration is located within 1km of the proposed HDD pipeline route. It is vulnerable to egg-collection and disturbance by boat traffic. Boat disturbance has the potential to result in the displacement of foraging African skimmer due to increased disturbance of surface water (due to propeller wash/wakes) and increased turbidity. Unsustainable fishing also has the potential to disrupt its food supply. Species point location records are unavailable for this species.
Summary of state of knowledge	Population estimates within the Murchison Falls National Park IBA is only available for 1999 and, other than those detailed in the aforementioned Nature Uganda 2014 report, species point location records are unavailable for this species. Further pre-construction surveys are required to establish if there is a breeding population within the project footprint at the River Nile and to confirm mitigation planning.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts (Direct)	**Habitat Loss and Degradation** This species is associated with Landscape Context C (Lake Albert, rivers and wetlands). The Tilenga Project Footprint includes this area and there are potential direct impacts on Lake Albert, rivers and wetlands due intrusion from construction activities such as the HDD, ferry piers and

African skimmer, *Rynchops flavirostris*				
	activities. Loss of territory within the Ramsar may also affect these species as well as loss of seasonal wetlands both north and south of the Nile. There is potential for loss or degradation of wetland habitat utilised by this species due to accidental spillage of fuels/hazardous substances and uncontrolled release of suspended solids during the construction phase. **Disturbance** There is the potential that this species could be affected by noise and visual disturbance from construction activities associated with HDD, as well as presence of humans in the landscape. This disturbance could result in the displacement of breeding and foraging birds from areas within the construction footprint of the proposed development. Operation of the ferry has the potential to result in the displacement of foraging African skimmer due to increased disturbance of surface water (due to propeller wash/wakes) and increased turbidity.			
Potential Impacts (Indirect)	**Habitat Loss and Degradation** There are potential indirect impacts on Lake Albert, rivers and wetlands due population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes, degradation of habitats and reduction in water quality, as well as increased disturbance (such as increased fishing activity causing disruption to foraging African skimmer due to boat wakes). New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within African skimmer habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	It is considered probable that the impacts relating to habitat loss/degradation and disturbance within Landscape Context A & C for roosting African Skimmer are localised and are relatively small in comparison to the abundance of suitable habitat for this species in the wider landscape (no nesting by African Skimmer was recorded by Nature Uganda [Ref. 14.A41] – nesting skimmers are more vulnerable to impacts associated with the project). Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or	It is considered probable that the impacts relating to habitat loss/degradation and disturbance within Landscape Context A & C for roosting African Skimmer are localised and are relatively small in comparison to the abundance of suitable habitat for this species in the wider landscape (no nesting by African Skimmer was recorded by Nature Uganda [Ref. 14.A41] – nesting skimmers are more vulnerable to impacts associated with the project). Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or	The risks arising from the operational phase would be the potential for habitat degradation and disturbance within Landscape Context A & C (for example: via operation of the ferry, increased disturbance of water by fishing boats). Using table 14-11 – the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect the conservation	The risks arising from the decommissioning phase would be habitat degradation within Landscape Context A (for example via increased disturbance of water by fishing boats). Using Table 14-11, the following scores were achieved: • Scope Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect the conservation status;

African skimmer, *Rynchops flavirostris*				
	distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect the conservation status; • Duration: Low – the construction of the ferry facility will be completed within 5 years; and • Permanence: Negligible – the ferry facility could be removed within 2 years.	distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – the construction will be completed with 5 years; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration.	status; • Duration: Low – any impact will be temporary and short term; and • Permanence – Low – infrastructure could be removed within 2 years resulting in at least 90% restoration	• Duration – Low –any impact will be temporary and short term;
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**LOW**	**LOW**	**LOW**
Justification of in-combination sensitivity	Although the extent of and disturbance and habitat degradation arising from multiple projects would be proportionately greater, there is no reasonable likelihood that greater than 10% of the African Skimmer population would be affected by the additional projects.	Although the extent of disturbance and habitat degradation arising from multiple projects would be proportionately greater there is no reasonable likelihood that greater than 10% of the African Skimmer population would be affected by the additional projects.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, is not expected to impact on the population of African Skimmer.	The operation of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, is not expected to impact on African Skimmer beyond a temporary increase in disturbance.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Mitigation will comprise the requirement to undertake further pre-construction surveys for African Skimmer to use of sandbanks by this species (ie. to determine habitat use and location of breeding colonies if present). Procedures and protocols for operating water vessels will also be formulated and implemented.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Assuming mitigation measures are taken into account, particularly within the MFNP then impacts on this species should be minimised. However, further pre-construction surveys are required to determine the status and population of African Skimmer within the Project footprint; a precautionary approach has been taken until the results of the surveys are known. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation &**	**Construction & Pre**	**Commissioning &**	**Decommissioning**

African skimmer, *Rynchops flavirostris*				
	Enabling Works	**Commissioning**	**Operation**	
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude (Mag.)	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Other than the unavoidable degradation of habitats, residual effects are likely to be restricted to increases in disturbance which may be significant. A precautionary approach has been taken until the results of the surveys are known.	Other than the unavoidable degradation of habitats, residual effects are likely to be restricted to increases in disturbance which may be significant. A precautionary approach has been taken until the results of the surveys are known	The operational phase may result in increases in disturbance and habitat degradation. . These residual effects may be significant. A precautionary approach has been taken until the results of the surveys are known	The decommissioning phase will result in insignificant increases in disturbance and unavoidable temporary habitat degradation. These residual effects may be significant. A precautionary approach has been taken until the results of the surveys are known
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

HerpetilesAdanson's Hinged Terrapin (*Pelusios adansonii*)
African soft-shelled turtle (*Trionyx triunguis*)
Zaire Hinged Terrapin (*Pelusios chapini*)
Smooth Chameleon (*Chamaeleo laevigatus*)

Reptiles	Status (IUCN)	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Non-critical Habitat-qualifying Species					
Adanson's Hinged Terrapin (*Pelusios adansonii*)	NE (URDB – CR)	n/a	C	The species is known from sub-Saharan Africa including Sudan, Mali, Senegal, Niger, Nigeria, Cameroon, Chad, Central African Republic and Uganda. In Uganda, it is known from Lake Albert and the adjoining streams and wetlands.	High
African Soft-shelled Turtle (*Trionyx triunguis*)	VU (URDB – CR)	n/a	C	The African Soft-shelled turtle is widely distributed throughout African and the Mediterranean. In Africa, the species occurs in the Nile River basin in Egypt, Eritrea, Ethiopia, Sudan, South Sudan, Somalia, Kenya, Senegal, the Gambia, Guinea-Bissau, Mali, Central African Republic, Gabon and the Republic of Congo and Uganda. In Uganda, it is known from the shores of Lake Albert and the Victoria Nile.	High
Zaire Hinged Terrapin (*Pelusios chapini*)	NE (URDB – CR)	n/a	C	The species occurs in equatorial central Africa from Gabon, Central African Republic, Uganda and Central African Republic and Cameroon. In Uganda, the species known from MFNP, Kabwoya Wildlife Reserve and Lake Albert.	High
Smooth Chameleon (*Chamaeleo laevigatus*)	LC (URDB – EN)	n/a	A / B	This chameleon ranges through Central and East Africa including Ethiopia, Cameroon, Zambia and Uganda. In Uganda, the species in known from Murchison Fall National Park (MFNP) and Bugungu Wildlife Reserve.	High

Adanson's Hinged Terrapin (*Pelusios adansonii*)
African soft-shelled turtle (*Trionyx triunguis*)
Zaire Hinged Terrapin (*Pelusios chapini*)
Smooth Chameleon (*Chamaeleo laevigatus*)

SPECIES OVERVIEW	
Biodiversity significance	**Adanson's Hinged Terrapin** The species has not been listed by the IUCN but it is known to have an extensive range (> 50,000 km^2). Adanson's Hinged Terrapin is listed as Critically Endangered under the URDB, specifically under Criterion B – small range and declining population. Using Table 14-17, the species broadly accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity is assessed as Medium. **African soft-shelled turtle** Populations in West Africa, representing about one-third of the overall historical range, have been in

Adanson's Hinged Terrapin (*Pelusios adansonii*) **African soft-shelled turtle** (*Trionyx triunguis*) **Zaire Hinged Terrapin** (*Pelusios chapini*) **Smooth Chameleon** (*Chamaeleo laevigatus*)	
	severe decline in recent decades. Populations in Central Africa (and presumably eastern Africa) are thought to be in mild decline while populations in north-eastern Africa are understood to be stable. The species is listed as Vulnerable and Critically Endangered by the IUCN and URDB respectively. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity is assessed as Medium. **Zaire Hinged Terrapin** The species has not been listed by the IUCN but it is known to have an extensive range (> 50,000 km^2). The Zaire Hinged Terrapin is listed as Critically Endangered under the URDB, specifically under Criterion B – small range and declining population. Using Table 14-17, the species broadly accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity is assessed as Medium. **Smooth Chameleon** The Smooth Chameleon is widespread and abundant throughout Africa. The IUCN lists the species as Least Concern on the basis of this and the paucity of tangible threats. However, the URDB lists the Smooth Chameleon as endangered under Criterion B – small range and population declines. Although the species could be considered as meeting PS6 Criterion 1, Tier 2e, the fact that the species is listed as Least Concern by the IUCN and given its widespread distribution and paucity of threats, this is not considered to be appropriate. Using Table 14-17, the species broadly accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity is assessed as Medium.
Species Ecology	**Adanson's Hinged Terrapin** This turtle is found in rivers and calm waters, large ponds, flooded savannahs and more or less permanent wetlands. During the dry season, the species will spend several months buried in the mud at the bottom of ponds. The species is omnivorous consuming both plant and animal matter. Adanson's Hinged Terrapin nests several times per season. **African Soft-shelled Turtle** The African Soft-shelled Turtle feeds on a variety of animal prey (molluscs, insects, crustaceans, frogs and fish), carrion, and vegetarian items (palm nuts, fruits). Females produce clutches averaging about 30 – 40 eggs (but exceptionally up to 60–90 eggs) in exposed sandbanks and banks with heavier soil along rivers and marine beaches. Nesting occurs between March and July depending on latitude. The species is capable of remaining buried at the bottom of ponds for long periods of time. **Zaire Hinged Terrapin** The species occurs in brushy savannah where it occupies lakes, streams and rivers. During the rainy season, the Zaire Hinged Terrapin moves out on to flooded savannahs and human made ditches. The species is omnivorous feeding on fallen fruit, aquatic vegetation, crustaceans, fish and amphibians. **Smooth Chameleon** The Smooth Chameleon primarily inhabits bushes and trees; however, it readily descends to ground level to cross roads during the rainy season. The species readily feeds on invertebrates.
Habitat Preference	**Adanson's Hinged Terrapin** This turtle is found in rivers and calm waters, large ponds, flooded savannahs and more or less permanent wetlands. It is known from Lake Albert and the adjoining streams and wetlands. **African soft-shelled turtle** The African Soft-shelled Turtle inhabits fairly deep water in permanent lakes, rivers, estuaries, coastal lagoons and coastal waters; it is also highly tolerant of full seawater conditions for short periods of time. Sandbanks and banks with heavier soils along rivers and marine beaches are used for nesting. It is known from the shores of Lake Albert and the Victoria Nile. **Zaire Hinged Terrapin** The species occurs in brushy savannah where it occupies lakes, streams and rivers. During the rainy

Adanson's Hinged Terrapin (*Pelusios adansonii*) **African soft-shelled turtle** (*Trionyx triunguis*) **Zaire Hinged Terrapin** (*Pelusios chapini*) **Smooth Chameleon** (*Chamaeleo laevigatus*)	
	season, the Zaire Hinged Terrapin moves out on to flooded savannahs and human made ditches. **Smooth Chameleon** This is an arboreal savannah chameleon, which is widespread (Tilbury, 2010). It is sometimes observed in trees along watercourses (Trape *et al*., 2012).
Population & Trends	**Adanson's Hinged Terrapin** The IUCN does not include an assessment of this species; however, the URDB lists the species as declining. **African soft-shelled turtle** Although the species occurs throughout Africa, its conservation status is not consistent across its range. The situation in East Africa is unclear and more information is needed, although the species is understood not to be exploited where it occurs and available habitat is good. **Zaire Hinged Terrapin** The IUCN does not include an assessment of this species; however, the URDB lists the species as declining. The species known from MFNP, Kabwoya Wildlife Reserve and Lake Albert. **Smooth Chameleon** The IUCN lists the Smooth Chameleon as stable and widespread; however, the URSB assessed the species as declining.
Summary of state of knowledge	Very little life history information is available for these species. Without such basic information, impacts cannot be fully understood and mitigation not clearly defined. Further presence / absence surveys of these species ahead of construction could address some of these limitations.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	The three species of chelonian listed above are all largely dependent of the presence of open water (Areas C and F). The Smooth Chameleon, although often spotted within trees situated adjacent to rivers, is less dependent on open water and more closely associated with savannah (Areas A, B and E). **Habitat Loss and Degradation** Based on current plans, sources of habitat loss and degradation could arise from: • The construction and operation of well and associated pads; • The HDD pipeline crossing of the River Nile; • The construction of new roads and the upgrading of existing access tracks; • The construction and maintenance of the pipeline network; • The construction and operation of the CPF; • The construction and operation of a water abstraction facility on the shore of Lake Albert; • The construction and operation of the ferry facility within the River Nile; and • The extractions of materials from borrow pits. The construction of the above listed items could result in the physical loss or degradation of habitat. Some of these habitat losses (i.e. those arising from the construction of the pipelines) will be both temporary and reversible whilst others (such as the new roads) are likely to be permanent. It is not possible to quantify these impacts in fine detail as both population size and expected habitat occupancy are largely based on assumptions. However, given the Tilenga project's FEED strategy of avoiding wetlands wherever possible, the extent of this habitat loss is likely to be low. The loss of habitat to facilitate the construction of the well sites and pads is unlikely to be sufficiently extensive to isolate Smooth Chameleon populations. Likewise, the footprint of the pipelines will be both temporary and reversible and unlikely to fragment populations. Although the construction of new roads does necessitate the loss of habitat on a permanent basis (although certainly long-term), the operation of motor vehicles is likely to represent a barrier (see below). All water crossing points, the ferry point and abstraction facility have the potential to impact the aquatic reptiles. Indeed, the siltation of the water and accidental spills could have repercussions that extend beyond reptiles to the aquatic ecosystem. The construction and operation of plant, smoking and campfires all have the potential to cause

Adanson's Hinged Terrapin (*Pelusios adansonii*) **African soft-shelled turtle** (*Trionyx triunguis*) **Zaire Hinged Terrapin** (*Pelusios chapini*) **Smooth Chameleon** (*Chamaeleo laevigatus*)				
	wildfires, particularly in the savannahs. The footprint of the Tilenga development is situated exclusively outside of all identified areas of tropical high forest and Neppi. No habitat losses or degradation are anticipated in these areas. **Disturbance** Both chelonians and the Smooth Chameleon are likely to be disturbed by increased human presence, habitat clearance, the operation of heavy machinery or vehicles. As with the habitat losses and degradation, some of the disturbance impacts will be temporary and some permanent. Several species are thought to be adaptable (i.e. the Zaire Hinged Terrapin and Smooth Chameleon for instance) and are expected to be able to adapt (habituate) to small increases in disturbance; for others, the effects of disturbance might be more significant, in particular, any increases in disturbance levels at basking and egg laying sites. **Barrier Effects** The construction of the pipelines and construction and operation of the roads could prohibit natural movements. As the pipelines are to be constructed via a cut and fill method, these barrier effects are likely to be temporary only. Furthermore, given that the terrapins / turtle are largely restricted to wetlands and the apparent willingness of the Smooth Chameleon to cross roads, the physical structure is unlikely to be a barrier. However, the frequent movement of vehicles are well-known to be detrimental to reptile populations (Ref 14-A52). High volumes of traffic especially during construction could interfere with seasonally migrations (particularly during the wet season), increase mortality rates and fragment habitat. **Disease Transmission** The movement of materials and species between sites could increase the transmission of diseases. Many of these diseases occur in a state of equilibrium in nature; however, when an ecosystem is disturbed or species are deliberately moved (typically in trade), the diseases can become particular virulent. It is likely that there other as yet undescribed diseases present in wild African reptile populations.			
Potential Impacts - indirect	**Population Change** The increased presence of humans and the increased accessibility (from the upgraded and new roads) could induce population-level changes in the chelonians. All three are thought to be exploited bush meat, the pet trade or both. Given the Critically Endangered status of these species in Uganda, further exploitation could be severe. The greatly increased presence and operation of heavy vehicles is likely to increase the rates of nitrogen deposition on the surrounding landscapes. This enrichment could result in changes to the structure of vegetation, which in turn could affect the reptile assemblage occupying it.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Of the direct impacts listed, those associated with the construction / upgrade of roads (habitat loss and barriers) is considered to be the most important. Using Table 14-11, the following scores were	Of the direct impacts listed, habitat degradation and disturbance are considered to be the most important impacts. Of particular note are the degradation of aquatic habitats through the construction of the	The risks arising from the operational phase would be the use of the upgraded road system, disturbance and habitat degradation. Using Table 14-11, the following scores were achieved:	The risks arising from the decommissioning phase would be habitat degradation . However, the roads are also likely to be left *in situ*, increasing the accessibility of remote areas to tourists and poachers (Indirect impact).

Adanson's Hinged Terrapin (*Pelusios adansonii*) **African soft-shelled turtle** (*Trionyx triunguis*) **Zaire Hinged Terrapin** (*Pelusios chapini*) **Smooth Chameleon** (*Chamaeleo laevigatus*)				
	achieved: • Scope: Medium - Up to 20% of the population affected; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – the construction of roads will be completed within 5 years; and • Permanence: Low – much of the infrastructure could be removed within 2 years – note, this is unlikely to apply to the roads.	abstraction plant and ferry facility and the potential for increased collection as a result of the upgraded road system facilitating access (Indirect impact). Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the population affected; • Severity: Medium Adverse – further collection could potentially affect conservation status; • Duration: Low – the construction of the abstraction and ferry facilities will be completed within 5 years; however, the roads are likely to be left *in situ* after the Tilenga project has concluded; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	• Scope: Medium - Up to 20% of the population effected; • Severity: Medium– sufficient to affect conservation status; • Duration: Low any impact will be temporary and short term; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the population affected; • Severity: Low– insufficient to affect conservation status; • Duration: Low any impact will be temporary and short term; and • Permanence: Negligible.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**			
Justification of in-combination sensitivity	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater, it is unlikely that greater than 20% of the Adanson's Terrapin, African Soft-shelled Turtle, Zaire Hinged Terrapin or Smooth Chameleon populations would be affected by the additional projects. This assessment is based on the other projects avoiding wetlands whenever feasible and implementing strict pollution control protocols. The Smooth Chameleon is more likely to be affected through the loss of habitat and operation of the upgraded road networks (which could act as barriers to movement if sufficiently busy). Given the extent of scrubby savannah, the roads are unlikely to fragment populations from suitable habitat. The upgraded roads are likely to facilitate easier access to more remote areas; the result of this is the increased collection of terrapins and turtle for bush meat. Indeed, the operation of the oil facilities is likely to increase human presence in all affected areas.			

Adanson's Hinged Terrapin (*Pelusios adansonii*) **African soft-shelled turtle** (*Trionyx triunguis*) **Zaire Hinged Terrapin** (*Pelusios chapini*) **Smooth Chameleon** (*Chamaeleo laevigatus*)				
	The decommissioning of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, should not impact on reptile populations beyond a temporary increase in disturbance.			
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Many of the identified impacts can be appropriately addressed through the implementation of both generic and specific mitigation. Despite this, the operation of the road network is likely to result in the killing or harming of a small number of Smooth Chameleons and facilitate further exploitation. Given the extent of the road network coupled with the presence of large animals, it would not be appropriate to erect fencing. Underpasses are unproven for reptiles and are unlikely to be successful for arboreal species. Given the siting of roads away from wetlands and the implementation of a TMP, no further mitigation is suggested until the monitoring programme has been undertaken. The Tilenga staff and their families should be encouraged to be vigilant against poaching, fire lighting the unauthorised construction of new facilities with monetary rewards made available.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Once mitigation (included FEED input) has been considered, the project is likely to result in the following residual effects. **Loss and degradation of habitat** Although the Project will mean direct loss of habitat, mitigation should prevent loss or damage to habitat outside of the project footprint. The majority of losses would be temporary in nature (pipeline routes, well pads); however, much of the infrastructure (roads, ferry facility) is likely to be retained in perpetuity. These permanent losses represent small proportions of the habitat available and, according to Behangana *et al*. (2017) are unlikely to include any particularly important reptile areas. The construction of the roads could result in the killing of a small number of Smooth Chameleons. **Disturbance** Disturbance will be minimised although there will still be some impacts associated with this phase, particularly from the presence of people and vehicle movements within the park and around the lake and wetlands. Human and vehicle movements would be restricted to minimise disturbance; the residual disturbance is unlikely to be significant. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed. **Indirect Effects** During the construction and operational phases, there will be an increased human presence. Although members of staff and their families will be cautioned against dealing in bush meat, there is likely to be an increase in the collection of wild reptiles. Furthermore, once the operation has closed, the upgraded road network would allow increased access to more remote areas. As such, further collection could continue; however, given the limited population densities as indicated by Behangana *et al.* (2017), it is unlikely that poachers would specifically focus in on these areas. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Once mitigation has been implemented, the residual impact will be low significance.	Once mitigation has been implemented, residual impact will be moderate significance.	Once mitigation has been implemented, residual impact will be moderate significance.	The removal of the infrastructure and facilities will cause an initial loss of habitats and disturbance to

Adanson's Hinged Terrapin (*Pelusios adansonii*) **African soft-shelled turtle** (*Trionyx triunguis*) **Zaire Hinged Terrapin** (*Pelusios chapini*) **Smooth Chameleon** (*Chamaeleo laevigatus*)				
				local reptiles. The roads and Nile ferry facility are likely to be a permanent feature of the landscape and these could allow ingress of tourists and poachers into the more remote areas; however, the species is not thought to occur at high densities so a large influx of poachers is unlikely. Residual impact will be moderate significance
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Adolf Friedrich's Frog, *Arthroleptis adolfifriederici*

Kivu Clawed Frog, *Xenopus vestitus*

Golden Puddle Frog / Eared River Frog, *Phrynobatrachus auritus*

Ugandan Clawed Frog, *Xenopus ruwenzoriensis*

Rwanda Long Reed Frog, Hyperolius rwandae

Leptopelis oryi

Hyperolius lateralis

Hyperolius langi

Amphibians	IUCN Status (URDB)	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Criterion 2 (Tier 2) Endemic/Restricted Range Species					
Adolf Friedrich's Frog (*Arthroleptis adolfifriederici*)	LC (EN)	2b	**D**	This species occurs in Democratic Republic of Congo, Uganda, Rwanda and Burundi. In Uganda, the species is known from Budongo Forest Reserve.	High
Kivu Clawed Frog (*Xenopus vestitus*)	LC (EN)	2b	**D**	The Kivu Clawed Frog occurs in the mountains bordering the Albertine Rift in southwestern Uganda, western and northern Rwanda and eastern Democratic Republic of Congo. It ranges as far north as Kibale Forest in Uganda but it also known from Wambabya Forest Reserve.	High
Golden Puddle Frog (*Phrynobatrachus auritus*)	LC (EN)	NA	**D**	This species known range includes Nigeria, Cameroon, Democratic Republic of Congo, Uganda and Rwanda. In addition, there are records from mainland Equatorial Guinea, Gabon, Congo and Central African Republic. In Uganda, the species is known to occur in the Budongo Forest Reserve, Bugoma Forest Reserve and Wambabya Forest Reserve.	HIGH
Ugandan Clawed Frog (*Xenopus ruwenzoriensis*)	DD (VU)	2b	**D**	This species is known from near Bundibugyo in western Uganda. It is also know from the foot of the Ruwenzori Mountains in the Democratic Republic of Congo. Known from Budongo Forest Reserve.	Medium
Rwanda Long Reed Frog (*Hyperolius rwandae*)	LC (DD)	2b	N/A	This species is known from Rwanda; however, it is assumed to be more widespread than current records show, including within the Ugandan portion of the Albertine Rift.	Medium

Amphibians	IUCN Status (URDB)	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Leptopelis oryi	LC	2b	N/A	This species is known from Garamba National Park in north-eastern Democratic Republic of Congo and savannah near Budongo Forest in western Uganda. It presumably occurs more widely, in particular in the area between these two locations. The species is historically known from the MFNP but was not recorded during recent surveys (Behangana *et al*., 2017).	Medium
Hyperolius lateralis[1]	LC (DD)	2b	N/A	This species is known to inhabit subtropical or tropical moist lowland forests, subtropical or tropical swamps, subtropical or tropical moist montane forests, rivers, swamps, and heavily degraded former forest. It is found in Burundi, Democratic Republic of the Congo, Kenya, Rwanda, Tanzania, and Uganda. However, these species are data deficient and it is unknown if they will be impacted by the project development.	Medium
Hyperolius langi[2]	LC (DD)	2b	N/A	This species is known to inhabit subtropical or tropical moist lowland forests, subtropical or tropical swamps, subtropical or tropical moist montane forests, rivers, swamps, and heavily degraded former forest. It is found in Democratic Republic of the Congo, possibly Rwanda, and possibly Uganda. However, these species are data deficient and it is unknown if they will be impacted by the project development.	Medium

[1] *Hyperolius lateralis* is data deficient and it is unknown if they will be impacted by the Project development. If these species do occur within the AoI, they are likely to be affected by indirect impacts only. Nevertheless, species occupying similar habitat (e.g. Adolf Friedrich's Frog, *Arthroleptis adolfifriederici*, Golden puddle frog, *Phrynobatrachus auritus*, Uganda Clawed Frog, *Xenopus ruwenzoriensis*, and Kivu clawed frog, *Xenopus vestitus*) have been assessed, and recommended mitigation for these species will be adequate to cover any potential impacts of the development to *Hyperolius lateralis* and their habitat.

[2] *Hyperolius langi* is data deficient and it is unknown if they will be impacted by the Project development. If these species do occur within the AoI, they are likely to be affected by indirect impacts only. Nevertheless, species occupying similar habitat (e.g. Adolf Friedrich's Frog, *Arthroleptis adolfifriederici,* Golden puddle frog, *Phrynobatrachus auritus*, Uganda Clawed Frog, *Xenopus ruwenzoriensis*, and Kivu clawed frog, *Xenopus vestitus*) have been assessed, and recommended mitigation for these species will be adequate to cover any potential impacts of the development to *Hyperolius langi* and their habitat.

Adolf Friedrich's Frog, *Arthroleptis adolfifriederici* **Kivu Clawed Frog, *Xenopus vestitus*** **Golden Puddle Frog / Eared River Frog, *Phrynobatrachus auritus*** **Ugandan Clawed Frog, *Xenopus ruwenzoriensis*** **Rwanda Long Reed Frog, *Hyperolius rwandae*** ***Leptopelis oryi***	
SPECIES OVERVIEW	
Biodiversity significance	**Adolf Friedrich's Frog** The Adolf Friedrich's Frog is listed as 'Least Concern' globally by the IUCN; however, the Ugandan Red Data Book (URDB) lists the species as 'Endangered' nationally. Using the URDB, Adolf Friedrich's Frog accorded with criterion B', "the geographic range of the species is limited and is known to be declining". It is due to this restricted range that the species qualified as PS6 'Criterion 2, Tier 2', which corresponds to a species sensitivity categorisation of High. **Kivu Clawed Frog** The Kivu Clawed Frog is listed as 'Least Concern' globally by the IUCN; however, the URDB lists the species as 'Endangered' nationally for the same reasons described above. The species is known from Mgahinga Gorilla National Park, Echuya Forest Reserve, Wambabya Forest Reserve. Given its restricted distribution, the species meets PS6 'Criterion 2, Tier 2', which corresponds to a species sensitivity of High. **Golden Puddle Frog** The Golden Puddle Frog is assessed as Least Concern by the IUCN, despite some uncertainties surrounding its genetic status. The URDB lists the species as Endangered as it accords with 'URDB criterion B', "the geographic range of the species is limited and is known to be declining". The Golden Puddle Frog is found widely throughout central Africa, including Uganda where it is known from Budongo Forest Reserve, Bugoma Forest Reserve and Wambabya Forest Reserve.. **Ugandan Clawed Frog** The Ugandan Clawed Frog is listed as Data Deficient by the IUCN, largely because of uncertainties surrounding its geographic extent, status and ecological requirements. What is known from the type specimen is that this species is unique among vertebrates (with the exception of *Xenopus longipes*) in that it has 12 sets of chromosomes (dodecaploid). It is because of this that the IUCN lists it as 'of considerable conservation interest'. The URDB lists the Ugandan Clawed Frog as Endangered (again under Criterion B) given its limited geographic extent and presumed ongoing decline. The Ugandan Clawed Frog is known from Rwenzori National Park and the foothills, Semliki National Park and Budongo Forest Reserve. Although Table 14-17 describes Data Deficient species as Medium sensitivity, the combination of a restricted range (PS6 criterion 2, Tier 2) and importance from a genetic perspective mean that the species is assessed as High. **Rwanda Long Reed Frog** The Rwandan Long Reed Frog is listed as Least Concern globally by the IUCN (and not as Near Extinct as indicated by the URDB). This assessment was based on the species broad distribution throughout Rwanda, abundant population and adaptability to habitat modification. The URDB lists the Rwandan Long Reed Frog as Data Deficient nationally. The IUCN describes the species as endemic to Rwanda; indeed, the URDB omits listing any locations in Uganda due to taxonomic confusion (which is also presumably the reason for the mis-categorisation of the IUCN rating). However, field surveys in support of the ESIA (Behangana et al., 2017) did not identify the species. Table 14-17indicates that the species accords with PS6 'Criterion 2, Tier 2', which equates to a species sensitivity categorisation of High. ***Leptopelis oryi*** The IUCN lists *L. oryi* as being of Least Concern whilst the URDB omits the species altogether. Globally, *L. oryi* is only known from a national park in the Democratic Republic of Congo and Budongo Forest in Uganda. The species is historically known to uccur in the MFNP; however, recent surveys did not record the presence of the species within the study site. The species is assessed as PS6 'Criterion 2, Tier 2', which equates to a species sensitivity categorisation of High.
Species Ecology	**Adolf Friedrich's Frog** This species is thought to occupy leaf litter of montane forest habitats. Typical of frogs occupying higher elevations, the species exhibits direct development (i.e. the physical development lacks a larval (or tadpole) stage). It is because of this that Adolf Friedrich's Frog is not constrained by having to return to standing water to breed.

Adolf Friedrich's Frog, *Arthroleptis adolfifriederici* Kivu Clawed Frog, *Xenopus vestitus* Golden Puddle Frog / Eared River Frog, *Phrynobatrachus auritus* Ugandan Clawed Frog, *Xenopus ruwenzoriensis* Rwanda Long Reed Frog, *Hyperolius rwandae* *Leptopelis oryi*	
	Kivu Clawed Frog The Kivu Clawed Frog is known to occur in the mountains bordering the Albertine Rift, where is ranges as far north as Kibale Forest in Uganda. Like the Adolf Friedrich's Frog, it is a high-altitude species, descending as low as 1,200 m above sea level; however, unlike the Adolf Friedrich's Frog, it is a water-dependent species and does not typically occur in forested areas. Rather, it occupies high-altitude grassland and agricultural areas. **Ugandan Clawed Frog** The Ugandan Clawed Frog is a poorly known species. Despite its type locality type being a pool in a banana plantation, it is assumed to be a principally aquatic species that occupies lowland rainforest (700 – 1,200 m asl). The Ugandan Clawed Frog is thought to be able to survive in degraded habitats provided that the pools which it requires for breeding in are shaded locations. **Golden Puddle Frog** The Golden Puddle Frog occupies primary, secondary and riparian rainforest up to 1,200 m above sea level where it is often associated with rivers. It has not been found in open habitats outside forest and breeds by larval development in small pools. **Rwanda Long Reed Frog** This species has been recorded at elevations between 1,300 to 1,800 m above sea level. Incidental records show that the species has been collected from ponds and swamps in farmland and open natural wetlands where it was found perching in vegetation 5 cm and 1.2 m above the ground or the water level. This species appears to be relatively adaptable to artificial habitats and resilient to habitat disturbance. ***Leptopelis oryi*** This species is known from just two localities both of which comprise dense, humid savannah with tall grass and scattered bushes. The males are known to sit high up in grass or on branches during the wet season whilst in the dry season they are found buried in soil, and under rocks. Its breeding habits are unknown, though it presumably lays eggs in a nest on the ground near water.
Habitat Preference	**Adolf Friedrich's Frog** This species is thought to occupy montane forest habitats, although its altitudinal range is unclear. Individuals from the Bwindi Impenetrable Forest (Uganda) have been found at 2,070 m above sea level (Ref 14.-A53); however, specimens from other countries have been recorded both higher and lower than this. Recent surveys in Burundi indicate that this species occurs between 1,800 and 2,200 m above sea level. This is considerably higher than any part of the Tilenga Project site. It is unclear whether Adolf Friedrich's Frog it is tolerant of more intensive land conversion or whether it can persist away from forested areas. It is thought to favour a fossorial lifestyle. **Kivu Clawed Frog** The Kivu Clawed Frog is known to occur in the mountains bordering the Albertine Rift. It is a high-altitude (1,200+ m asl) species that selectively occupies grassland and agricultural areas. Like the Adolf Friedrich's Frog, it occupies elevations far greater than any part of the Tilenga Project site. The risk of encountering the Kivu Clawed Frog in the MFPA (c. 815 m asl) is therefore assessed to be low. **Golden Puddle Frog** The Golden Puddle Frog occupies primary, secondary and riparian rainforest up to 1,200 m above sea level where it is often associated with rivers. It has not been found in open habitats outside forest and breeds by larval development in small pools. **Ugandan Clawed Frog** The Ugandan Clawed Frog is assumed to be a principally aquatic species that occupies lowland rainforest (700 – 1,200 m asl). The Ugandan Clawed Frog is thought to be able to survive in degraded habitats provided that the pools which it requires for breeding in are shaded locations. **Rwanda Long Reed Frog** This high altitude (1,300 to 1,800 m asl) species has been recoded from ponds and swamps in

Adolf Friedrich's Frog, *Arthroleptis adolfifriederici* **Kivu Clawed Frog, *Xenopus vestitus*** **Golden Puddle Frog / Eared River Frog, *Phrynobatrachus auritus*** **Ugandan Clawed Frog, *Xenopus ruwenzoriensis*** **Rwanda Long Reed Frog, *Hyperolius rwandae*** ***Leptopelis oryi***	
	farmland and open natural wetlands. This species appears to be relatively adaptable to artificial habitats and resilient to habitat disturbance. Given its preference for occupying higher elevations, it is unclear whether the species will occur within the Tilenga Project site. However, prior to the targeted field studies (undertaken to support the ESIA), the Rwandan Long Reed Frog was unknown from the Tilenga project area. The lead surveyor commented that the reason it hasn't been recorded in the savannah previously was that most (if not all) of the survey effort has historically been directed to the MFPA. It is likely that the species is more widely distributed than previously thought. ***Leptopelis oryi*** This species is known from just two localities both of which comprise dense, humid savannah with tall grass and scattered bushes. Although there is little information available, *L. oryi* is thought to an adaptable species and it occurs in a region of limited human impact.
Population & Trends	**Adolf Friedrich's Frog** An estimated 30% of the global population is present in Uganda and 100% of the population is present in the Albertine Rift. In Uganda's Impenetrable Forest the species is known from only five specimens (Drewes & Vindum, 1994); however, surveys of this region have been limited. Elsewhere, the species does not appear to be very common in the Democratic Republic of Congo but individuals are encountered fairly regularly and there is no evidence of population decline in this area. Despite a continuing decline in the extent and quality of its habitat, Adolf's Friedrich's frog appears to be stable. **Kivu Clawed Frog** Although the population size and trends are not fully understood, the Kivu Clawed Frog occurs in extensive areas of habitat that are not currently under threat. The species is thought to have a presumed large and stable population in these areas. **Golden Puddle Frog** The Golden Puddle Frog is a common species and its population is thought to be stable. **Ugandan Clawed Frog** The Ugandan Clawed Frog is a very poorly known species and current population sizes and trends are unknown. **Rwandan Long Reed Frog** This species adaptable species is abundant at all known sites. Although population trends are not explicitly known, the population is thought to be stable. ***Leptopelis oryi*** Given *L. oryi*'s wide distribution and tolerance of a range of habitats, it is thought to have a large population; indeed, it is reasonably abundant everywhere it has been found.
Summary of state of knowledge	Basic ecological data is missing for many of the above species accounts, such as time, location and duration of mating, seasonal dynamics or key environmental factors that influence distribution. In the absence of detailed species accounts, assumptions need to be made with regards to the likely distribution and severity of impacts arising from the Tilenga project. This data could be collected through further presence / absence surveys ahead of construction activities. The presence / absence survey should focus on areas where these species are likely to occur.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	The six species of amphibian listed above are likely to occur at each of the identified land parcels (A-F). **Habitat Loss and Degradation** Based on current plans, sources of habitat loss and degradation could arise from: • The construction and operation of well and associated pads (Kivu Clawed Frog, Rwanda Long Reed Frog, *Leptopelis oryi*); • The HDD pipeline crossing of the River Nile (Kivu Clawed Frog, Rwanda Long Reed Frog);

Adolf Friedrich's Frog, *Arthroleptis adolfifriederici* **Kivu Clawed Frog, *Xenopus vestitus*** **Golden Puddle Frog / Eared River Frog, *Phrynobatrachus auritus*** **Ugandan Clawed Frog, *Xenopus ruwenzoriensis*** **Rwanda Long Reed Frog, *Hyperolius rwandae*** ***Leptopelis oryi***	
	• The construction of new roads and the upgrading of existing access tracks (Kivu Clawed Frog, *Leptopelis oryi*); • The construction and maintenance of the pipeline network (Kivu Clawed Frog, Rwanda Long Reed Frog, *Leptopelis oryi*); • The construction and operation of the CPF (Kivu Clawed Frog, Rwanda Long Reed Frog, *Leptopelis oryi*); • The construction and operation of a water abstraction facility on the shore of Lake Albert (Kivu Clawed Frog, Rwanda Long Reed Frog); • The construction and operation of the ferry facility within the River Nile (Kivu Clawed Frog, Rwanda Long Reed Frog); and • The extractions of materials from borrow pits (Kivu Clawed Frog, Rwanda Long Reed Frog, *Leptopelis oryi*). The construction of the above listed items could result in the physical destruction or degradation of habitat, eggs of *L. oryi*, which are deposited on the ground as well as direct harm to individuals. Some of these habitat losses (i.e. those arising from the construction of the pipelines) will be both temporary and reversible whilst others (such as the new roads) are likely to be permanent. It is not possible to quantify these impacts in fine detail as both population size and expected habitat occupancy are largely based on assumptions. However, given the assumed adaptability of each species, the modification of habitat is likely to be less of an issue than its total loss. . The loss of habitat to facilitate the construction of the well sites and pads is unlikely to be sufficiently extensive to isolate populations. Likewise, the footprint of the pipelines will be both temporary and reversible and unlikely to fragment populations. Although the construction of new roads does necessitate the loss of habitat on a permanent basis, the operation of motor vehicles is likely to be of greater significance to amphibians; this is discussed further within the Barrier Effects section. All water crossing points have the potential to adversely impact the affected wetlands. Indeed, the siltation of the water and accidental spills could have repercussions that extend beyond amphibians to the aquatic ecosystem as a whole. The construction activities could result in the creation of dust. The permeable skin of amphibians makes them sensitive to the effects of dust. However, given Uganda's high precipitation levels, this is unlikely to be a significant impact. The construction and operation of plant, smoking and campfires all have the potential to cause wildfires, particularly in the savannahs. Given the extent of the affected habitat in the context of its availability in the wider landscape, it is likely that only a small proportion (< 1%) would be affected by the development. The majority of habitat loss would be associated with the construction of the well pads and roads. The footprint of the Tilenga development is situated exclusively outside of all identified areas of tropical high forest and Neppi. No habitat losses or degradation are anticipated in these areas. **Disturbance** Frogs are likely to be disturbed by increased human presence, habitat clearance, the operation of heavy machinery or vehicles. As with the habitat losses and degradation, some of the disturbance impacts will be temporary and some permanent. Several species are thought to be adaptable (i.e. Kivu Clawed Frog and *L. oryi* for instance) and are expected to be able habituate to small increases in disturbance. For others, the effects of disturbance might be more important. Increases in noise and light, associated with the construction and operation phases, could interfere with frog courtship. Males that rely on vocal calls to attract females are likely to be dissuaded from areas subject to high levels of background noise (such as generators). **Barrier Effects** The construction of the pipelines and construction and operation of the roads could prohibit natural movements. As the pipelines are to be constructed via a cut and fill method, these barrier effects are likely to be temporary only. The new and upgraded roads, in contrast, are likely to be permanent features in the landscape. The compacted surfaces will be largely impermeable and systems of drainage will be required. Highly mobile amphibians, such as anurans, will be able to cross 10 m

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	road surfaces, assuming no physical barriers such as raised curbs. However, the frequent movement of vehicles are well-known to be detrimental to amphibian populations. Frogs in particular have been shown to be vulnerable to the many adverse effects of roads (Andrews *et al.*, 2008). High volumes of traffic could interfere with seasonal migrations (particularly during the wet season), increase mortality rates and fragment habitat. **Disease Transmission** The movement of materials and species, between sites could increase the transmission of diseases. Emerging diseases have featured prominently in the global decline of amphibian populations. Many of these diseases occur in a state of equilibrium in nature; however, when an ecosystem is disturbed or species are deliberately moved (typically in trade), the diseases can become particular virulent. Chytridiomycosis, a particularly devastating amphibian disease, was close linked with the collection and selling of *Xenopus laevis* from South Africa. It is likely that there other as yet undescribed diseases present in wild African amphibian populations.			
Potential Impacts - indirect	**Population Change** The greatly increased presence and operation of heavy vehicles is likely to increase the rates of nitrogen deposition on the surrounding landscapes. This enrichment could result in changes to the structure of vegetation, which in turn could affect the amphibian assemblage occupying it. Although the footprint of the Tilenga development does not include forested areas, the increased presence of people due to in-migration is likely to increase pressure on them (foraging, hunting, tourism, conversion /degradation of their habitat for camps / huts). The increased presence of humans (associated with both the construction and operational phases) and the increased accessibility (from the upgraded and new roads) could induce population-level changes, particularly in the Ugandan Clawed Frog, which is thought to be exploited for bush meat.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Of the direct impacts listed, those associated with the construction / upgrade of roads (habitat loss, barriers and increased risk of collection) is considered to be the most important. Using Table 14-11, the following scores were achieved: • Scope: Low - Less than 10% of the feature's population and/or distribution within	Of the impacts listed, habitat degradation, disturbance and barrier effects are considered to be the most important. Specifically, the temporary degradation of habitats (caused by the influx of people and construction activities) and creation of barriers. Using Table 14-11, the following scores were achieved: • Scope Medium - Up to 20% of the	The risks arising from the operational phase would be the use of the upgraded road system and habitat degradation. Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the	The risks arising from the decommissioning phase would be habitat degradation. However, the roads are also likely to be left in situ, increasing the accessibility of remote areas to tourists and poachers. Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or distribution within

Adolf Friedrich's Frog, *Arthroleptis adolfifriederici* **Kivu Clawed Frog, *Xenopus vestitus*** **Golden Puddle Frog / Eared River Frog, *Phrynobatrachus auritus*** **Ugandan Clawed Frog, *Xenopus ruwenzoriensis*** **Rwanda Long Reed Frog, *Hyperolius rwandae*** ***Leptopelis oryi***				
	the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – the construction of the water abstraction plant and ferry facility will be completed within 5 years; and • Permanence: Low – much of the infrastructure could be removed within 2 years – note, this is unlikely to apply to the roads.	feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low Adverse – although not sufficient to affect conservation status the construction and operational of the roads could result in a small number of fatalities; • Duration: Low – the construction will be completed within 5 years; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	impact; • Severity: Low Adverse – although not sufficient to affect conservation status, the operational of the roads could result in a small number of fatalities; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	the landscape context will be affected by the impact; • Severity: Low Adverse – although not sufficient to affect conservation status, the operational of the roads could result in a small number of fatalities; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low.
Potential Impacts	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Vegetation removal for new road, feeder and pipelines construction works, leading to minor degradation and disturbance of amphibian habitat. Impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary and	The construction of the supporting and associated facilities will result in habitat degradation and/or disturbance; however, these effects will be temporary. Improvements to the major 'R' roads are unlikely to result in significant habitat losses for amphibians but could exacerbate the barrier effect associated with them.	The operation of both new pipelines is unlikely to affect amphibians. In contrast, the operation of the new industrial park could disrupt courtship behaviours through elevated levels of background noise and light.	Decommissioning works of supporting and associated facilities will lead to moderate degradation of habitat and/or disturbance of ecological function; however, it is unlikely that this would lead to a reduction in population. If roads are left *in situ* and without monitoring by the Tilenga staff, it

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	reversible.	The impact will last the duration of the project, and can be reversed to baseline levels within 5 years once activity has ceased; however, this is unlikely to apply to roads. Less than 10% of each of the respective amphibian populations is likely to be affected by the impact.		is possible that they could be used to access more remote areas. This would leave elevated traffic levels (and speeds), disturbance and barrier effects, all of which could be permanent.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Many of the identified impacts can be appropriately addressed through the implementation of mitigation. Despite this, the operation of the road network is likely to result in the killing or harming of a small number of individuals.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Once mitigation has been considered, the project is likely to result in minimal residual effects. Of these, the most important is likely to be increased human presence. Once the operations are over, the upgraded road network would allow increased access to more remote areas placing pressure on forests, savannah *etc*. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Magnitude	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Once mitigation has been implemented, residual impact would be low significance.	Once mitigation has been implemented, residual impact would be moderate significance.	Once mitigation has been implemented, residual impact would be moderate significance.	The removal of the infrastructure and facilities will cause an initial loss of habitats and disturbance to local amphibians. The roads and Nile ferry facility are likely to be a permanent feature of the landscape and these could allow ingress of tourists and poachers into the more remote areas. The residual impact would be moderate significance.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Christy's Grassland Frog (*Ptychadena christyi*)

Lake Victoria Toad (*Amietophrynus vittatus* / *Sclerophrys vittata*)

Striped Beaked Snake (*Psammophylax acutus*)

Bequaert's Green Snake (*Philothamnus bequaerti*)

Sudan Beaked Snake (*Letheobia cf sudanensis*)

Reticulated Centipede-eater (*Aparallactus lunulatus*)

Herpetofauna	Status (IUCN)	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Non Critical Habitat Qualifying Species of Interest					
Christy's Grassland Frog (*Ptychadena christyi*)	LC (VU in Uganda)	n/a	A B D	The species is known from the Democratic Republic of the Congo and Uganda. In the latter, Christy's Grassland Frog has been recorded in Semliki National Park, Budongo Forest Reserve and Lake Albert.	Medium
Lake Victoria Toad (*Amietophrynus vittatus*)	DD	n/a	A C	The Lake Victoria Toad is known only from Uganda; however, it is thought to extend beyond Uganda along the Nile Valley as far north as Egypt. In Uganda, the species is known from Lira.	Medium
Striped Beaked Snake (*Psammophylax acutus*)	NE (DD in Uganda)	n/a	N/A	The Striped Beaked Snake is known from Angola, Benin, Burundi, Cameroon, Democratic Republic of the Congo, Ghana, Cote d'ivoire, Nigeria, Tanzania, Uganda and Zambia.	Medium
Northern Green Bush Snake/ Bequaert's Green Snake (*Philothamnus bequaerti*)	NE (DD in Uganda)	n/a	A	Bequaert's Green Snake is reported from the Central African Republic, Cameroon, Ethopia, Sudan and Uganda. In Uganda, the species is known from Semuliki National Park.	Medium
Sudan Beaked Snake (*Letheobia cf sudanensis*)	NE	n/a	A B C	The Sudan Beaked Snake is known from the Democratic Republic of the Congo, Uganda and Zaire. Recent surveys (Behangana *et al.*, 2017) identified the species at both the north and south Nile crossing points and the site of the Central Processing Facility.	Low
Reticulated Centipede-eater (*Aparallactus lunulatus*)	NE (VU in Uganda)	n/a	A B C	The Reticulated Centipede-eater is known from Botswana, Central African Republic, Cameroon, Ethiopia, Ghana, Cote d'ivoire, Mozambique, Somalia, Swaziland, Tanzania, Uganda and Zambia and Zimbabwe. In Uganda, the species is known from Semuliki National Park and Kabwoya Wildlife Reserve.	Medium

Christy's Grassland Frog (*Ptychadena christyi*) **Lake Victoria Toad (*Amietophrynus vittatus*)** **Striped Beaked Snake (*Psammophylax acutus*)** **Bequaert's Green Snake (*Philothamnus bequaerti*)** **Sudan Beaked Snake (*Letheobia cf sudanensis*)** **Reticulated Centipede-eater (*Aparallactus lunulatus*)**	
SPECIES OVERVIEW	
Biodiversity significance	**Christy's Grassland Frog** This species is listed as Least Concern by the IUCN Red List reflecting its wide range and presumed large population; indeed, the predicted extent of the species is over 57,000 km^2, which exceed the criterion to be considered a restricted range species. However, the IUCN assessment also states that the population is thought to be declining. The Ugandan Red Data Book (URDB) lists the species as Vulnerable, under criterion B – the geographic range of the species is limited and the species is known to be declining. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity of Christy's Grassland Frog is assessed as Medium. **Lake Victoria Toad** The Lake Victoria Toad is listed as Data Deficient by the IUCN and is not included on the URDB; as such, there are large uncertainties around the status of the species in Uganda. Although only known from Ugandan, the species is believed to extend much further afield within the Nile Valley. As such, the range of the Lake Victoria Toad is likely to exceed 50,000 km^2 and therefore it is not assessed to be a restricted range species. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity of the Lake Victoria Toad is assessed as Medium. **Striped Beaked Snake** The Striped Beaked Snake has not been evaluated by the IUCN and is listed as Data Deficient on the URDB; as such, there are large uncertainties around the status of the species in Uganda. It is a widespread species throughout much of central Africa and is unlikely to be assessed as a range restricted species. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity of the Striped Beaked Snake is assessed as Medium. **Bequaert's Green Snake** Bequaert's Green Snake has not been evaluated by the IUCN and is listed as Data Deficient on the URDB; as such, there are large uncertainties around the status of the species in Uganda. It is a widespread species throughout much of central Africa and is unlikely to be assessed as a range restricted species. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity of the Bequaert's Green Snake is assessed as Medium. **Sudan Beaked Snake** The herpetological study (Behangana et al., 2017) that identified this species is awaiting further confirmation of the species; however, it could represent a first for the region and Uganda as a whole. The Sudan Beaked Snake has not been evaluated by the IUCN and is not included on the URDB; as such, there are large uncertainties around the status of the species in Uganda. It is because of these uncertainties that a conservative approach to the assessment of sensitivity has been applied. For the purpose of this assessment, the species is considered as Data Deficient and accorded a sensitivity rating of Medium. **Reticulated Centipede-eater** This species has not been evaluated by the IUCN whilst the URDB lists it as Vulnerable, under criterion D – very small or restricted populations. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient*

Christy's Grassland Frog (*Ptychadena christyi*) Lake Victoria Toad (*Amietophrynus vittatus*) Striped Beaked Snake (*Psammophylax acutus*) Bequaert's Green Snake (*Philothamnus bequaerti*) Sudan Beaked Snake (*Letheobia cf sudanensis*) Reticulated Centipede-eater (*Aparallactus lunulatus*)	
	(DD), whichever is the higher category." As such, the Sensitivity of the Reticulated Centipede-eater is assessed as Medium.
Species Ecology	**Christy's Grassland Frog** The biology of this species is very poorly understood, but it appears to live on the rainforest floor where it breeds in temporary terrestrial pools including those on or near roads. It is unclear whether the species has a set mating season but it is likely that breeding would occur at different times in different localities within the range of this species. **Lake Victoria Toad** There is very little known about the ecology of the Lake Victoria Toad. It has been recorded in marshy areas, where it presumably breeds by larval development. **Striped Beaked Snake** The Striped Beaked Snake is a largely under-studied species and very little is known of its ecology; however, the species is thought to be oviparous (egg-laying). The timing and locality of egg deposition is not known. **Bequaert's Green Snake** Bequaert's Green Snake is a largely under-studied species and very little is known of its ecology; however, the species is thought to be oviparous. Snakes of the genus *Philothamnus* are typically diurnal and arboreal. **Sudan Beaked Snake** Very little is known about the Sudan Beaked Snake other than, like most blind snakes, it occupies a fossorial niche. Most blind snakes are known to be nocturnal, insectivorous and oviparous. **Reticulated Centipede-eater** The Reticulated Centipede-eater is a little known snake of central Africa. It is thought to be an oviparous and insectivorous fossorial species.
Habitat Preference	**Christy's Grassland Frog** This is a species found in lowland and montane rainforest (600 – 1,200 m asl) and wetalnds. The individuals from Boyulu were found in temporary pools formed in the road through the forest, which contained large masses of spawn. **Lake Victoria Toad** There is very little known about its habitat and ecology. It appears to occupy marshy areas, where it presumably breeds by larval development. **Striped Beaked Snake** Little is reported of the habitat preferences of the Striped Beaked Snake; however, the type specimen was collected from the Barotse flood plains in western Zambia. **Bequaert's Green Snake** Based on its presumed arboreal tendencies, this species is thought primarily to be a forest-dweller; however, it is also expected to occur in thicket-rich savannahs such as Semuliki National Park. **Sudan Beaked Snake** Little is known of the habitat preferences of the Sudan Beaked Snake but it is thought to favour a mosaic of lowland rain forest and secondary grassland. **Reticulated Centipede-eater** The Reticulated Centipede-eater occurs within savannah (moist and dry), thickets and semi-desert up to 2,200 m.
Population & Trends	**Christy's Grassland Frog** Although this species is hard to find, further surveys may indicate that it is more widespread than currently thought. However, there is ongoing decline in the quality and extent of its habitat, so its

Christy's Grassland Frog (*Ptychadena christyi*) **Lake Victoria Toad (*Amietophrynus vittatus*)** **Striped Beaked Snake (*Psammophylax acutus*)** **Bequaert's Green Snake (*Philothamnus bequaerti*)** **Sudan Beaked Snake (*Letheobia cf sudanensis*)** **Reticulated Centipede-eater (*Aparallactus lunulatus*)**	
	population is presumed to be decreasing. The habitat in which this species lives is undergoing encroachment due to ongoing expansion of low intensity agricultural areas. In addition, there is a large international gold mining concession that has recently established in Ituri region **Lake Victoria Toad** There is very little information on its population status; indeed, the IUCN lists the species as Data Deficient. **Striped Beaked Snake** This species has yet to be evaluated by the IUCN and current population trends are unclear. **Bequaert's Green Snake** This species has yet to be evaluated by the IUCN and current population trends are unclear. **Sudan Beaked Snake** This species has yet to be evaluated by the IUCN and current population trends are unclear. **Reticulated Centipede-eater** This species has yet to be evaluated by the IUCN and current population trends are unclear.
Summary of state of knowledge	Of the six species included within this section, one is listed as Data Deficient and four have not been evaluated by the IUCN at all. Very little life history information is available for these species. Without such basic information, impacts cannot be fully understood and mitigation not clearly defined. Further presence / absence surveys of these species ahead of construction could address some of these limitations.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	The species listed above are largely under-studied and there are uncertainties with regards to localised distribution and habitat use. However, habitat preferences are thought to include forest (i.e. Christy's Grassland Frog, Bequaert's Green Snake and Sudan Beaked Snake), savannah (Bequaert's Green Snake, Sudan Beaked Snake and Reticulated Centipede-eater) and wetlands (Christy's Grassland Frog, Lake Victoria Toad and Striped Beaked Snake). **Habitat Loss and Degradation** Based on current plans, sources of habitat loss and degradation could arise from: • The construction and operation of well and associated pads; • The HDD pipeline crossing of the River Nile; • The construction of new roads and the upgrading of existing access tracks; • The construction and maintenance of the pipeline network; • The construction and operation of the CPF; • The construction and operation of a water abstraction facility on the shore of Lake Albert; • The construction and operation of the ferry facility within the River Nile; and • The extractions of materials from borrow pits. The construction of the above listed items could result in the physical destruction or degradation of habitat as well as direct harm to individuals. Some of these habitat losses (i.e. those arising from the construction of the pipelines) will be both temporary and reversible whilst others (such as the new roads) are likely to be permanent. It is not possible to quantify these impacts in fine detail as both population size and expected habitat occupancy are largely based on assumptions. The loss of habitat to facilitate the construction of the well sites and pads is unlikely to be sufficiently extensive to isolate populations occupying savannah. Likewise, the footprint of the pipelines will be both temporary and reversible and unlikely to fragment populations. Although the construction of new roads does necessitate the loss of habitat on a permanent basis (although certainly long-term), the operation of motor vehicles is more likely to represent a barrier than the physical structure of the road

Christy's Grassland Frog (*Ptychadena christyi*) **Lake Victoria Toad (*Amietophrynus vittatus*)** **Striped Beaked Snake (*Psammophylax acutus*)** **Bequaert's Green Snake (*Philothamnus bequaerti*)** **Sudan Beaked Snake (*Letheobia cf sudanensis*)** **Reticulated Centipede-eater (*Aparallactus lunulatus*)**				
	(see below). All water crossing points, the ferry and abstraction plant facilities the potential to adversely impact the aquatic amphibians and reptiles. Indeed, the siltation of the water and accidental spills could have repercussions that extend beyond reptiles to the aquatic ecosystem. The construction and operation of plant, smoking and campfires all have the potential to cause wildfires, particularly in the savannahs. The footprint of the Tilenga development is situated exclusively outside of all identified areas of tropical high forest and Neppi. No habitat losses or degradation are anticipated in these areas. **Disturbance** All of the above listed species are likely to be disturbed by increased human presence, habitat clearance, the operation of heavy machinery or vehicles. As with the habitat losses and degradation, some of the disturbance impacts will be temporary and some permanent. Given the paucity of life history knowledge, the effects of disturbance might be significant, in particular, any increases in disturbance levels at basking and egg laying sites (snakes only). **Barrier Effects** The construction of the pipelines and construction and operation of the roads could prohibit natural movements. As the pipelines are to be constructed via a cut and fill method, these barrier effects are likely to be temporary only. The frequent movement of vehicles are well-known to be detrimental to both amphibian and reptile populations (Andrews et al., 2008). High volumes of traffic could interfere with seasonal migrations (particularly during the wet season), increase mortality rates and fragment habitat. **Disease Transmission** The movement of materials and species, between sites could increase the transmission of diseases. Many of these diseases occur in a state of equilibrium in nature; however, when an ecosystem is disturbed or species are deliberately moved (typically in trade), the diseases can become particular virulent. It is likely that there other as yet undescribed diseases present in wild African amphibian and reptile populations.			
Potential Impacts - indirect	**Population Change** The increased presence of humans and the increased accessibility (from the upgraded and new roads) could induce population-level changes; however, none of the above species are known to be exploited by humans. The greatly increased presence and operation of heavy vehicles is likely to increase the rates of nitrogen deposition on the surrounding landscapes. This enrichment could result in changes to the structure of vegetation, which in turn could affect the reptile assemblage occupying it.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**LOW / MEDIUM**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Of the direct impacts listed above, those associated with the construction / upgrade of roads (habitat loss, barriers) is considered to be the most	Of the direct impacts listed, habitat degradation (and disturbance are considered to be the most important impacts. Of particular	The risks arising from the operational phase would be the use of the upgraded road system, disturbance and habitat degradation. Using	The risks arising from the decommissioning phase would be habitat degradation. However, the roads are also likely to be left *in situ*, maintaining

Christy's Grassland Frog (*Ptychadena christyi*) **Lake Victoria Toad (*Amietophrynus vittatus*)** **Striped Beaked Snake (*Psammophylax acutus*)** **Bequaert's Green Snake (*Philothamnus bequaerti*)** **Sudan Beaked Snake (*Letheobia cf sudanensis*)** **Reticulated Centipede-eater (*Aparallactus lunulatus*)**				
	important. Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the population could be affected % of the population; • Severity: Low – minor impacts, not expected to be sufficient to affect conservation status; • Duration: Low – the construction of roads will be completed within 5 years; and • Permanence: Low – much of the infrastructure could be removed within two years – note, this is unlikely to apply to the roads.	note are the degradation of aquatic habitats through the construction of the abstraction plant and ferry facility and the potential for increased collection as a result of the upgraded road system. Using Table 14-11, the following scores were achieved: • Scope: Low – less than 10% of the population affected; • Severity: Medium Adverse – the roads could result in the killing of a small number of individuals and fragment populations; however, it is unlikely to affect conservation statuses; • Duration: Low – the construction of the abstraction plant and ferry facility will be completed within 5 years; however, the roads are likely to be left *in situ* after the Tilenga project has concluded; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	Table 14-11, the following scores were achieved: • Scope: Low – less than 10% of the population could be affected; • Severity: Medium Adverse – in particular the road mortality could be sufficient to affect conservation status; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low – infrastructure could be removed within two years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	any barrier effects. Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the population could be affected; • Severity: Low – insufficient to affect conservation status; • Duration: Low – any impact will be temporary and short term; and • Permanence: Negligible.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**			
Justification of in-	Although the extent of vegetation clearance and disturbance arising from multiple projects would be			

Christy's Grassland Frog (*Ptychadena christyi*) **Lake Victoria Toad (*Amietophrynus vittatus*)** **Striped Beaked Snake (*Psammophylax acutus*)** **Bequaert's Green Snake (*Philothamnus bequaerti*)** **Sudan Beaked Snake (*Letheobia cf sudanensis*)** **Reticulated Centipede-eater (*Aparallactus lunulatus*)**				
combination sensitivity	proportionately greater, it is unlikely that greater than 20% of the respective populations would be affected by the additional projects. This assessment is based on the other projects avoiding wetlands whenever feasible, implementing strict spill prevention and control protocols and the prevention of driving vehicles outside of the compounds / roads. The savannah-occupying species are more likely to be affected through the loss of habitat and operation of the upgraded road networks (which could act as barriers to movement if sufficiently busy). Given the extent of scrubby savannah, the roads are unlikely to fragment populations from suitable habitat. Small numbers of animals are likely to be killed whilst attempting to cross the roads. Mortality rates are likely to be higher along roads that are situated closer to wetlands (particularly for amphibians that undertake seasonal migrations). The decommissioning of the additional oil-related facilities, assuming the implementation of comparable mitigation measures, should not impact on amphibian / reptile populations beyond a temporary increase in disturbance.			
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Many of the identified impacts can be appropriately addressed through the implementation of mitigation. Despite this, the operation of the road network is likely to result in the killing or harming of a small number of individuals			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Once mitigation has been considered, the project is likely to result in the following residual effects. **Loss and degradation of habitat** Although the Project will mean direct loss of habitat, mitigation should prevent loss or damage to habitat outside of the project footprint. The majority of losses would be temporary in nature (pipeline routes, well pads); however, much of the infrastructure (roads, ferry facility) is likely to be retained in perpetuity. These permanent losses represent small proportions of the habitat available and, according to Behangana *et al*. (2017) are unlikely to include any particularly important reptile areas. The construction of the roads could result in the killing of a small number of savannah-dwelling species. **Disturbance** Disturbance will be minimised although there will still be some impacts associated with this phase, particularly from the presence of people and vehicle movements within the park and around the lake and wetlands. Human and vehicle movements would be restricted to minimise disturbance; the residual disturbance is unlikely to be significant. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed **Indirect Effects** During the construction and operational phases, there will be an increased human presence due to in-migration. Although members of staff and their families will be cautioned against dealing in bush meat, there could be an increase in the collection of wild amphibians and reptiles. Furthermore, once the operation has closed, the upgraded road network would allow increased access to more remote areas. As such, further collection could continue; however, given the limited population densities as indicated by Behangana *et al*. (2017), it is unlikely that poachers would specifically focus in on these areas. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**LOW / MEDIUM**			

Christy's Grassland Frog (*Ptychadena christyi*) **Lake Victoria Toad (*Amietophrynus vittatus*)** **Striped Beaked Snake (*Psammophylax acutus*)** **Bequaert's Green Snake (*Philothamnus bequaerti*)** **Sudan Beaked Snake (*Letheobia cf sudanensis*)** **Reticulated Centipede-eater (*Aparallactus lunulatus*)**				
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Once mitigation has been implemented, the residual impact will be low significance.	Once mitigation has been implemented, the residual impact will be low significance.	Once mitigation has been implemented the residual impact will be low significance.	The removal of the infrastructure and facilities will initially cause disturbance. The roads and Nile ferry facility are likely to be a permanent feature of the landscape and these could allow ingress of tourists and poachers into the more remote areas. Residual impact will be low significance
Residual Impacts Significance	**INSIGNIFICANT**	**LOW**	**LOW**	**LOW**

Common / Serrated Hinge-back Tortoise (*Kinixys erosa*) Uganda House Snake (*Hormonotus modestus*) Mocquard's African Ground Snake (*Goniotophis brussauxi*)					
Reptiles	**Status (IUCN)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Non-Critical Habitat Qualifying Species					
Common / Serrated Hinge-back Tortoise	DD	n/a	N/A	The species in wide ranging and is known from Angola, Burkina Faso, Cameroon, the Central African Republic, the Democratic Republic of the Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Liberia, Nigeria, Rwanda, Senegal, Sierra Leone and Uganda.	Medium
Uganda House Snake	NE (DD in Uganda)	n/a	N/A	Although often referred to as the Ugandan house snake, this species is known from Guinea, Sierra Leonne, Cote d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Central African Republic, Gabon, Angola and Republic of Congo.	Low
Mocquard's African Ground Snake	NE	n/a	N/A	The species has been recorded in Cameroon, Democratic Republic of the Congo, Republic of the Congo, Gabon and Uganda.	Medium

Common / Serrated Hinge-back Tortoise (*Kinixys erosa*) **Uganda House Snake (*Hormonotus modestus*)** **Mocquard's African Ground Snake (*Goniotophis brussauxi*)**	
SPECIES OVERVIEW	
Biodiversity significance	**Common Hinge-back Tortoise** The Common Hinge-back Tortoise is listed as Data Deficient by both the IUCN and the Ugandan Red Data Book (URDB); as such, there are large uncertainties around the status of the species in Uganda and beyond. The species has a wide range that is likely to exceed 50,000 km^2 and therefore it is not assessed to be a restricted range species. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity of the Common Hinge-back Tortoise is assessed as Medium. **Ugandan House Snake** The Ugandan House Snake has not been evaluated by the IUCN and is listed as Data Deficient on the URDB; as such, there are large uncertainties around the status of the species in Uganda. It is a widespread species throughout much of central Africa and is unlikely to be assessed as a range restricted species. Using Table 14-17, the species accords with the following description "*Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category*." As such, the Sensitivity of the Ugandan House Snake is assessed as Medium. **Mocquard's African Ground Snake** Mocquard's African Ground Snake is neither assessed by the IUCN nor included on the URDB. Very little is known around the species and it is this uncertainty that has resulted in a conservation assessment of sensitivity. Although not strictly aligned with the description of Medium sensitivity in Table 14-17, the paucity of available information means that it could be considered as Data Deficient.

Common / Serrated Hinge-back Tortoise (*Kinixys erosa*) **Uganda House Snake (*Hormonotus modestus*)** **Mocquard's African Ground Snake (*Goniotophis brussauxi*)**				
Species Ecology	**Common Hinge-back Tortoise** This forest dwelling, oviparous species are thought to have a largely carnivorous diet; beyond this, little is known about the species. Earlier surveys (Behangana *et al*., 2017) did not record the species. **Ugandan House Snake** Very little is known of this typically forest-dwelling species other than its propensity to visit human dwellings, presumably in search of cohabiting pests such as rats and mice. Earlier surveys (Behangana *et al*., 2017) did not record the species. **Mocquard's African Ground Snake** Very little is known of this species and earlier surveys (Behangana *et al*., 2017) did not record the species.			
Habitat Preference	**Common Hinge-back Tortoise** This species occupies warm and humid forests, where it is found within the leaf litter. **Ugandan House Snake** Although typically found in forest, the Ugandan house Snake does occur within and near to human dwellings. This does indicate a level of adaptability by the species. **Mocquard's African Ground Snake** Very little is known about this species.			
Population & Trends	None of the aforementioned species have been studied in detail and current population trends are unknown for the site, Ugandan or Africa.			
Summary of state of knowledge	The Common Hinge-back Tortoise, Ugandan House Snake and Mocquard's African Ground Snake are all under-studied species. Little basic ecology is known and further surveys are required to address this limitation.			
POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts - direct	All three species are thought to be primarily associated with tropical rainforest; however, there are significant gaps in our understanding of their ecology and distribution. The footprint of the development does not include rainforest habitat but does include some wooded areas; however, earlier surveys (Behangana *et al*., 2017) did not record any of the above species in these areas. **Disturbance** It is unknown whether these species are susceptible to the effects of disturbance.			
Potential Impacts - indirect	**Population Changes** The increased presence of humans and the increased accessibility (from the upgraded and new roads) could induce population-level changes. Although none of the three species are known to be exploited for bush meat, increased access to remote areas could result in incidental collection (particularly of the Common Hinge-back Tortoise). The increase people could encourage the Ugandan House Snake into closer contact with the residential areas / well pads (they are attracted by the associated increase in small mammals). Many species of snake are persecuted throughout Africa, whether venomous or otherwise. Interactions with people, particularly those not familiar with the Ugandan House Snake, could result in the killing of a small number of individual snakes. Although the footprint of the Tilenga development does not include forested areas, the increased presence of people due to in-migration is likely to increase pressure on them (foraging, hunting, tourism, conversion /degradation of their habitat for camps / huts).			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**LOW / MEDIUM**			

Common / Serrated Hinge-back Tortoise (*Kinixys erosa*) **Uganda House Snake (*Hormonotus modestus*)** **Mocquard's African Ground Snake (*Goniotophis brussauxi*)**				
Magnitude of Potential Direct Impact	**LOW**	**LOW**	**LOW**	**LOW**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Very few direct impacts are anticipated. Indirect impacts include the increased presence of people. Using Table 14-11, the following scores were achieved: • Scope: Low - Less than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low Adverse – Minor degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change will not be enough to result in change in conservation status of the species or habitat; • Duration: Low – the construction of roads will be completed within five years; and • Permanence: Low – much of the infrastructure could be removed within 2 years – note, this is unlikely to apply to the roads.	No significant direct impacts are anticipated. However, the increase of people due to in-migration could put additional pressures on the adjacent forests (through foraging and recreational activities) and potentially encourage the Ugandan House Snake in to closer contact with people. Using Table 14-11, the following scores were achieved: • Scope: Low - Less than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low Adverse – the increase in people could put additional pressure on the adjacent forests; • Duration: Low – the construction of the abstraction plant and ferry facility will be completed within five years; however, the roads are likely to be left in situ after the Tilenga project has concluded; and • Permanence: Low – infrastructure could be removed within two years resulting in at least 90% restoration – note, this is unlikely to apply to infrastructure such as roads and the ferry facility.	The increase in people could put additional pressures on the adjacent forests (through foraging and recreational activities) and potentially encourage the Ugandan House Snake in to closer contact with people. Using Table 14-11, the following scores were achieved: • Scope: Low - Less than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low Adverse – the increase in people could put additional pressure on the adjacent forests; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration– note, this is unlikely to apply to infrastructure such as roads and the ferry port.	The roads are likely to be left in situ, increasing the accessibility of remote areas to tourists and poachers. Using Table 14-11, the following scores were achieved: • Scope: Low - Less than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low Adverse – insufficient to affect conservation status; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low.

Common / Serrated Hinge-back Tortoise (*Kinixys erosa*) Uganda House Snake (*Hormonotus modestus*) Mocquard's African Ground Snake (*Goniotophis brussauxi*)				
Potential Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**			
Justification of in-combination sensitivity	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater, these losses are not expected to significantly impact forest habitats. The upgraded roads are likely to facilitate easier access to more remote areas; the result of this is the increased collection of terrapins and turtle for bush meat. The decommissioning of the supporting and associated facilities, assuming the implementation of comparable mitigation measures, should not impact on reptile populations beyond a temporary increase in disturbance.			
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Many of the identified impacts can be appropriately addressed through the implementation of mitigation. Of principal importance would be to ensure that all Tilenga staff (and their families) are encouraged to be vigilant against poaching and fire lighting.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	Once mitigation has been considered, the project is likely to result in minimal residual effects. Of these, the most important is likely to be increased human presence. Workers will be prohibited from entering forested areas and cautioned against dealing in bush meat. However, once the construction and operations have terminated, the upgraded road network would allow increased access to more remote areas. As such, further collection could occur; however, it is unlikely that poachers would specifically focus in on these species. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**LOW / MEDIUM**			
Residual Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Summary justification for residual impact assessment	Once mitigation has been implemented, the residual impact is assessed as 'Insignificant'.	Once mitigation has been implemented, the residual impact is assessed as 'Insignificant.	The increased presence of humans could place additional pressures on the adjacent forests; however, following the implementation of mitigation this is likely to be minimal. As such, the residual impact is assessed as 'Insignificant.	Once the operations has completed, the roads and ferry facility are likely to remain. This would improve access to the remote forests and could result in increased pressures (tourists, foraging, hunters). However, these are unlikely to affect the Common Hinge-back Tortoise, Ugandan House Snake and Mocquard's African Ground Snake. As such, the residual impact is assessed as 'Insignificant.
Residual Impacts	**INSIGNIFICANT**	**INSIGNIFICANT**	**INSIGNIFICANT**	**INSIGNIFICANT**

Nile Crocodile, *Crocodylus niloticus*						
Reptiles	**Status (IUCN)**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Other Notable Species (not CHQS)						
Nile Crocodile	LC	N/A	A	C	The Nile Crocodile is widely distributed throughout sub-Saharan Africa. Although found throughout Uganda, the Nile Crocodile is largely restricted to areas with suitable freshwater bodies: these include rivers (including the Nile River and its tributaries), lakes (including Lakes Victoria and Albert) and swamps.	Low

Nile Crocodile, *Crocodylus niloticus* (Laurenti, 1786)	
SPECIES OVERVIEW	
Biodiversity significance	The Nile Crocodile is widespread and abundant throughout much of sub-Saharan Africa; indeed, the species is known to occur in high densities within Lake Albert and Nile Valley. Current population estimates are between 250,000 – 500,000 Nile Crocodiles in the wild (EoL, 2018). The IUCN Red List cites the species' conservation status as of Least Concern and the Nile Crocodile is not included on the Ugandan Red Data Book (URDB). Despite this, the species is listed on CITES (Appendix II in Uganda), which places controls on exports. It is worth noting that the IUCN assessment is now 22 years old and an update is required. The MFPA Management Plan, however, does list the Nile Crocodile as a Priority Species. Ecologically, the Nile Crocodile is an apex predator. Apex predators are essential for the maintenance functional and healthy ecosystems; the removal of apex predators in other areas has led to the proliferation of secondary predators and the disruption of the ecosystem. In Lake Albert and the Nile Valley (including the MFPA), the large crocodile population is likely to exert population controls on a range of cohabitating species (which, due to cannibalistic tendencies, also includes the Nile Crocodile). Furthermore, the species also readily scavengers, removing large carcasses that would otherwise decay and enrich waterbodies. From a socio-economic perspective, the Nile Crocodile is likely to be important locally. The MFPA Management Plan states that the area supports the largest crocodile population in Uganda and within it are some particularly large individuals. The Nile Crocodile is therefore likely to be an important constituent for ecotourism.
Species Ecology	The Nile Crocodile is a large freshwater reptile that occurs throughout much of sub-Saharan Africa. The species occupies a range of freshwater systems including rivers and lakes. Although well known as an ambush predator, the crocodile's diet does undergo an ontogenetic shift. Young individuals primarily feed on fish, amphibians and crustaceans. As the individual grows, the diet moves to one more based on vertebrates including turtles, birds and mammals. Implications of such a varied diet are profound: fish, amphibians and crustaceans for instance are highly sensitive to pollution. The loss of such 'smaller' prey items could curtail recruitment and ultimately could lead to the local extirpation of Nile Crocodiles. Similar cases have been well-documented, particularly in the Philippines (Ross, 1989). Although largely adapted to an aquatic lifestyle, the Nile Crocodile spends large proportion of their time basking (c. 50% +). Basking is an important thermoregulatory function that is required to maintain the individual within safe parameters; however, Nile Crocodiles are sensitive to anthropogenic disturbance during this time. Frequent disturbance is likely to adversely affect physical condition and cause individuals to leave their territories. In contrast, the clearance of bankside habitat (such as adjacent to the well sites, water abstraction facility and ferry port) could actively encourage crocodiles to bask in these unshaded areas, bringing them into close contact with people (van Bochove, pers. comm.). Nile Crocodiles on average lay between 25 and 80 eggs (depending on size) in burrows on the bankside. Behangana et al (2014) reports that nesting activity was recorded between January and March, with the peak nesting behaviour February and with hatchlings recorded at or close to nests in March. Although females actively defend nest sites, they are prone to raiding either by humans as persecution of the species or as a source of sustenance (also including humans). The sex of unhatched crocodiles is greatly affected by the ambient temperature. Thus any excavation of crocodile nest could affect the sex ratio of the population, thereby lowering the effective population size.

Nile Crocodile, *Crocodylus niloticus* (Laurenti, 1786)	
	During the dry season, Nile Crocodiles can and do move over land between available waterbodies. This behaviour is typically in response to the drying of waterbodies and increased intraspecific competition for resources. During this period, Nile Crocodiles would be sensitive to physical barriers that would inhibit such movements.
Habitat Preference	The Nile Crocodile can be found within a range of habitats including large freshwater lakes (including Lake Albert), rivers (including the Nile River), freshwater swamps, small brackish streams, coastal estuaries and mangrove swamps (Alden *et al*., 1996). In East Africa, they are found mostly in rivers, lakes, marshes, and dams, favouring open, broad bodies of water over smaller ones (Leslie, 1997). The field studies, described in the accompanying ESIA, reported that the habitat most frequently utilised by crocodiles was water (37%). Grassy banks, islands, river mouths and sandy banks cumulatively constituted about 47% of the habitats utilised.
Population & Trends	The IUCN Red List cites the species' conservation status as of Least Concern; however, this should be treated with caution as the most recent assessment was undertaken in 1996 and an update is now overdue. Although the number of Nile Crocodiles in Uganda is not known, recent field surveys (Geo-Texon Consult; 2014) identified large but declining population within the MFNP. Since the 1960's, the Nile Crocodile population is thought to have declined by as much as 69%; however, the author reports that the species is likely to have stabilised more recently. Despite this, the MFPA Management plan indicates that the area supports one of the few remaining viable populations Uganda.
Summary of state of knowledge	The status of Nile Crocodiles in Uganda is unknown and, as such, it is not possible to accurately value the species in the context of the site. An understanding of the hydrology of the smaller watercourses (such as tributaries of the River Nile) would enable a prediction of crocodile movements during the dry season. This information could be used to identify and mitigate possible barrier effects. Empirical evidence indicates that crocodiles have been drawn to soak-away pits of water at drilling sites in Murchison Falls National Park (Behangana et al., 2017), which were several kilometres from the river. Although it is clear that Nile Crocodiles can move large distances, it is not fully understood why. It is not known how Nile Crocodiles response to the operation of a ferry. An earlier survey (Behangana, 2014) reported that Nile Crocodiles fled whenever their survey boat approached. Furthermore, the author states "Nile Crocodiles must also have been fleeing from other boats including the tourist boats. With increase in tourist traffic along the river, this threat will also increase. This will disrupt crocodile activities including breeding". The resulting disturbance could cause crocodiles to emigrate from the affected area; equally, crocodile could habituate to the disturbance rapidly. While the chosen location for the ferry did not have signs of the crocodile's nests, potential changes to baseline conditions will be carefully monitored. It is unclear to what extent hunting and persecution of Nile Crocodiles is undertaken. Currently, the hunting of crocodiles within the MFNP is prohibited; however, this protection is unlikely to extend to individuals beyond the bounds of the national park.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, Degradation or Fragmentation of Nile Crocodile Habitat** Given the Nile Crocodiles lead largely aquatic lifestyle, habitat loss and degradation are likely to be restricted to activities that are situated near to existing waterbodies. Based on current plans, these include: • The construction and operation of 34 well pads – of these, eight pads appear to be situated near to watercourses; • The HDD pipeline crossing of the River Nile; • The construction and operation of a water abstraction facility on the shore of Lake Albert; • The construction of new roads and the upgrading of existing access tracks; • The construction and operation of the ferry facilityon the River Nile; • The construction and maintenance of pipeline network; and • The extractions of materials from borrow pits. The activities listed above could result in the physical destruction of habitat; however, at this stage these losses cannot be quantified. Losses of habitat and of banks in particular, could limit basking opportunities for these largely territorial animals. Furthermore, poorly timed habitat clearance could result in the destruction of active nests. Some of these habitat losses, i.e. those arising from the construction of the pipeline, will be both temporary and reversible. Others however, such as the water abstraction facility, are likely to be

Nile Crocodile, *Crocodylus niloticus* (Laurenti, 1786)				
	permanent. Given both the spatial and temporal extent of these losses, it is unlikely that any crocodile populations would become isolated. Further to the direct loss of habitats, the above activities (and in particular the construction of the ferry facility and water abstraction facility infrastructure) could result in the degradation of the waterbodies. Siltation of the water and accidental spills could have repercussions on crocodiles and the aquatic ecosystem in general. The affected waterbodies / watercourses (or parts thereof) comprise a small proportion (< 10%) of the habitat available in the wider landscape or site as a whole. The majority of habitat loss would be associated with the water abstraction station and where the pipelines cross watercourses. Given the limited extent of the impact, no changes in the local conservation status of the Nile Crocodile would be expected. **Population changes** Both the increased presence of humans (associated with both the construction and operational phases) and the increased accessibility (from the upgraded and new roads) could induce population-level changes in the abundance of Nile Crocodiles. **Disturbance** Increased presence of Project and associated staff, habitat clearance, heavy machinery and vehicles (including ferries) and drilling will result in disturbance. Nile Crocodiles are sensitive to disturbance and have been known to stop breeding and feeding activities as a result of disturbance (Behangana, 2014). Most of these will be temporary, although Project infrastructure and ferry operation will result in a long-term impact throughout operations and could dissuade individuals from their territories and basking and nesting habitat. As a highly territorial species, the encroachment of non-resident crocodiles into established territories as a result of disturbance could increase the occurrence of fighting and mortality of smaller individuals. However, in spite of the above, disturbance impacts are unlikely to have a significant impact on the species' ability to survive and reproduce. **Barrier effects** Nile Crocodiles have been known to move large distances at night overland. This is typically a response to the drying of waterbodies and increased intraspecific completion. The clearance of vegetation and the construction of well pads, access roads and flow lines could create barriers as they traverse the landscape. Furthermore, there is a risk that crocodiles may get trapped inside the trenches for the flow lines during the construction phase. Given the generally large distance between existing watercourses and the proposed infrastructure, barriers are unlikely to be a significantly adverse effect. **Transmission of Disease(s)** The movement of materials and species between waterbodies could increase the transmission of diseases. These diseases could either infect the crocodiles directly or prey species.			
Potential Impacts - indirect	**Population Changes** Increased human presence might dissuade prey items, such as large mammals, from certain waterbodies or sections thereof. This would lower the carrying capacity for the area affected and could cause crocodiles to venture into other territories. Equally, a paucity of natural prey items could result in the crocodiles becoming more aggressive towards humans. Nile Crocodiles are perceived as a threat to people and are often persecuted either through direct hunting or the destruction of nests. In Uganda, crocodiles continue to be threatened outside of protected areas; indeed, they are frequently killed at Lake Albert because of the threat they pose to fishermen (WCS, 2018). Even within protected areas, such as MFNP, the collection of eggs for farming purposes continues despite the fact that the 10-year licence expired in the early 2000's. The new and upgraded roads developments are likely to exacerbate hunting and egg collection. An increased human presence, particularly within crocodile occupied watercourses, could result in an increased disturbance. Nile Crocodiles are sensitive to disturbance and the influx of people could result in individuals foregoing breeding and feeding (Behangana, 2014).			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**LOW**			
Magnitude of Potential Direct Impact	**MEDIUM**	**LOW**	**LOW**	**LOW**
Magnitude of Potential Indirect Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**

Nile Crocodile, *Crocodylus niloticus* (Laurenti, 1786)				
Summary justification for impact magnitude	Of the direct impacts listed, habitat loss and degradation is considered to be of higher significance. Of this, the water abstraction station and ferry facility have the largest footprint. Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – the construction of the water abstraction station and ferry facility will be completed within 5 years; and • Permanence: Negligible – the abstraction station/ ferry facility could be removed within 2 years.	Of the direct impacts listed, habitat degradation, disturbance and barrier effects are considered to be of higher significance. Specifically, the temporary degradation of habitats and creation of barriers arising from the installation of the pipes, disturbance in case Lake Water Abstraction requires construction of the floating platform. Using Table 14-11, the following scores were achieved: • Scope Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – the construction will be completed within 5 years; and • Permanence: Low – infrastructure could be removed within 2 years resulting in at least 90% restoration with the exception of the ferry facility infrastructure	The risks arising from the operational phase would be the increased exploitation of Nile Crocodiles and habitat degradation . Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low.	The risks arising from the decommissioning phase would be habitat degradation , disturbance caused by the decommissioning. Using Table 14-11, the following scores were achieved: • Scope: Medium - Up to 20% of the feature's population and/or distribution within the landscape context will be affected by the impact; • Severity: Low – minor impacts, not sufficient to affect conservation status; • Duration: Low – any impact will be temporary and short term; and • Permanence: Low.
Potential Impacts Significance	**LOW**	**LOW**	**LOW**	**LOW**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW ADVERSE**			
Justification of in-combination sensitivity	Although the extent of vegetation clearance and disturbance arising from multiple projects would be proportionately greater, it is unlikely that greater than 10% of the Nile Crocodile population would be affected by the additional projects. The temporary barrier of movements to prey species (such as large migrating herbivores) could influence the availability of prey. The influx of people, however, could result in elevated mortality and disturbance levels. The activities related to construction, operations and decommissioning of the additional oil-related facilities should not impact on Nile Crocodiles beyond a temporary increase in disturbance, assuming the implementation of comparable mitigation measures.			
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation	The loss of crocodile habitat is relatively small in comparison to its abundance in the wider			

Nile Crocodile, *Crocodylus niloticus* (Laurenti, 1786)				
Discussion	landscape. However, large areas of habitats can be degraded through accidental spill events. The proposed mitigation measures are designed to minimise these risks. The second principal threat to crocodiles is their persecution and/or exploitation. The combination of restricted movement, checkpoints and a code of conduct for workers should minimise such deleterious interactions between humans and crocodiles. Finally, restricting the operating speed of the ferry and other watercraft should reduce the incidence of collisions and disturbance.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss and degradation of habitat** Although the Project will mean direct loss of habitat, mitigation should prevent loss or damage to habitat outside of the project footprint. Although losses will be kept to a minimum, it is likely that a small number of undetected nests would be destroyed. **Population changes** It is unclear whether the construction of the Project facilities would directly influence mortality rates. However, once the mitigation measures have been implemented, no significant changes in crocodile population would be expected. **Disturbance** Disturbance will be minimised although there will still be some impacts associated with this phase, particularly from the presence of people and vehicle movements within the park and around the lake and wetlands. Human and vehicle movements would be restricted to minimise disturbance; the residual disturbance is unlikely to be significant. **Barrier effects** Scheduling of works should consider preventing barrier effects as much as practicable. However, these will not be completely avoided during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and must be carefully monitored and managed **Indirect Effects** The influx of people could result in the increased hunting and persecution of reptiles. The improved road scheme would allow greater access to remote areas after the Tilenga project has ended. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**LOW**			
Residual Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Other than the unavoidable loss of habitat, residual effects are likely to be restricted to insignificant increases in disturbance and barriers to movement (between rather than within waterbodies). The influx of people could result in the increased hunting and persecution of reptiles.	Other than the unavoidable loss of habitats, residual effects are likely to be restricted to insignificant increases in disturbance and barriers to movement (between rather than within waterbodies). The influx of people could result in the increased hunting and persecution of reptiles.	The operational phase will result in insignificant increases in disturbance only. The influx of people could result in the increased hunting and persecution of reptiles.	The decommissioning phase will result in insignificant increases in disturbance only.
Residual Impacts Significance	**INSIGNIFICANT**	**INSIGNIFICANT**	**INSIGNIFICANT**	**INSIGNIFICANT**

Insects

Butterflies	Uganda Red List	PS6 Criterion	Landscape Context		General Location	Receptor Sensitivity
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient						
17 butterfly species	VU/EN/CR	1e	D		All forest species known from Budongo and Bugoma Forest Reserves	HIGH
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the study area.						
5 butterfly species	NE	1A and possibly 2b (Tier 2)	D		Bugoma Forest Reserve	MEDIUM
Criterion 3: Migratory and congregatory species						
No butterfly species defined in this category.						
Data Deficient and Not Evaluated species						
Mylothris hylara (alternative spelling: *Milithrus hylara*)	NE	Possible 1e	D		This species is yet to be evaluated for either Red List. It has been associated with forest corridor habitats and it is possible that this butterfly meets Critical Habitat criterion 1e in the study area.	MEDIUM
Other Notable Species (not CHQS)						
Various butterfly species	N/A	N/A	A	D	Field surveys identified a number of other mainly forest species within the MFNP, around the Bugungu Airstrip and Buliisa areas.	MEDIUM

Butterflies	
SPECIES OVERVIEW	
Biodiversity Significance	There are 17 butterfly species that are nationally threatened and CHQS. Therefore, all these species are considered to have a High receptor sensitivity. 5 of the butterfly species recorded are Not Evaluated on the IUCN Red List, however, they are considered to have a restricted range and are therefore to be High sensitivity receptors. *Mylothris hylara* is yet to be evaluated for either Red List. It has been associated with forest corridor habitats and it is possible that this butterfly meets Critical Habitat criterion 1e in the study area. Therefore, this species is considered to have a Medium sensitivity. Field surveys identified a number of other mainly forest species within the MFNP, around the Bugungu Airstrip and Buliisa areas. These species are considered to have a Medium sensitivity.
Species Ecology	All species of butterfly of conservation concern are ultimately forest species, although a number of these were also recorded in the project areas, including MFNP and the Ramsar.
Habitat Preference	Generally regarded as forest species.
Population & Trends	Unknown.
Summary of state of knowledge	Habitat preferences of most butterfly species are known, however, very little is known about the population of most butterfly species. Where data is available, the butterflies are found in Budongo and Bugoma Forest Reserves. The precautionary principle should be adopted when assessing the direct and indirect impacts of Project activities on these butterflies.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Loss, degradation or fragmentation of species habitat** These species are generally associated with Landscape Context D (Tropical High Forest) although

Butterflies				
	some have been recorded in savanna areas and in the MFNP. The Tilenga Project Footprint does not include forest areas but there are potential direct impacts on species in the MFNP and savanna areas. The butterfly species in the MFNP are generally associated with wooded areas which will not be directly impacted by the project within the MFNP, other than in areas close to the Ramsar where the vegetation is more woody and dense. **Population changes** Loss of wooded areas of the MFNP and Ramsar, as well as human activity within protected forest areas may impact on population growth due to effects on habitats. **Disturbance** Butterflies are unlikely to be affected by disturbance issues. **Barrier effects** Widening or realignment of oil roads through forests will be associated with an increase in project-traffic on roads, which may create barrier effects.			
Potential Impacts - indirect	**Loss, degradation or fragmentation of species habitat** These species are generally associated with Landscape Context and D (Tropical High Forest) although some have been recorded in savanna areas and in the MFNP. The Tilenga Project Footprint does not include forest areas but there are potential indirect impacts on forests. Indirect impacts in forest areas would be due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impacts on habitats and species populations. This would be associated with land use changes and degradation of habitats. New oil roads and other access improvements in the region are likely to enable people to enter more easily and impact on this receptor during this phase. **Population changes** Human activity within protected forest areas may impact on population growth due to effects on habitats. **Disturbance** Butterflies are unlikely to be affected by disturbance issues. **Barrier effects** Widening or realignment of oil roads through forests may create barrier effects. Land use changes where forests areas are lost or fragmented are likely to also create barriers to movement and dispersal of insects.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM to HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**LOW**	**LOW**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Only a small proportion of butterfly populations are expected to be impacted during this phase, probably corresponding to less than 10% for each species, given the limited extent of direct impacts, the smaller	Direct impacts are unlikely to affect many butterfly species in the area of works; however indirect impacts are expected to be more significant due to in-migration and land-use change, possibly affecting butterflies at	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Without mitigation, butterfly populations	During the decommissioning phase, indirect impacts will be less significant. It is expected that less than 10% of butterfly species population numbers will be impacted during this phase through habitat

Butterflies				
	duration of this phase which would also limit the effect of indirect impacts. During this phase, minor habitat degradation or disturbance of potential butterfly foraging habitat can potentially happen. Change during this phase will result in a Moderate to Low significant impact on butterflies and/or their habitat. This impact will be mainly temporary.	the population level if mitigation measures are not implemented. However less than 10% of the species is expected to be influenced, as these species are generally associated with Landscape Context D (Tropical High Forest) even if some were found in the MFNP and Ramsar ,,Tilenga Project Footprint does not include forest areas. The butterfly species in the MFNP are generally associated with wooded areas which will not be directly impacted by the project within the MFNP, other than in areas close to the Ramsar. Many people will move to the area during the construction phase to work for the Project or in search of work and economic opportunities. This will increase the potential indirect impacts, through a possible increase in demand for land. Road improvements and pipeline construction will likely result in moderate habitat degradation and/or disturbance, and improve access to the area. This will in turn affect several butterfly species living inside and outside of protected areas, potentially leading to a reduction in their numbers and to a potential loss of habitat and connectivity.	could be affected during this phase indirectly through habitat loss or degradation. Project related in-migration will likely result in moderate habitat degradation or disturbance, leading to reduction in species population, habitat functionality, or protected site integrity, including connectivity. Impact likely to result in change in conservation status of the species or habitat. The direct impact will be medium term, lasting between 5 and 10 years (the time for vegetation to grow back), but indirect impacts related to induced access and in-migration may be permanent.	degradation, increased and continued pressure from indirect impacts, such as habitat loss from land-use change. Decommissioning works will likely result in moderate habitat degradation, reduction in species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Impacts likely to affect several butterfly species and their habitat. The impact will be low significance and temporary, but indirect impacts of in-migration may be permanent.
Potential Impacts Significance	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**
In-combination effects				
Risk of in-combination effects	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities can cause disturbance, habitat loss and degradation. Butterfly species	Construction of supporting and associated facilities can cause disturbance, habitat loss and degradation.	Increased Project induced-migration leading to land-use change will cause further disturbance, habitat loss and degradation.	The decommissioning phase will lead to disturbance and potential habitat loss. This may lead to a disruption of foraging and commuting

Butterflies				
	occupy a wide range of habitats, mostly outside of the park in forest areas (Bugungu, Wambabya and Budongo) as well as savanna areas within the Park and savanna corridor. Increased disturbance and habitat loss will have an effect on these butterfly species.	Increased Project induced-migration leading to land-use change will further disrupt foraging and commuting habitats.		habitats.
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Induced changes in human populations and the pressures that they create on the landscape, particularly resulting in loss of woodland or forest, could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Long term strategies to protect and enhance forest habitats, reconnect fragments and prevent detrimental land use changes will have to be developed.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Long term strategies will need to be agreed to protect woodland and forest habitats. These will need to be implemented, monitored and maintained for potential overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats, if effective, should reduce or avoid pressures on species population. **Disturbance** Disturbance is expected to be minimum. **Barrier effects** N/A In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**MEDIUM to HIGH**			
Magnitude of Residual Impact	**NEGLIGIBLE**	**LOW/NEGLIGIBLE**	**LOW/NEGLIGIBLE**	**LOW / NEGLIGIBLE**
Summary justification for residual impact assessment	These species are generally associated with Landscape Context D (Tropical High Forest), which does not include the Tilenga project footprint. Mitigation to protect habitats, if effective, should reduce or avoid pressures on species population	These species are generally associated with Landscape Context D (Tropical High Forest), which does not include the Tilenga project footprint. If long term strategies are agreed to protect woodland and forest habitats, these will reduce potential pressures on butterfly habitat and population numbers.	These species are generally associated with Landscape Context D (Tropical High Forest), which does not include the Tilenga project footprint. If long term strategies are agreed to protect woodland and forest habitats, these will reduce potential pressures on butterfly habitat and population numbers.	These species are generally associated with Landscape Context D (Tropical High Forest), which does not include the Tilenga project footprint. If long term strategies are agreed to protect woodland and forest habitats, these will reduce potential pressures on butterfly habitat and population numbers.

Butterflies				
Residual Impacts Significance	**LOW / INSIGNIFICANT**	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**

Dragonflies	Uganda Red List	PS6 Criterion	Landscape Context		General Location	Receptor Sensitivity
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient						
Albertine Jewel *Chlorocypha schmidti*	VU	1e (possible)	D		Forests in Uganda	MEDIUM
Aethiothemis coryndoni	VU	1e	D		Budongo Forest Reserve	MEDIUM
Black Threadtail *Elattoneura nigra*	EN	1e	D		MFNP (forest species)	HIGH
Pale Duskhawker *Heliaeschna trinervulata*	CR	1e	D		Forests in western Uganda	HIGH
Other Notable Species (not CHQS)						
Pseudagrion (B) torridum	VU	N/A	A	C	Field surveys identified a number of other dragonfly species within the MFNP and Ramsar site areas.	MEDIUM
Neurogomphus featheri	DD > ?EN	N/A	A	C		MEDIUM
Sympetrum fonscolombii	DD	N/A	A	C		MEDIUM
Acisoma inflatum	DD > ?VU	N/A	A	C		MEDIUM
Gomphidia bredoi	VU	N/A	A	C		MEDIUM

Dragonflies	
SPECIES OVERVIEW	
Biodiversity significance	*Chlorocypha schmidti* This species qualifies as Vulnerable on the IUCN Red List due to the limited number of locations (4), the restricted Extent of Occurrence (EOO) and the decline in the area, extent and quality of habitat. VU B1ab(iii). It was previously assessed as Endangered but this has changed as new information has become available. It is listed as Endangered in central Africa in view of extent of occurrence estimated to be less than 5,000 km² and area occupancy estimated to be less than 500 km², with ongoing habitat destruction. It is only a possible CHQS and therefore has a Medium sensitivity. *Aethiothemis coryndoni* This species is classified as VU on the Ugandan Red List and is a CHQS However, it is assessed as Least Concern on the IUCN Red List in view of the wide range of the records, from central Uganda to central Democratic Republic of the Congo. Though the records are rather sparse, this species is assumed to be widespread in the under-recorded areas in eastern Democratic Republic of the Congo. Therefore, it is considered to have a Medium sensitivity. *Elattoneura nigra* This is a widespread species with no known major widespread threats that is unlikely to be declining fast enough to qualify for listing in a threatened category. It is therefore assessed as Least Concern by the IUCN Red List. However, it is classified as Endangered according to the Ugandan Red List therefore, it is considered to have a High Sensitivity. *Heliaeschna trinervulata* This is a widespread species with no known major threats. It is unlikely to be declining fast enough to qualify for listing in a threatened category and is therefore assessed as Least Concern on the IUCN Red List. However, it is CR on the Ugandan Red List and a CHQS. Therefore, it has a High sensitivity. *Pseudagrion (B) torridum* This species is classified as Vulnerable according to the Uganda Red List and was identified during field surveys within the MFNP and Ramsar site areas. However, this species is assessed as Least Concern according to the IUCN Red List in view of its wide distribution, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category. Therefore, it is considered to have a Medium sensitivity. *Neurogomphus featheri* This is a widespread species with no known major threats. It is unlikely to be declining fast enough to qualify for listing in a threatened category and is therefore assessed as Least Concern on the IUCN Red List. This species is Data Deficient on the Ugandan Red List and is therefore considered to be of Medium sensitivity. *Sympetrum fonscolombii* The species is common and widespread throughout most of its range and is able to (re)colonize promptly formerly dry areas after any rainfall period, it is therefore assessed as Least Concern on the IUCN Red List and DD on the Ugandan Red List. Therefore considered to be of Medium sensitivity.

Dragonflies	
	Acisoma inflatum This species is widespread and therefore considered to be Least Concern on the IUCN Red List and DD on the Ugandan Red List. Therefore this species is considered to be of Medium sensitivity. *Gomphidia bredoi* This is a widespread species with no known major threats and it is unlikely to be declining fast enough to qualify for listing in a threatened category. It is therefore assessed as Least Concern. However, this species qualifies as Vulnerable on the Ugandan Red List. Therefore this species is considered to be of Medium sensitivity.
Species Ecology	All species of dragonfly of conservation concern, that are identified as CHQS are defined as forest species. In addition, species noted during field surveys were encountered within the MFNP and Ramsar sites, although some of these will also be associated with forests. Dragonflies require water habitat to breed and therefore all species will be associated with aquatic habitats, whether this be contained within forests, or associated with savanna (the MFNP) and the fringes of the Ramsar site. Such species will therefore be vulnerable to loss of degradation of aquatic habitats, including inland seasonal wetlands, where they breed.
Habitat Preference	CHQS are forest species, but there is a general association with water for all species.
Population & Trends	Unknown.
Summary of state of knowledge	Habitat preferences of most dragon species are known, however, very little is known about population numbers and trends of most dragonfly species. The precautionary principle should be adopted when assessing the direct and indirect impacts of Project activities on the dragonflies. The main threats to the species are destruction of rainforests, clearing of forest areas along rivers and streams due to agriculture and wood harvesting.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - Direct	**Loss, degradation or fragmentation of species habitat** These species are generally associated with aquatic habitats within Landscape Context D as well as within the Ramsar and MFNP itself. The Tilenga Project Footprint does not include forest areas but there are potential direct impacts on species in the MFNP, the Ramsar and savanna areas as well as indirect impacts on forests. The dragonfly species in the MFNP are generally associated with areas where is likely to be standing or slow moving water which they can breed in. A reduction in water quality would impact these species. **Population changes** Loss of aquatic and wooded areas of the MFNP and Ramsar, as well as human activity within protected forest areas may impact on population growth due to effects on habitats. **Disturbance** Dragonflies are unlikely to be affected by disturbance issues. **Barrier effects** Widening or realignment of oil roads through forests may create barrier effects. Land use changes where forests areas are lost or fragmented are also likely to create barriers to movement and dispersal of insects.
Potential Impacts - Indirect	**Loss, degradation or fragmentation of species habitat** These species are generally associated with aquatic habitats within Landscape ContextD as well as within the Ramsar and MFNP itself. The Tilenga Project Footprint does not include forest areas but there are potential direct impacts on species in the MFNP, the Ramsar and savanna areas as well as indirect impacts on forests. The dragonfly species in the MFNP are generally associated with areas where is likely to be standing or slow moving water which they can breed in. A reduction in water quality would impact these species. Outside of the project footprint such areas may not be directly impacted by the project activities within the MFNP, other than in areas close to the Ramsar and areas of seasonal wetland. Indirect impacts in forest areas would be due to population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and species populations. This would be associated with land use changes and degradation of habitats.

Dragonflies				
	New oil roads and other access improvements in the region will enable people to enter more easily and impact on this receptor during this phase. **Population changes** Loss of aquatic and wooded areas of the MFNP and Ramsar, as well as human activity within protected forest areas may impact on population growth due to effects on habitats. **Disturbance** Dragonflies are unlikely to be affected by disturbance issues. **Barrier effects** Widening or realignment of oil roads through forests may create barrier effects. Land use changes where forests areas are lost or fragmented will also create barriers to movement and dispersal of insects.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for impact magnitude	Only a small proportion of dagonfly populations can be potentially impacted during this phase, probably corresponding to less than 10% for each species, given the smaller extent of direct impacts, the smaller duration of this phase which would also limit the effect of indirect impacts. During this phase, minor habitat degradation or disturbance of potential dragonfly habitat can potentially happen. Change during this phase will result in a Low significant impact on butterflies and/or their habitat. This impact will be mainly temporary.	Direct impacts are unlikely to affect many dragonfly species in the area of works; however indirect impacts are expected to be more significant due to in-migration and land-use change, possibly affecting dragonflies at the population level if mitigation measures are not implemented. However, less than 10% of the species is expected to be influenced. The dragonfly species in the MFNP are generally associated with wetland areas which can be directly impacted by the project within the MFNP, however, impacts will be localised. Many people will move to the area during the construction phase to work for the Project or in search of work and economic opportunities. This will increase the potential indirect impacts, through a possible increase in demand for land. Road improvements and	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Without mitigation, dragonfly populations could be affected during this phase through habitat loss or degradation. Project in-migration will likely result in moderate habitat degradation or disturbance, leading to reduction in species population, habitat functionality, or protected site integrity, including connectivity. Impact likely to result in change in conservation status of the species or habitat. The direct impact will be medium term, lasting between 5 and 10 years (the time for vegetation to grow back), but indirect impacts related to induced access and in-migration may be permanent.	During the decommissioning phase, indirect impacts will be less significant. It is expected that less than 10% of dragonfly species population numbers will be impacted during this phase through habitat degradation, increased and continued pressure from indirect impacts, such as habitat loss from land-use change. Decommissioning works will likely result in Low habitat degradation or disturbance, reduction in species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Impacts can potentially affect several dragonfly species and their habitat. The impact will be low significance and temporary, but indirect impacts of in-migration may be permanent.

Dragonflies				
		pipeline construction can potentially result in moderate habitat degradation and/or disturbance, and improve access to the area. This will in turn affect several dragonfly species living inside and outside of protected areas, potentially leading to a reduction in their numbers and to a potential loss of habitat and connectivity.		
Potential Impacts Significance	**MODERATE/LOW**	**MODERATE/LOW**	**MODERATE/LOW**	**MODERATE/LOW**
In-combination effects				
Risk of in-combination effects	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**	**MODERATE / LOW**
Justification of in-combination sensitivity	Site clearance for supporting and associated facilities will cause habitat loss and degradation. The dragonfly species in the MFNP are generally associated with areas where is likely to be standing or slow moving water which they can breed in. A reduction in water quality would impact these species	Construction of supporting and associated facilities will cause disturbance, habitat loss and degradation. Increased Project induced-migration leading to land-use change will further disrupt foraging and commuting habitats. The dragonfly species in the MFNP are generally associated with areas where is likely to be standing or slow moving water which they can breed in. A reduction in water quality would impact these species.	Increased Project induced-migration leading to land-use change will cause further disturbance, habitat loss and degradation. The dragonfly species in the MFNP are generally associated with areas where is likely to be standing or slow moving water which they can breed in. A reduction in water quality would impact these species	The decommissioning phase will lead to disturbance and potential habitat loss. This may lead to a disruption of foraging and commuting habitats. The dragonfly species in the MFNP are generally associated with areas where is likely to be standing or slow moving water which they can breed in. A reduction in water quality would impact these species
Mitigation	Mitigation tables are included in Chapter 14 and cover each phase of the Project.			
Mitigation Discussion	Protection of water habitats is important for the conservation of dragonflies. This means strict control of emissions to water as well as avoiding losing aquatic habitats, particularly seasonal wetlands. This will include minimising areas of work within the Ramsar sites and other areas close to seasonal wetlands. Induced changes in human populations and the pressures that they create on the landscape, particularly resulting in loss of woodland or forest, could be significant and in fact may be more significant than the direct impacts with the Project Footprint. Long term strategies to protect and enhance forest habitats, reconnect fragments and prevent detrimental land use changes will have to be developed.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact (all phases)	**Loss, degradation or fragmentation of species habitat** Direct measures effectively implemented should protect aquatic habitats and wetlands. Long term strategies will need to be agreed to protect woodland and forest habitats. These strategies will need			

Dragonflies				
	to be implemented, monitored and maintained for potential overall pressures to be reduced and the decline of suitable habitat halted or reversed. **Population changes** Mitigation to protect habitats if effective should reduce or avoid pressures on species population. **Disturbance** N/A **Barrier effects** N/A In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM to HIGH**			
Magnitude of Residual Impact	**NEGLIGIBLE**	**LOW / NEGLIGIBLE**	**LOW / NEGLIGIBLE**	**LOW / NEGLIGIBLE**
Summary justification for residual impact assessment	Long term strategies to protect wetlands, aquatic habitats, forest habitats, reconnect forest fragments and prevent detrimental land use changes will have to be developed. Mitigation to protect habitats if effective should reduce or avoid pressures on species population	Long term strategies to protect wetlands, aquatic habitats forest habitats, reconnect forest fragments and prevent detrimental land use changes will have to be developed. Mitigation to protect habitats if effective should reduce or avoid pressures on species population	Long term strategies to protect wetlands, aquatic habitats forest habitats, reconnect forest fragments and prevent detrimental land use changes will have to be developed. Mitigation to protect habitats if effective should reduce or avoid pressures on species population	Long term strategies to protect wetlands, aquatic habitats forest habitats, reconnect forest fragments and prevent detrimental land use changes will have to be developed. Mitigation to protect habitats if effective should reduce or avoid pressures on species population
Residual Impacts Significance	**LOW / INSIGNIFICANT**	**MODERATE / LOW / INSIGNIFICANT**	**MODERATE / LOW / INSIGNIFICANT**	**MODERATE / LOW / INSIGNIFICANT**

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APPENDIX O4

Tilenga Project

TERRESTRIAL WILDLIFE

Preliminary Report on Loss/Gain

2018

The Biodiversity Consultancy Preliminary Report on Loss/Gain

Executive summary

Scope and approach

This report provides preliminary results of an ongoing process of forecast of residual impacts of the Tilenga Project on selected priority biodiversity features and identifies targets for delivering an overall net gain for these features.

This preliminary assessment includes direct, and indirect impacts of the Tilenga Project and of associated facilities, as defined in the ESIA. For this assessment, direct impacts were limited to footprint and potential species disturbance, while indirect impacts were limited to increase consumption of natural resources due to in-migration.

Appropriate approaches for forecasting losses for each priority biodiversity feature were identified based on (i) receptor sensitivity (as defined through the ESIA), (ii) the likelihood of residual impacts (based on High, Moderate and Low categories), in turn based on the ESIA outcomes and further expert assessment and, (iii) the availability of information on species' status. Individual forecasts of residual losses are therefore being developed for:

- Critical Habitat-qualifying threatened ecosystems;
- Natural Habitats;
- Six large mammal species for which detailed habitat-association or population data was available.

For priority biodiversity features for which only broad habitat association was known, forecasts were derived from estimates of impacts to those habitats.

For species with lower receptor sensitivity, lower likelihood of residual impacts, or less available data, qualitative forecast is being provided. Monitoring should be conducted to verify the existence (or not) of impacts to these features and their significance.

Data sources and methods

Forecasts of residual impacts are developed as follows:

- Direct impacts
    - Footprint-related: assessed by overlaying maps of Project infrastructure and associated facilities onto landcover / vegetation and habitat quality maps developed for the project (Ref 13.24).

  - Disturbance: quantified for five fauna species by 1) converting estimated avoidance distances from research within MFNP into a 'disturbance buffer' around Project infrastructure and associated facilities 2) estimating the percentage of the most-used habitats for each species lost due to this buffer, weighted by quality, and 3) extrapolating to the percentage of the MFNP population of each species based on aerial survey data collected for the Project.
- Indirect impacts on habitats were forecast by 1) developing forecasts of the extent of project-induced in-migration based on the Project's In-migration risk assessment and situation Analysis (Ref 16.11), 2) developing scenarios about the likely natural resource impacts of in-migrants and 3) combining these with data on existing rates of loss from a Project-commissioned landcover change assessment (Ref. 13.24). The scenarios used are summarised in Table 1 below.

Table 1 : Scenarios used for assessing indirect residual impacts

Scenario	Qualitative description of scenario		
	Duration of impact	Effectiveness of additional mitigation	Protected area management
Optimistic	In-migration largely transient – 60% of new households leave early in the operational phase.	Additional mitigation measures to address indirect impacts are implemented early and are effective: Natural resource consumption rates of in-migrants similar / lower than existing households.	Protected area management is effective: indirect impacts largely confined to areas outside protected areas.
Intermediate	In-migration persistent – only 30% of new households leave early in the operational phase.	Additional mitigation measures to address indirect impacts are implemented early and are effective: Natural resource consumption rates of in-migrants similar to existing households.	Protected areas only partially able to withstand additional pressures: degradation proceeds in protected areas at current rates, with an increase proportional to expected in-migration.
Pessimistic	In-migration persistent: 90% of new households remain for the project duration.	Additional mitigation measures to address indirect impacts are implemented late and are not effective at managing indirect impacts. Natural resource consumption rates of in-migrants greater than existing households.	Protected areas not able to withstand additional pressures: degradation proceeds in protected areas at a rate similar to outside protected areas.

These preliminary forecasts are based on available data and on a significant number of assumptions that will be detailed in the full loss-gain assessment report. Where appropriate, precautionary estimates are used to ensure that the forecasts are on the side of caution, without being unrealistic. The assessment should be understood as an initial order-of-magnitude forecast of impacts that is being developed and can be refined using monitoring of actual impacts.

Summary of preliminary forecast residual impacts on priority vegetation

Table 2 below summarises the preliminary estimated footprint and indirect impacts on Critical Habitat-qualifying threatened ecosystems and Natural Habitat. Table 3 summarises preliminary forecast residual impacts on priority flora species.

Table 2 Summary of preliminary forecast residual impacts for Critical Habitat-qualifying ecosystems and Natural Habitat. Forecasts are provided both in terms of quality hectares (QH) and as a % loss within the landscape. Indirect impact forecasts are provided for the three scenarios of in-migration.

	Direct footprint impact		Indirect impacts					
			Optimistic		Intermediate		Pessimistic	
Priority Biodiversity	QH	%[1]	QH	%[1]	QH	%[1]	QH	%[1]
Critical Habitat-qualifying Threatened Ecosystems								
Grass savanna	275	0.3	300	0.3	450	0.4	6,100	6
Moist Combretum Savanna	65	<0.1	655	0.8	980	1.3	5,600	7
Forest/Savanna Mosaic	14	<0.1	680	3	1,000	4	2,565	10
Natural Habitats (including Transitional Habitat)								
Tropical high forest/ riparian forest	56	<0.1	1,300	1.7	2,400	4.7	7,700	10
Grassland / Wooded Grassland / Woodland	82	<0.1	8,500	3	13,000	4.7	30,800	7.4
Wetland	156	0.1	650	0.5	1,000	0.7	2,100	1.5

1) Percentage of total quantity (QH) in the Murchison-Semuliki landscape according to data from Nangendo et al. (2017a)

Table 3 : Summary of preliminary forecast residual impacts on priority flora species, derived through habitat association

Priority Biodiversity	Likelihood of significant residual impact	Approach used	Summary of impact
Terrestrial plants, including: Antrocaryon micraster, Chytranthus atroviolaceus, Holarrhena floribunda, Irvingia gabonensis, Afzelia Africana, Albizia ferruginea, Citropsis articulate, Cordia milleni, Efulensia montana, Entandrophragma angolense, Entandrophragma cylindricum, Entandrophragma utile, Leplaea (Guarea) cedrata, Khaya senegalensis, Khaya anthotheca, Khaya grandifoliola, Lovoa swynnertonii, Lovoa trichilioides, Milicia excels, Brachylaena huillensis, Encephalartos septentrionalis, Millettiac lacus-alberti, Psilotrichum axilliflorum, Brazzeia longipedicellata, Uvariodendron magnificum, Dialium excelsum, Encephalartos macrostrobilus, Afrothismia winkleri	Medium	No quantification: Verify through monitoring	• Mostly forest species, but detailed habitat association unknown. Indirect impacts on tropical high forest could be as much as 10% of all forest in a pessimistic scenario. • Impacts can be monitored by extent and condition of tropical high forest and by assessing management effectiveness of Forest Reserves. • Some species may be targeted for logging so monitoring of pressure on these species will be necessary.

Summary of preliminary forecast residual impacts on priority fauna

Table 4 below summarises the preliminary forecast residual impacts on priority fauna species.

Table 4 : Summary of preliminary forecast residual impacts to priority fauna species

Priority Biodiversity	Likelihood of significant residual impact	Approach used	Summary of Impact
Lion	High	Semi-quantitative: Area and quality of habitat and proportion of population	Direct impacts from the footprint could approximately affect up to 0.8% of most used habitat in MFPA, coupled with a wider habitat disturbance this could potentially affect part of the species population. In an optimistic scenario, little change would be expected in regards to indirect impacts as long as management of MFPA is supported and remains robust. A more pessimistic scenario would relate to increase in hunting, poisoning, snaring and loss of an important part of MFPA habitat due to Human encroachment.
Rothschild's Giraffe			
African Elephant			
Lelwel Hartebeest			
Uganda Kob			
Chimpanzee	High	Semi-quantitative: population and area and	Direct Impacts would mainly be related to potential disturbance of chimpanzees population due to increased traffic and human presence on the Masindi-Biiso road, which would also result in a potential increased risk of vehicle-animal collision. The upgrade of this oil critical road could indirectly impact chimpanzees by resulting in some loss

Priority Biodiversity	Likelihood of significant residual impact	Approach used	Summary of Impact
		quality of habitat	of habitat, coupled with the upgrade of the Kasanja-Park Junction road by UNRA. They could also be indirectly impacted by losses of habitats due to Human encroachment.
Spotted Hyena	High	Habitat	Direct impacts from the footprint could approximately affect <1% of habitat. Disturbance or accidental roadkills may also be a cause of impacts. Because the Hyena population is estimated to be approx. 40 individuals, impacts on the population are likely be significant. Little is known about the Bohor Reedbuck population and distribution of this species and hence monitoring is very important. In an optimistic scenario, little change would be expected in regards to indirect impacts as long as management of MFPA is supported and remains robust. A more pessimistic scenario would relate to increase in hunting, poisoning, snaring and loss of an important part of MFPA habitat due to Human encroachment.
Bohor Reedbuck	High	Habitat	
Forest-associated mammals: Uganda Mangabey, Medje Mops Bat, Trevor's Free-tailed Bat, Savanna/Helios Pipistrelle, Russett Free-tailed Bat, Ugandan Lowland Shrew, Charming Thicket Rat	Medium	Habitat	Minimal impacts anticipated because the forests are not under direct Project footprint. Indirect impacts could be caused by losses of habitats due to Human encroachment.

Priority Biodiversity	Likelihood of significant residual impact	Approach used	Summary of Impact
Birds: African Skimmer African Crowned Eagle, Black- rumped Buttonquail, Pallid Harrier, Hooded Vulture, Ruppell's Vulture, White-backed Vulture, White-headed Vulture, Fox Kestrel, Lappet-faced Vulture, Grey-crowned Crane, Madagascar Pond-heron, Shoebill, Pel's Fishing Owl, Denham's Bustard, Nahan's Partridge (Francolin)	Medium for Nahan's Partridge (Francolin) Low for others	No quantification: Verify through monitoring	On-going monitoring is appropriate to assess threats and effectiveness of mitigation measures if mitigation measures are implemented early on before impacts. Most impacts on these species could occur from direct habitat loss/degradation, which can be monitored through pressure and response indicators. Several species are wide ranging but vulnerable to a potential increase in persecution (poisoning), hunting and/or habitat loss and degradation. For a number of species there is limited information to assess status. Targeted surveys may be needed for some species which are more threatened by project impacts and where likelihood of residual impacts is unclear.
Reptiles: Adanson's Hinged Terrapin, Smooth Chameleon, Zaire Hinged Terrapin African Softshell Turtle, Common Tortoise, Mocquard's African Ground Snake, Brown File Snake	Medium	No quantification: Verify through monitoring	For most species there is a lack of data. Threats to these species can be monitored through pressure and response indicators
Amphibians: Hyperolius langi, Hyperolius rwandae, Kivu Clawed Frog, Leptopelis oryi, Rugege Forest Squeaker, Ugandan Clawed Frog	Medium		

Priority Biodiversity	Likelihood of significant residual impact	Approach used	Summary of Impact
Terrestrial invertebrates: All Critical Habitat-qualifying butterfly and dragonfly species	Medium	No quantification: Verify through monitoring	Mostly forest-associated species, but detailed habitat association unknown. Indirect impacts on tropical high forest could be as much as 10% of all forest in a pessimistic scenario. Impacts can be monitored by extent and condition of tropical high forest and by assessing management effectiveness of Forest Reserves.

Impacts on aquatic wildlife

Available data did not allow detailed quantification of impacts to aquatic wildlife (Table 5). Impacts to these features should be verified through monitoring and quantification developed later at a later stage if appropriate.

Table 5 : Summary of preliminary forecast residual impacts to aquatic wildlife

Priority Biodiversity	Likelihood of significant residual impact	Approach used	Summary of impacts
Freshwater fish All Critical Habitat-qualifying freshwater fish	Medium	No quantification: Verify through monitoring	• For most species there is a lack of data. Threats to these species can be monitored through pressure and response indicators. • Particular monitoring of pressure from fisheries and of incidences of unplanned events (e.g. spills) will be important.
Freshwater molluscs and shrimp All Critical Habitat-qualifying freshwater fish	Medium	No quantification: Verify through monitoring	• For most species there is a lack of data. Threats to these species can be monitored through pressure and response indicators.

Significance of impacts and targets for delivering a net gain

The main findings and implications of this analysis are that:

- Direct impacts: footprint-related impacts are expected to be relatively minor, generally between <0.1 and 0.3% of the landscape extent for all priority biodiversity features. Avoidance and minimisation of footprint appears to have been quite successful. It will be essential to ensure this design is adhered to, for example through the Site clearance and Site Restoration Management Plans. The avoidance protocol should continue to be applied to any further development and any further opportunities for minimising footprint explored.
- Direct impacts: disturbance may be significant, variably affecting some proportions of Rothschild's Giraffe, Lion, Uganda Kob, Lelwel Hartebeest and African Elephant populations within the MFPA. . This is because the Project activities are concentrated in the same area of MFPA that is most used by these species. The quantification is still being developed, however with high confidence intervals associated with these potential impacts. Implementation of planned mitigation is critical and should be accompanied by monitoring and evaluation at an intensity and frequency that permits mitigation to be adapted or enhanced where impacts are seen to be significant.
- The assessment of potential indirect impacts is based on a range of assumptions about the extent of in-migration, and scenarios about the impact of in-migrants and the resilience of existing protected areas:
    - Under an optimistic scenario, indirect impacts would be largely restricted to outside protected areas. However, losses outside protected areas could impact the remaining extent of Natural Habitat and Critical Habitat-qualifying threatened ecosystems (equivalent to 1-3% of landscape extent).
    - Under a pessimistic scenario, indirect impacts would extend into existing protected areas, and would be very significant for the majority of terrestrial priority biodiversity features. Impacts on this scale would likely be unacceptable and would be impossible to offset.
- The scale of potential indirect impacts, and implications for biodiversity are expected to be significant. This emphasises the need for further pre-emptive mitigation to avoid and minimise these impacts and highlights the need for these concepts to be implemented at a scale and intensity and on a timeline that ensures they are truly pre-emptive.

These forecasts are based on available information, which despite the extensive baseline data collection, does not allow a complete understanding of an extremely diverse, complex and fast-changing landscape. The forecasts are therefore intended to be understood as plausible estimates of the likely order-of-magnitude of impacts to guide mitigation planning rather than precise estimates.

Based on these estimates, indicative targets for delivering a net gain have been developed (Table 6 and Table 7). These targets assume that the Project will deliver gains through an outcome-based approach of investment in the same landscape. These outcomes are intended to be delivered through the pre-emptive mitigation concepts described in Chapter 14: Terrestrial Wildlife of this ESIA. The nature and scale of these pre-emptive actions will therefore need to be aligned with these targets.

Need for monitoring and evaluation

Quantitative loss-gain forecasting is an iterative process and this initial forecast should be revised as further information becomes available about biodiversity, impacts and mitigation efficacy, which will enable a more accurate assessment. Robust monitoring and evaluation will enable the Project to update this preliminary forecast and assess whether the type, scale or intensity of mitigation should be adjusted to ensure biodiversity outcomes are achieved. A process and schedule for updating the assessment will be defined in the Project's Biodiversity Action Plan. As an indicative guide, this assessment should be reviewed once 1) the mitigation concepts have been fully scoped and feasibility studies completed and 2) the management plans referred to in the ESIA have been prepared. If the outcomes of these studies result in significant changes to the assumptions of this assessment, it should be updated. This assessment should also be reviewed if the Project design or mitigation commitments change significantly, or if new data on biodiversity is available that may significantly change the assessment of potential impacts or gains.

Table 6 : Targets for achieving net gain for Critical Habitat-qualifying threatened ecosystems and Natural Habitat

Ecosystem / Habitat	Baseline trend	Baseline description	Target for demonstrating Net Gain
Natural Habitat			
Tropical high forest	↓ Strong decline	• Outside PAs: c.20,000 ha (in 2011) for c.13,000 QH • Inside PAs: c.88,000 ha for c. 63,000 QH Background loss rate c. 15% per year or >8,000 ha/yr outside of protected areas within the corridor. Loss rates within PAs around 1% per year.	• By 2045 (or Project end), the extent and average quality of tropical high forest within protected areas are the same or greater than the 2018 baseline for a total of ~63,000 QH • By 2045, at least 10,000 ha of remaining tropical high forest is maintained due to investment in strategic locations outside of PAs; at an average quality of at least 66%. • Approximately 1,000 ha of tropical high forest is under restoration in identified priority sites to maintain connectivity
Grassland/Wooded grassland/Woodland	↓ Declining	.270,000ha / 209,000 QH outside PAs • c.290,000ha / 205,000 QH inside PAs • Habitat quality within PAs around 70% • Habitat quality outside of PAs slightly higher at around 75% • Degradation rate around 1-3% per year	• By 2045, the quality within PAs is the same or greater than the 2018 baseline (70%) • By 2045, the quality of grassland/woodland/wooded grassland outside of PAs is improved to >80%
Wetlands	↓ Declining	• c.144,000 ha / 80,000 QH outside PAs • c.84,000 ha / 61,000 QH inside PAs • Degradation rate outside PAs around 0.5% per year due to increasing threats resulting in habitat loss and degradation • Wetland extent inside MFPA likely to be stable or increasing slightly. • Wetland quality inside MFPA around 75% and 55% outside	• By 2045, the extent and quality of wetlands within MFPA is the same or greater than the 2018 baseline (>75%) with a demonstrable reduction in threats • By 2045, extent of wetlands outside MFPA is maintained with quality improved to 60%. This could be achieved by securing important remaining wetland areas and through rehabilitation of c. 500 ha of degraded wetlands along Lake Albert, on the north-western side of the escarpment.
Lake Albert, Victorian Nile and other associated freshwater features	↓ Declining	• Lake threatened by deterioration of water quality, hydrological changes and overfishing • Degradation rate not unknown	• By 2045, the freshwater quality of Lake Albert is in a similar or better condition than currently.

Critical Habitat-qualifying threatened ecosystems			

All	↓
	
	Declining
		• Rate of habitat loss around 2-3% per year outside PAs apart from riparian forest (estimated at 15%).
		• Rate of loss inside PAs negligible apart from riparian forest (estimated at 1%).
		• All threatened ecosystems are less than 75% quality within PAs
		• Quality of grass savanna and palm savanna similar within and outside MFPA at around 70-75% quality of moist Combretum savanna significant higher within than outside MFPA (75% vs. 45% resp.)
		• Quality of forest savanna mosaic significant higher within than outside MFPA (75% vs. 35% resp.)
		• Low quality of moist Combretum savanna and Dry Acacia outside PAs (both around 45%).
			• By 2045, the extent of threatened ecosystems within existing protected areas is the same or greater than the 2018 baseline at same or greater average quality:
			  • >70% for grass and palm savanna
			  • >75% for moist Combretum savanna and forest savanna
			• By 2045, the average quality of threatened ecosystems outside of protected areas in the landscape is improved to at least :
			  • >75% for grass and palm savanna
			  • >70% for moist acacia
			  • >45% for moist Combretum savanna and Dry acacia>40% for forest/savanna mosaic

Table 7 : Targets for achieving net gain for priority species

Priority species	Baseline trend	Baseline description	Objective for achieving Net Gain
Lion	? ↓ ? Weak decline/ stable	• c. 130 individuals within the MFPA in 2009 (possibly 248 in 2014 according to a different survey) • No population time series, but indications of increasing threat from poisoning and hunting. • Indications that carrying capacity within MFPA has not been reached so there may be a slow, gradual increase in numbers north of Nile • Very little information on status of lions south of Nile (Bugungu WR).	• By 2045: number of prides and composition (adult/sub-adult/cub) remains stable or increase within Project area (within c. 10km radius of footprint) compared to 2018 baseline • By 2045: The MFPA lion population has increased by at least 25% (>165 individuals).
Chimpanzee	↓ Strong decline	• No population time series, but ongoing deforestation and disturbance leading to decline • Population size c. 1,100-2,100 individuals: - 256 – 319 between Bugoma and Budongo - 400-800 in Budongo - 450-850 in Bugoma - 100-150 in Wambabya	• By 2045: population numbers and area of occupancy within the Bugoma-Budongo corridor and Budongo FR are stable or greater than baseline (>250 individuals and > 400 individuals respectively) • Key forest patches for chimpanzees outside of PAs successfully protected with existing threats reduced through community-based initiatives

		• Population density: c. 2 ind/ km^2 in forest fragments and 0.4 in rest of landscape	
Hyena	↓ Weak decline	• Estimated population in 2009 <40 individuals within MFPA but a 2013 survey suggested there could be > 600 • Carrying capacity unlikely to have been reached so potential for increase where existing threats (persecution, accidental poisoning, etc.) are controlled and prey populations increase in MFPA • No population time series, but threats continue so likely to be declining	• High variation in estimates means no population target can be set at present • Threat-focused indicators to be developed in BAP / BMEP
Reedbuck	? Unknown	• Population within MFPA unknown	• Population based target not feasible with current data • Threat-focused indicators to be developed in BAP / BMEP
Uganda Kob	↑ Increasing	• Population appears to be increasing in MPNP although estimates vary widely. Most recent estimates indicate c. 120,000 individuals • Carrying capacity has not yet been reached within MFNP	• By 2045: total population is maintained or increasing (>120,000 ind.) with equal or greater area of occupancy
Lelwel Hartebeest	↑ Increasing	• Population appears to be increasing in MPNP although estimates vary widely. Most recent estimates indicate c. 10,000 individuals • Carrying capacity has not yet been reached within MFNP	• By 2045: total population is maintained or increasing (>10,000 ind.) with equal or greater area of occupancy
Giraffe	↑ Increasing	• Population appear to be increasing in MPNP although estimates vary widely. Recent estimates (2014/15) indicate c. 1,400 individuals • Species continues to be threatened by accidental snaring and encroachment	• By 2045: population North of the Nile has reached its carrying capacity within the MFNP and is stable (<1,500) with threats reduced • By 2045: population South of the Nile is increasing, and increasing its range
Elephant	↑ Weak increase	• Population increase over the last 20 years, but trend over the last few years unclear • Population estimated at around 1,500 within MFPA • Numbers moving outside of MFPA unclear. • Human-wildlife conflict continues to be a serious issue outside of MFPA	• By 2045: Elephants exhibit similar seasonal ranging patterns as 2018 baseline and do not extend their range outside of the PAs as a result of Project disturbance • By 2045: Total population has increased by at least 25% (>1,850) and their area of occupancy within MFPA has increased to the carrying capacity of the MFPA. Incidences of human-wildlife conflict remain

			similar to current levels.
Forest-associated species (including Nahan's Partridge)	↓ Declining	• No population time series, but forest extent is declining rapidly in the area • Population of species therefore presumed to be declining	• As for Tropical High Forest • Most important forest connectivity patches under active protection
Birds[1]	↓ Stable to declining	• Very little population or trend data available at present • Threats to species including wetland and savanna habitat degradation and poisoning (for vultures) continue, so presumed to be declining	• Population based target not feasible with current data • Threat-focused indicators to be developed in BAP / BMP
Amphibians[2]	↓ Declining	• Lack of population data but threats, particularly loss and degradation of tropical high forest and woodland/savanna confirmed, so presumed to be declining	• For forest-associated species: As for Tropical High Forest • For woodland/savanna-associated species: As for grassland targets
Reptiles[3]	↓ Declining	• Lack population data but threats, particularly habitat degradation and hunting confirmed, so presumed to be declining	• Quality of wetland (for turtles and terrapins) and savanna for Smooth Chameleon) habitat increased, as per net gain objectives for ecosystems • Level of hunting of Soft-shelled Turtle is reduced through community-based interventions
Freshwater fish, molluscs & shrimp	↓ Declining	• Lack population data but threats, mainly due to habitat degradation, decline in water quality and fishing confirmed, so presumed to be declining	• Water quality is similar to 2018 baseline or improved • Quality of wetland habitat increased, as per net gain objectives for wetlands • Sustainable fishing practices have been implemented and reduced threats from overfishing to current baseline levels

[1] White-backed Vulture Rüppell's Vulture, Hooded Vulture, White-headed Vulture, Lapped-faced Vulture, Grey-crowned Crane, Madagascar Pond Heron, Pallid Harrier, African Crowned Eagle, Black-rumped Buttonquail, Denham's Bustard, Fox Kestrel, Pel's Fishing Owl, Shoebill, African Skimmer

[2] Golden Puddle Frog, Kivu Clawed Frog, Rugege Forest Squeaker Frog, Christy's Grassland Frog and Uganda Clawed Frog

[3] Adanson's Hinged Terrapin, Zaire Hinged Terrapin, African Soft-shelled Turtle and Smooth Chameleon

Butterflies and dragonflies	↓ Declining	• Lack of population data but threats, particularly loss and degradation of tropical high forest confirmed, so presumed to be declining	• Threats to tropical high forest are reduced and their quality and extent is increasing (as per net gain objective for tropical high forests)
Terrestrial plants	↓ Declining	• Some occurrence data, but overall distribution and status unknown	• Threats to tropical high forest are reduced and their quality and extent is increasing (as per net gain objective for tropical high forests)

TILENGA PROJECT ESIA - APPENDIX P: Aquatic Life

May 2018

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Table of Contents

List of Figures

List of Tables

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Appendix P : Aquatic Ecology Baseline Component

P.1 Introduction

A decision to develop the oil and gas resources in Contract Area 1 (CA-1), and License Area 2 North (LA-2 North) in Buliisa and Nwoya Districts was taken by the Government of Uganda. As part of the mandatory Environmental and Social Impact Assessment (ESIA) required by the National Environment Management Authority (NEMA), Total Exploration & Production Uganda B.V. and Tullow Uganda Operations Pty (the developers), commissioned seasonal aquatic biodiversity surveys of surface waters targeting the main dry and rainy seasons of 2016/2017. The overall objective of the surveys was to characterize the environmental features at the selected sample collection stations; assemble data essential to water quality and productivity; study species diversity and relative abundance of micro and macro invertebrates; and determine fish species diversity, distribution and aspects of biology and ecology at the selected sampling stations. The studies made during the dry (December 2016) and wet (May 2017) seasons, were intended to generate data and information expected to constitute a representative aquatic ecology baseline to feed into the Tilenga ESIA for oil and gas development in the Project area. The baseline data assembled would be used to identify potentially vulnerable nearshore and other surface water habitats/resources likely to be critical to sustaining aquatic biodiversity conservation and fishery biology processes (breeding, nursery, feeding, sheltering) and hence contribute to environmental health and viable fisheries in the surface waters of Areas in CA-1, LA-2 North (the Project area).

1.1 General strategy of the study

Seventeen stations were sampled during the rainy season, as shown in Table 1-1. AL11, AL13 and AL14 were not sampled during the dry season. Specifically, the dates of the surveys were as follows:

- dry season – 02/12/16 – 10/12/16; and
- wet season – 30/04/17 – 08/05/17.

Sampling stations were strategically located at the main potential entry points of pollution into surface waters and other potential sources of impact as a result of Project implementation through the different phases. They included watercourses transiting through watersheds with the identified oil fields to be developed, the oil pipeline crossings and oil trucking routes across the Victoria Nile; as well as critical fish breeding and nursery habitats likely to be directly or indirectly impacted by oil development activities.

A summary of the different sites is described in Table 1-1, below.

Table 1-1: Sample site locations for the primary baseline surveys

Waterbody	Survey sites	Further Comment
Victoria Nile river	AL1	Surveyed during both wet and dry seasons
	AL2	Surveyed during both wet and dry seasons
	AL13	Only surveyed in the wet season
Victoria Nile river Delta	AL4	Surveyed during both wet and dry seasons
	AL4B	Surveyed during both wet and dry seasons
Lake Albert	AL7	Surveyed during both wet and dry seasons. Sites AL7 and AL7B combined for fish surveys (due to proximity)
	AL7B	Surveyed during both wet and dry seasons. Sites AL7 and AL7B combined for fish surveys (due to proximity)
Waiga-Waisoke Delta/Lake Albert	AL8	Surveyed during both wet and dry seasons. Sites AL8 and AL8B combined for fish surveys (due to proximity)
	AL8B	Surveyed during both wet and dry seasons. Sites AL8 and AL8B combined for fish surveys (due to proximity)
River Waiga	AL12	Surveyed during both wet and dry seasons
River Zoliya	AL11A	Only surveyed in the wet season (due to access)
River Sambiye	AL9	Dry during both wet and dry seasons
River Ngazi	AL10A	Dry during both wet and dry seasons
	AL10B	Dry during both wet and dry seasons
Unnamed	AL5A	Surveyed during both wet and dry seasons

Waterbody	Survey sites	Further Comment
Watercourse	AL5B	Dry during both wet and dry seasons
River Tangi	AL14	Only surveyed in the wet season Could not practicably be sampled for algae.

As set out in Table 1-1, several sites were not sampled due to them being dry during both survey seasons. In addition, site AL5A on the Unnamed Watercourse was too dry to sample for fish using any of the methods available, although any fish recorded during the macroinvertebrate kick-sampling were recorded. Those sites that were located in close proximity to each other (i.e. AL7 and AL7B; AL8 and AL8B) could not be sampled as distinct survey points for fish, as fish surveys covered larger areas and therefore sample sites were combined.

Major environmental features and habitat characteristics at each sampling station were summarized using briefly annotated pictures (see Figures 1-1 to Figure 1-10). The key environmental features included GPS location, water depth, bottom sediment types, associated aquatic plants and shoreline topography. Several sampling sites were identified at each station. At each of the sampling sites, in situ data and samples for analysis in the laboratory were collected, as relevant, for the four disciplines studied namely water quality, phytoplankton, zooplankton and, macro-invertebrates. Data on fish was collected across sites at a given sampling station.

The number of samples (or sub-samples) for the different specialist surveys (fish, macroinvertebrate etc.) at each station, varied according to survey methods and site constraints. There were generally samples and sub-samples at each station in order to maximise the different habitats covered, and any associated differences in diversity of flora and fauna. For samples collected on the Victoria Nile, the sub-samples included central (deep water) and marginal (generally shallow) locations. Three sub-samples were collected at each sample location on Lake Albert, which were along transects, from shallow areas adjacent to the shore, to deeper areas, with each sample located approximately 100 m apart along the transect. For samples on the smaller watercourses (River Tangi, River Waiga, River Zoliya and the Unnamed Watercourse), subsamples covered any different mesohabitats present.

A combination from those environmental features may turn out to be indicators of habitats of good or poor environmental quality when tested against the results from studies of the data collected for the five disciplines. Results from the studies are intended to define the baseline aquatic environment before the oil and gas development.

1.2 Study limitations and challenges

The number and size of the candidate surface water resources with the potential to be impacted by the Project development was a major challenge to representative selection and location of sampling stations for the baseline studies. The vast Nile Delta, whose baseline information is by far inadequate to represent that in the diverse aquatic habitats and biodiversity likely to be indirectly impacted was sampled at only one station[1]. Secondly, timing of wet season sampling was made difficult by the unusually prolonged dry season. Data collection was done early May 2017 when water levels in permanent rivers were still lower than at dry season sampling. Water was just returning to seasonal surface waters and recolonization of biotic populations had just begun. These limitations and challenges ought to be carefully evaluated as they would affect some study outcomes.

[1] It is, however, important to note that comprehensive aquatic studies (similar to what was done in this study) are being conducted at the delta to inform impact mitigation. While the results are not included in this ESIA because of time constraints, they will be used for monitoring during Project implementation.

1.3 Annotated summary of aquatic environmental features at sampled stations in CA-1, and LA-2 North

Figure 1-1: Sampling Station AL13: Along Proposed Victoria Nile Ferry crossing

Sampling Station AL13: Along proposed Victoria Nile Ferry crossing.

South shore (Right): Extensive low lying hinterland variously covered in papyrus mats, emergent swamp forest 'tree', scattered *Vocia cuspidata*, fringed by mats of *Salvinia molesta*, water hyacinth and *Nymphia caerulia.* Depth at sampling site - 1.4 m**. North shore:** Raised shoreline under thick woodland
Shore fringe by scanty *Cyperus* sp. Hard sandy clay bottom

Figure 1-2: Aquatic environmental features at sampling Stations along Victoria Nile HDD Crossing

Sampling Station AL1: Along Victoria Nile HDD crossing

South shore (Left): Water depth 2 m; hard sandy bottom; extensive swampy low lying hinterland; dominant vegetation cover of Cyperus sp. & Cyperus papyrus, **North shore (right)** low-lying front of tufts of heavily grazed *Vossia cuspidata* with wetland shrubbery.

Figure 1-3: Aquatic environmental features at sampling Stations along Victoria Nile HDD Crossing

Sampling Station AL2: Along Victoria Nile HDD crossing;

South shore (Left): Water depth 6.2m, hard sandy bottom, Fringe of *Vossia* cuspidate with stands of Phragmites sp; Salvinia molesta in sheltered nooks; gentle current shallow water – 0.5 to 1.5 m. (Right) High forested bank fringed with sparsely scuttered clumps of *Vossia cuspidata*. – opens into extensive lowlying wetland heavily grazed expanse – very shallow water

Figure 1-4: **Aquatic environmental features at sampling Stations along Nile Delta**

Sampling Station AL 4: Along **River Nile Delta,**

Views of vast shallow open water expanse of the Delta. Water depth range at sampled sites 1.5 to 1.6 m; Vegetation: various including submerged e.g *Potamogeton sp;* floating e.g *Salvinia molesta*, Water hyacinth, Nile cabage, *Ipomoea aquatica*; emergent flora- *Vossia cuspidata* fringing extensive expanses of *Cypreus papyrus*.

Figure 1-5: Aquatic environmental features at sampling Stations near proposed Water Abstraction Point

Sampling Station AL 7: Water abstraction Point

Open shore – Boat landing site. Hard sandy bottom - 0.9 m depth; submerged *Potamogeton sp* & *Najas horrida* & Varisneria offshore depth 4.3 m at 200m : hard clay bottom

Figure 1-6: Aquatic environmental features at sampling Stations in Waiga-Waisoke Deltas

Station AL8: Waiga-Waisoke Deltas

Extensive merged fringing floodplain of River Waiga and River Waisoke deltas along Lake Albert. NB- rich flora includes Papyrus mats, stands of *Phragmites* sp, *Vossia cuspidata* ; swamp forest trees; plus floating & rooted submerged water plants not in picture sites. Water depth generally shallow far offshore: 0.8 to 1.2 m; hard bottom fine sand at Waiga River mouth & dark muddy sand at Waisoke River mouth. Water-line receded extensively during last prolonged drought.

Figure 1-7: Aquatic environmental features at sampling Station in River Waiga

Sampling Station AL12: River Waiga

Width about 4 m, depth >0.5 m. Brisk current; hard bottom with coarse sandy gravel, plus pebbles some smooth stones. Hinterland cover –bush

Figure 1-8: Aquatic environmental features at sampling Stations in River Zolia

Sampling Station AL11A: River Zolia

Recently re-inundated; Left (North of road). extensive wetland covered in shrubs, *Vossia*.Right (South of road)

Figure 1-9: Aquatic environmental features at sampling at Unnamed Watercourse

Station AL5A the Unnamed Watercourse

Seasonal tributary into Albert Nile with perennial water in delta zone packed with aquatic macrophytes dominated by *Salvinia molesta* and water hyacinth (left photo in December 2016) River drains vast Savana grassland section of Murchison Falls National Park but hold water for very short periods of rain season. Picture to the Right -May 2017- water recently retained in sections of the river

Figure 1-10: Aquatic environmental features at sampling Stations in River Tangi

Station AL14. River Tangi – River just filling up.

Left : Downstream and Right: Upstream of the Tangi River Bridge. Note: Heavily turbid water, muddy bottom type, very low water levels. NB River Tangi flows through extensive floodplain delta which starts at the sampling site

P.2 Materials and Methods

2.1 Water quality sampling and analysis

Water samples assessed for baseline quality were collected at fifty centimetres under surface using a 5Lvan dorn sampler. Dissolved oxygen (mg L^{-1}), temperature ($^{\circ}C$), pH and water conductivity (µS cm^{-1}) were measured *in situ* at 0.5 m below water surface using Multiprobe (Hach HQ40d). Sample for determining water quality in the laboratory was transported in a cool-box on ice. Ammonia-nitrogen and nitrate-nitrogen were determined using Jenway 6505 UV/Vis Spectrophotometer. Soluble reactive phosphorous, total phosphorus (TP), total nitrogen (TN) and soluble reactive silica were determined using various standard methods as set out in APHA (1995). Chlorophyll a was determined spectrophotometrically using the hot ethanol extraction method (ISO, 1992).

2.2 Phytoplankton sampling and data analysis

At each sampling site, 20 ml of water for assessment of baseline status of phytoplankton was drawn at 0.5m depth, fixed with Lugol´s solution (Utermöhl, 1958), and stored away from light (Wetzel and Likens, 2000). The sedimentation method of Utermöhl (1958) was used to count the phytoplankton under an inverted microscope (Leica DM IL). Taxonomic identification was made with the help of standard literature (John et al., 2002; Komarek and Anagnostidis 1999). Species counts were made at a 400-times magnification. For each sample, two transects in the sedimentation chamber were counted and the average recorded. *Nitzschia* and *Planktolyngbya* were counted as filaments, and their total length and width measured using the micrometer scale inserted into the eyepiece (1 unit in the scale equal to 2.5 µm). Other species such as *Anabaena, Chroococcus, Merismopedia* and *Oocystis* were counted as single cells. Cell lengths and widths were determined for biovolume calculation. Twenty (20) randomly selected specimens from the dominant species were measured and their volumes calculated by assuming a geometric shape, that is, for *Microcystis*. The formula 'πd3/6' was used where'd' denotes cell diameter (Hillebrand et al 1999; Wetzel and Likens 2000). The biovolume was then calculated by multiplying the mean cell volume with cell density.

2.3 Zooplankton sampling and data analysis

Vertical zooplankton hauls were taken from 0.5m above the bottom sediments to the surface using a conical net of 0.25 m mouth opening and 60 µm nitex mesh. Three hauls were taken to make a composite sample, which was preserved with 4% sugar-formalin solution. In the laboratory, samples were examined at appropriate magnification under an inverted microscope (X40 for counting and X100 for taxonomic identification). Species identification was done using published keys (Rutner-Kolisko, 1974, Brooks, 1957, Pennak, 1953, Sars, 1895) enumerated and density data compiled.

2.4 Macro-invertebrate sampling and data analysis

Macro-invertebrate samples were collected in waters deeper than one meter, using a Ponar grab with approximate jaw area and inner depth of 238.0 cm^2 and 8.0 cm, respectively (APHA, 1992). The samples were collected in triplicate and pooled together in a plastic basin. A Kick- net was used to collect bottom samples from River Waiga where the water depth was about 20 cm. Water depth was determined using an eco-sounder of 400 Hz. and recorded. Similarly samples for aquatic macro-invertebrates collected in triplicate using Kick net were pooled in another plastic basin. The physical characteristics e.g. hard, soft, type of material (shell fragments, clay, sandy, stony, etc,) were noted during the pooling process and recorded. The composite samples were transferred and washed in a washing net of a 500 µm mesh pore size. The macro-invertebrates were placed in sample bottles and preserved using 70% ethanol. The preserved organisms were transported to laboratory for sorting, identification and quantification; all based on procedures described in selected similar studies (Ferraro and Cole, 1992 and Ochieng *et al*., 2008). The Chironomidae (Diptera), Ostracoda, Hirudinea and Oligochaetes could not be identified further but most organisms were identified to genus level and some down to species level, using guides to fresh water aquatic macro-invertebrates (Pennak, 1953; Merrit and Cummins, 1997; De Moor *et al*., 2003a; 2003b).

Using MS excel program, mean numbers of macro-invertebrate taxa were determined from the composite samples (n=3) from each site. Based on observed general similarities on most water depths, bottom substrates (micro-habitats) and occurrences of macro-invertebrates to some extent, among sites of most stations, the data from all the three sites per station were pooled and their means calculated. The mean values were rounded off to the nearest whole numbers to determine the Ephemeroptera, Plecoptera and Trichoptera (EPT) and total taxa

indexes, and also individual taxa densities (mean numbers per square meter), as described and used to indicate environmental quality in other macro-invertebrate studies (Wenn, 2008; Oghenekaro, 2011). The EPT and Total taxa indices are presented in form of graphs, while taxa densities and distribution are in a table.

2.5 Fish sampling and data analyses

During the dry season fish sampling was done using experimental gillnets (mesh 1-2.5 inches), plus basket and minnow traps. These gears were set along the banks of Victoria Nile and small rivers/streams for a period of at least 2hrs. The small rivers were accessed using hip waders (walking boots) while Victoria Nile and the main lake were accessed using a boat. Additional data were obtained from fishermen's catch operating in the study areas. Use of gillnets was not successful in River Nile. During the rainy season fishing gears used comprised a potable backpack ELT 60II GI HONDA GXV50 electro fisher with about 2 m long floating copper cathode; 2 m long handheld anode ending in a 47 cm diameter ring (approximately 280V, 12A) mounted with netting; multifilament nylon gillnets of mesh size ranging from 1.5" increasing to 4" by 0.5"; metallic fish traps and fyke-nets. Electrofishing equipment was used along the shores of River Nile, mostly in shallow (< one meter zones) and in River Waiga and River Tangi. Electrofishing was also done among submerged aquatic vegetation cover at the shores of Lake Albert. Gillnets were used mainly in the open waters of Lake Albert and the zones of the Nile Delta deeper that two meters. Gillnets of mesh size 1, 1.5 and 2 inches were used to catch fish in Rivers Waiga and Tangi. Electrofishing was not successful due to absence of vegetation or other shelter at the sampling site. On River Nile electrofishing, a non –lethal fishing method was deployed from a boat. The stunned fish were collected using both the anode held by the operator and a dip net held by a second person.

The catch were identified to species level using Greenwood (1966), counted, the total length/fork length (TL/FL) and standard length (SL) were measured to the nearest 1mm. The individual weights of fish were measured to the nearest 0.1 g using a digital scale (model CS-10KWP-IP65). Some of the catch was released back after length and weight measurements were taken. Other samples were dissected for further biometric data collection on species life history characteristics.

Sexes were determined for only those fish whose gonads were identifiable as male and female and maturity stages of fish were assigned from stage I to VII according to a method described by Witte and Van Densen (1995). Fish in stages I, II and III were regarded immature whereas those in stages IV, V, VI and VII as mature. The guts were fixed in 4% formalin and later preserved in 70% ethanol in labelled sample bottles for laboratory examination. In the laboratory, the guts were split open, contents emptied onto a petri dish and examined under compound microscope (Model XSZ-H) to determine food of the fish sampled, The food items were identified and points allocated to different degrees of stomach fullness according to Hynes (1950) to give stomach fullness index from which the contribution of food items relative to all food items in the gut were allotted.

Species composition and relative abundance were calculated from the catch statistics. Catch rates (number/weight of fish per gear per day) were calculated based on a total number of gears used at that particular habitat. A total of eight nets were used during this survey due to the nature and feasibility of use of gillnets and duration of fishing. Relative condition factor (Kn) was calculated as the ratio of observed individual fish weight to expected weight of an individual of a given length using regression constants a and b obtained from running a length-weight relationship according to LeCren (1951). The relative importance of food items was estimated from multiplying the stomach fullness index by percentage contribution of food items.

P.3 Results and Discussion

This section presents the general findings from the surveys, while Section P.7 provides the detail of the analyses made by species.

3.1 Water quality

Physical and chemical parameters

Measurements of the physical and chemical parameters assessed fell within the accepted limits of national drinking water standards as per National Water and Sewerage Cooperation (NEMA, 1999) (Table 3-1). All the parameters were below the upper limits. Dissolved oxygen was more uniformly distributed at all sites sampled ranging from 4.4 - 8.9 mgL^{-1} during the wet season and 3.5 - 8.8 mgL-1 during the dry season highly suitable for both drinking water and water for a balanced biodiversity that supports high fish production (Romaire, 1985). The temperature range of 23.6 - 31.7°C recorded during the wet season was slightly higher than 22.7 - 29.6°C recorded during the dry season most probably due to the sampling time variation. They however remain within the optimum range for fish production (20 - 30°C) and national standard for discharge into the natural system (20 - 35°C). pH on the other hand had a narrow range of 7.7 - 9.3 during the wet season compared to 6.8 - 9.0 recorded during the dry season. All measurements showed a balanced alkaline condition. An elevated pH above 9.5 can lead to ammonia toxicity while low pH of 4.4 - 5.2 is considered lethal to fisheries (Beveridge, 1996). Conductivity varied highly ranging from 74 - 160 μScm^{-1} during the wet season sampling compared to 57.6 – 637.3 μScm^{-1} recorded during the dry season. The in-situ physio-chemical water qualities conditions generally at all the sites were still suitable for fisheries productivity and maintenance of other aquatic biodiversity.

3.1.1 Total Suspended Solids (TSS)

For a portable drinking water supply, TSS is supposed to be 0 mgL^{-1} however water for productivity processes requires presence of some plankton as carbon source without much interference with water clarity. Because of the decomposing plant and erosion from the catchment area, TSS was high ranging from 5 - 462 mgL^{-1}. During the implementation period of the project, TSS will be expected to increase.

3.1.2 Phosphorus compound

The overall total phosphorus concentration ranged from 47 - 802 μgL^{-1} during the wet season sampling (Table 3-1 as compared to 27 - 272 μgL^{-1} (Table 3-2) recorded in the dry season (December 2016). According to Mann-Whitney U test, there is a statistical significance difference (P = <0.001) between the wet and dry season samples. This variation could be explained by the nutrient wash in from the animal waste, a case that in future needs to be regulated in cases of oil spill. The supplied soluble reactive phosphorus (SRP) ranged from 3 – 164 μgL^{-1} during the wet season and 7 - 136 μgL^{-1} during the dry season. SRP are readily absorbed by the green and blue-green algae to be able to maintain the fish population. The phosphorus supply into the water column was good but because of high current and turbidity, the condition was not that favourable for algal productivity. It can be said as of now; there are indications that phosphorus loading for the moment is due to wildlife and nature of the catchment soil type. The initial stages of the proposed project activities still have no threat to fish productivity. If suitable mitigation measures are strictly applied including gazetting some of these sites as restricted breeding/nursery grounds during the time of oil transportation.

3.1.3 Silica compound

Soluble reactive silica (SRSi) ranged from 200 – 1720 μgL^{-1} in all the sites sampled during the wet season (Table 3-1.) compared to 32 - 1242 μgL^{-1} during dry season (Table 3-2). This is the form which is readily absorbed by the diatoms hence contributing to their higher biovolume in the river system. The presence of SRSi relays good energy source through the diatom to fish. River connectivity to the catchment area relates to the higher concentration of SRSi recorded. Again there are big variations between the wet and dry season with more Silica coming in with rain. Similar explanation as in phosphorus compound holds. During the construction period, deposition of the excavations will lead to some sedimentation that in turn will result into increase in silica concentration. If appropriate mitigation measures are applied, sedimentation will be minimal hence continuity of the fish productivity.

3.1.4 Nitrogen compound

Total Nitrogen concentration ranged from 700 - 5898 μgL^{-1} (Table 3-1) during the wet season very good to sustain aquatic ecosystem processes especially phytoplankton the major carbon producer in fisheries production. The concentration was lower in the first sampling during the dry season ranging from 131 - 929 μgL^{-1} (Table 3-2). Other nitrogen products that include ammonia had concentrations within the water column at a range of 0.09 - 433 μgL^{-1} during wet season and 3 - 378 µgL-1 during dry season. The majority of sites indicated a well-functioning aquatic ecosystem, while others with stagnant waters not. Ammonia becomes detrimental to fish health at a level greater than 20µgL-1 hence the ecosystem has to buffer it off to a lower concentration. In a healthy aquatic ecosystem, ammonia is converted immediately into nitrate via the intermediate product nitrite in the presence of oxygen. Nitrite the intermediate product ranged from 1 – 119 μgL^{-1} in wet season and 0 – 19 μgL^{-1} during dry season. Nitrate the final product of nitrification ranged from 23 - 301μgL^{-1} during the wet season and higher during the dry season ranging from 65 - 439 μgL^{-1} an indication of efficient conversion in the presence of dissolved oxygen which was greater than 2.0 mgL^{-1} at all sites with the exception of only site AL11A (0.43 mgL^{-1}) although not sampled during the dry season. A fall in oxygen concentration below 2.0 mgL^{-1} would result into cessation of nitrification process (Delince, 1992). Hence the Project Area aquatic system during these two study periods remained healthy to sustain these biogeochemical processes that aid in sustaining all the aquatic biodiversity lives.

3.1.5 Chlorophyll a

Chlorophyll a, an indirect determinant of algal biovolume, ranged from 0 - 5.9 μgL^{-1} (Table 3-1) during the wet season. This range despite being low maintains good food supply for the fish without visible algal blooms that could lead to reduced levels of dissolved oxygen by algal shading and eventual decay. The range would have qualified the study area as oligotrophic (0 - 8.5 μgL^{-1} according to OECD, 1982). The concentrations of the phosphorus compoundis the main driving factor, however turned it into a eutrophic condition coupled with the high TSS recorded during the wet season ranging from 2 – 462 mgL^{-1}, depriving algae of light to flourish.

Table 3-1: Water quality characteristics in surface waters ofCA-1, and LA-2 North, December 2016

Transect		TD	SD	DO	Temp	pH	EC	Tot N	Tot P	PO_4-P	NO_2-N	NH_4-N	NO_3-N	SRSi
		m	M	mg/L	°C		µS/cm	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
AL1	S1	5.0	0.7	8.8	28.1	8.1	115.7	131.7	59.6	21.1	1.9	75.5	254.9	32.1
	S2	6.2		8.4	28.3	7.8	115.3	118.0	43.6	17.2	1.2	18.5	249.7	108.3
	S3	1.7	0.61	9	28.6	7.6	115.7	159.2	39.5	15.2	0.5	14.8	260.2	142.4
AL2	S1	2	0.6	8.6	28	7.8	118.5	131.7	83.7	7.4	2.6	3.8	291.8	223.7
	S2	3.5	0.4	7.9	27.6	7.8	117.2	269.3	59.6	15.2	4.1	86.5	86.5	197.5
	S3	1.7	0.6	8.8	28.4	7.8	117.4	269.3	35.5	9.3	2.6	104.9	265.5	176.5
AL4	S1	1.6	0.6	6.2	28.2	7.3	116.8	296.8	67.7	15.2	2.6	13.0	297.1	116.1
	S2	1.3		7.9	28.2	7.8	116.9	283.0	67.7	13.2	2.6	25.8	297.1	118.8
AL4B	S1	1.9	0.6	6.9	28.4	7.5	117.2	283.0	27.5	13.2	3.9	33.2	281.3	82.0
	S2	1.9	0.7	7.1	28.6	7.7	117.1	255.5	51.6	15.2	5.5	36.9	249.7	118.8
AL5B	S2	-	-	3.5	29.6	6.8	57.6	351.8	272.5	136.8	0.5	378.8	439.2	1242.1
AL7	S1	0.9	0.9	7.7	29.2	8.9	641.7	228.0	55.6	15.2	0.0	38.7	291.8	1047.9
	S2	2.2	1.7	8.5	29.5	7.8	637.1	173.0	55.6	13.2	0.1	20.3	233.9	890.4
	S3	4.2	1.9	7.8	29.3	8.6	637.3	173.0	87.7	7.4	18.6	11.1	102.3	1100.4
AL7B	S1	1.1	1.1	8	27.9	9.0	636.2	145.5	63.6	13.2	1.9	20.3	123.4	890.4
	S2	2.6	2.3	7.5	28.6	8.9	636.2	131.7	39.5	13.2	3.4	7.4	191.8	184.4
	S3	3.9	1.9	7.4	28.8	8.9	635.9	186.8	75.7	13.2	4.8	7.4	212.8	184.4
AL8	S1	0.8	0.5	7.1	28.3	8.7	519.6	214.3	87.7	32.8	5.5	20.3	133.9	184.4
AL8B	S1	-	-	1.1	24.5	6.8	167.1	228.0	47.6	19.1	4.1	14.8	160.2	208.0
	S2	1.1	0.6	8.3	29.3	8.7	586	186.8	212.2	154.4	7.0	51.6	65.5	929.8
	S3	1.2	0.6	8.5	29.1	8.8	590	929.5	67.7	40.7	8.4	11.1	86.5	179.1
AL12	S1	0.7	0.3	3.6	22.7	7.1	148.6	200.5	236.3	99.5	5.5	77.3	165.5	1040.0
National Standards portable water				**NS**	**20-35***	**6.5-8.5**	**2500**	**10000***	**10000***	**500***	**3000**	**1000**	**45000**	**NS**

NB: TD = Total depth; SD = Secchi depth; DO = Dissolved oxygen; Temp = Temperature; Tot-N = Total nitrogen; Tot-P = Total phosphorus; PO4-P = Reactive phosphorus; NO_2-N = Nitrite nitrogen; NO_3-N = Nitrate nitrogen; SRSi = Soluble reactive silicon; NS = Not Specified; * = Effluent discharge standard

Table 3-2: Water quality characteristics in surface waters of CA-1, and LA-2 North, May 2017

Transect		TD	SD	DO	Temp	pH	EC	Tot N	Tot P	PO_4-P	NH_4-N	NO_2-N	NO_3-N	SRSi	TSS	Chl-a
		M	m	mg/L	°C		µS/cm	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
AL1	S1	2.0	0.22	7.77	27.09	7.72	100	2816.16	115.84	3.43	29.72	1.20	98.61	780.76	25.0	2.96
AL1	S2	4.4	0.23	8.23	27.2	7.72	101	1802.47	308.61	7.35	7.50	119.31	269.74	216.46	160.0	2.96
AL1	S3	1.6	0.21	7.25	27.07	7.76	102	3747.67	216.24	5.39	20.46	6.99	152.09	1376.56	19.0	2.96
AL2	S1	2.3	0.21	8.11	27.27	7.72	101	1076.44	296.57	23.04	38.98	1.20	120.01	990.73	136.0	0.00
AL2	S2	1.3	0.3	6.67	27.14	7.8	102	1802.47	147.97	162.25	103.80	8.44	152.09	623.28	22.0	2.96
AL2	S3	1.9	0.19	7.8	27.4	7.88	101	1186.03	236.33	9.31	1.94	88.15	301.82	200.71	95.6	0.00
AL4	S1	0.7	0.51	6.26	27.72	7.73	106	1870.96	127.89	5.39	44.54	1.20	103.96	221.71	20.0	4.44
AL4	S2	1.4	0.62	7.64	27.54	7.78	106	1035.34	79.70	79.90	383.43	9.17	173.48	253.20	19.0	2.96
AL4B	S1	1.8	0.68	7.13	27.64	7.84	106	2268.22	123.88	7.35	11.20	7.72	152.09	1358.19	19.5	5.92
AL4B	S2	1.2	0.59	6.91	27.69	7.75	106	898.36	123.88	5.39	33.43	20.04	114.66	893.62	34.7	1.98
AL5A	S1	.	.	4.39	31.71	8.97	265	3158.63	802.59	11.27	33.43	15.69	136.05	807.01	462.0	5.92
AL7	S1	0.7	0.39	8.89	27.97	9.19	120	1843.56	151.99	17.16	433.43	14.96	157.44	1489.42	31.6	1.48
AL7	S2	1.9	0.98	6.87	28.08	9.14	140	1816.16	91.75	164.22	38.98	6.99	29.10	1717.77	11.3	2.96
AL7	S3	2.9	1.01	6.69	28.16	9.07	148	953.15	135.92	5.39	38.98	20.04	178.83	646.90	15.5	2.96
AL7B	S1	0.7	0.7	7.24	27.23	9.08	160	1747.67	63.63	5.39	72.31	1.92	71.88	205.96	7.7	1.48
AL7B	S2	2.1	1.47	7.33	27.95	9.14	147	706.58	59.62	5.39	22.31	19.31	103.96	226.96	27.0	2.96
AL7B	S3	3.1	1.49	6.82	28.28	9.16	143	2994.25	103.80	1.47	24.17	1.20	103.96	649.53	2.7	1.48
AL8	S1	0.4	0.4	7.14	27.65	9.18	94	1473.70	75.68	7.35	0.09	7.72	130.70	1541.92	15.0	0.00
AL8B	S2	0.7	0.7	7.18	27.78	9.22	94	2857.26	47.57	9.31	50.09	8.44	141.40	224.33	12.7	0.00
AL8B	S3	0.8	0.8	7.16	27.96	9.28	98	5898.36	55.60	3.43	38.98	19.31	173.48	234.83	32.3	0.00
AL11 A		0.8	0.47	0.43	28.84	7.64	64	925.75	541.55	5.39	66.76	1.20	98.61	1720.39	5.6	2.96
AL12	(US)	.	0.3	2.81	23.63	7.9	66	1281.92	360.82	11.27	1.94	15.69	50.49	200.71	15.2	3.95
AL12	(DS)	0.6	0.61	2.93	23.68	8.19	78	1692.88	376.89	177.94	38.98	1.92	82.57	219.08	23.7	1.48
AL13	S1	1.4	0.65	8.44	28.6	8.43	65	2323.01	127.89	136.76	29.72	2.64	23.75	911.99	21.3	3.95
AL13	S2	5.0	0.52	8.89	28.4	8.27	74	1528.49	91.75	7.35	27.87	1.92	29.10	911.99	17.0	5.92
AL13	S3	5.0	0.51	8.91	28.85	8.73	93	2007.95	83.71	7.35	46.39	14.24	141.40	216.46	18.5	2.96
AL14		0.8	0.05	4.62	25.84	8.67	39	6501.10	1561.63	17.16	31.57	1.20	162.79	232.20	1250.0	0.00
National Standards portable water				**NS**	**20-35***	**6.5-8.5**	**2500**	**10000***	**10000***	**500***	**3000**	**1000**	**45000**	**NS**	**0**	NS

NB: TD = Total depth; SD = Secchi depth; DO = Dissolved oxygen; Temp = Temperature; Tot-N = Total nitrogen; Tot-P = Total phosphorus; PO4-P = Reactive phosphorus; NO_2-N = Nitrite nitrogen; NO_3-N = Nitrate nitrogen; SRSi = Soluble reactive silicon; US = Upstream and DS = Downstream; NS = Not Specified; * = Effluent discharge standard

3.2 Phytoplankton - results and discussion

A total of 72 phytoplankton taxa were recorded in surface waters of the Study Area during the wet season, compared with 84 in the dry season. However, the bio-volume was generally low in the wet season compared to the dry season. In the wet season bio-volume ranged from 0.95 to 10.60 $mm^3 L^{-1}$ as compared to 0.94 to 14.53 $mm^3 L^{-1}$ during the dry season, when bio-volume was generally higher (Tables 3-3 – 3-5).

'Blue-green algae' (cyanobacteria) and diatoms were dominant (in terms of bio-volume), followed by green-algae, while dinoflagellates, which were recorded in much lower levels. Blue-green algae were present at all sampled sites and contributed 26 and 28 taxa during dry and wet seasons respectively.

The low biovolume recorded could be because of the fast flowing waters at rivers providing turbulent conditions which favours increased productivity and abundance of some species such as the diatoms (Kilham, 1971) whereas impeding proliferation of other groups.

Like the blue-green algae, diatoms were also present in most of the sites and contributed 19 and 12 taxa during dry and wet seasons respectively. Additionally, the high turbidity and high Total Suspended Solids must have provided a light shading effect hindering algal proliferation. Although the green algae were recorded at a lower bio-volume, this group included relatively high number of taxa (32 and 25 taxa during dry and wet seasons respectively).The dominant biovolume contributors for Blue green algae were mainly *Planktolyngbya limnetica*, *Microcystis flosaquae* and *Coelosphaerium* species, Diatoms by *Aulacoseria granulate, Nitzschia* and *Surirella* species and the Green algae by *Monoraphidium, Oocystis* and *Scenedesmus* species. Generally the biovolume of Blue green and Green algae decreased during the wet season sampling (May 2017) while that of Diatoms increased making a statistical difference between the wet and dry season $t = -2.292$, $P = 0.028$.

Table 3-3: Distribution and abundance of phytoplankton expressed as biovolume (mm3L-1) in surface waters of CA-1, and LA-2 North - December, 2016 and May 2017

Station	Sample	Blue Green		Diatom		Dinoflagellates		Green		Total	
		Dec16	May17	Dec16	May17	Dec16	May17	Dec16	May17	Dec16	May17
AL14	S2		0.90		0.01		0.00		0.040		**0.95**
AL1	1A	4.02	0.75	0.96	0.00	0.00	0.00	1.18	0.150	**6.61**	**0.90**
	S2	4.81	0.66	0.82	2.23	0.00	0.00	3.74	2.540	**9.37**	**5.43**
	S3	2.37	0.64	0.63	1.74	0.00	0.00	0.72	1.990	**3.72**	**4.37**
AL2	S1	5.75	1.46	1.08	6.75	0.00	0.00	3.49	2.390	**10.32**	**10.60**
	S2	4.11	1.15	0.61	3.89	0.00	0.00	2.92	1.600	**7.64**	**6.64**
	S3	6.17	1.45	1.69	2.20	0.00	0.00	1.18	0.690	**9.04**	**4.34**
AL4	S1	4.46		0.60		0.00		0.62		**5.68**	
	S2	5.24	0.31	0.85	1.97	0.00	0.00	1.09	2.370	**7.18**	**4.65**
AL4B	S1	5.71	1.44	0.75	3.87	0.00	0.00	1.82	1.140	**8.28**	**6.45**
	S2	3.48	2.29	3.67	4.30	0.00	0.00	0.88	2.170	**8.03**	**8.76**
AL7	S1	3.86	0.56	0.27	5.01	1.62	0.01	0.22	0.640	**5.97**	**6.22**
	S2	2.16	0.12	0.07	6.40	0.23	0.00	1.35	0.270	**3.81**	**6.79**
	S3	4.42	0.40	1.82	2.91	0.46	0.00	2.58	1.130	**9.28**	**4.44**
AL7B	S1	0.51	0.16	2.79	3.39	0.93	0.00	8.82	0.660	**13.05**	**4.21**
	S2	6.34	0.56	0.29	2.65	0.23	0.00	2.48	0.760	**9.34**	**3.97**
	S3	4.47	0.26	0.45	4.61	0.23	0.00	0.05	0.510	**5.20**	**5.38**
AL8	S1	3.48	0.08	1.90	3.50	0.00	0.00	1.53	0.220	**6.91**	**3.80**
	S2	3.84	0.37	10.46	9.09	0.23	0.00	0.00	0.220	**14.53**	**9.68**
	S3	3.01		4.25		0.23		0.34		**7.83**	
AL8B	S1	0.94		1.59		0.00		0.48		**3.01**	
AL11A	S1		0.52		0.88		0.00		0.340		**1.74**
AL12	S1	0.35	3.37	0.52	0.00	0.00	0.00	0.07	0.060	**0.94**	**3.43**
AL13	S1		0.22		0.91		0.00		0.000		**1.13**
	S2		0.39		0.66		0.00		0.290		**1.34**
	S3		1.54		1.97		0.00		2.000		**5.51**

Table 3-4: Taxonomic checklist, species composition and distribution of Phytoplankton in surface waters of CA-1, and LA-2 North - May 2017

		AL 1			AL 2			AL 4		AL 4B		AL 7			AL 7B			AL 8B			AL 12	AL 13		
Family	**Species**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**		**1**	**2**	**3**
Blue-green	*Anabaena circinalis*								√												√			
	Anabaenopsis tanganyikae													√				√					√	√
	Aphanocapsa delicatissima	√									√				√									
	Aphanocapsa holistica				√					√				√			√		√					√
	Aphanocapsa incerta		√	√	√	√	√		√	√	√		√					√			√		√	
	Aphanocapsa elachista																		√					
	Aphanocapsa nubilium	√	√			√				√	√	√	√		√	√	√	√	√	√	√	√	√	
	Aphanocapsa spp	√								√						√	√				√			
	Chroococcus disperses	√	√		√	√	√		√	√	√	√	√									√		√
	Chroococcus limnetica	√	√	√	√	√	√		√	√	√					√		√		√	√		√	√
	Chroococcus minutus	√		√	√	√	√		√	√	√		√								√	√	√	
	Chroococcus spp																				√			√
	Coelomoron pusillum			√	√	√	√		√															√
	Coelomoron tropicale		√							√	√								√				√	√
	Coelosphaerium kuetzinganianum			√		√					√													√
	Cylindrospermopsis africana										√					√		√	√		√			
	Merismopedia glauca										√													√
	Merismopedia tenuissima		√		√	√	√			√	√	√				√						√	√	√
	Microcystis flos-aquae						√			√														
	Microcystis aeruginosa				√						√													
	Planktolyngbya tallingi					√																		
	Planktolyngbya circumcreta	√	√	√	√	√	√		√		√	√	√	√		√	√		√		√		√	√
	Planktolyngbya limnetica	√	√	√	√	√	√		√		√	√	√	√		√	√		√		√		√	√
	Planktolyngbya undulata																				√			√
	Psuedanabena limnetica		√		√	√					√					√					√	√		
	Psuedanabena spp														√		√							
Diatoms	*Achnanthes lanceolate*											√												
	Achnanthes linearis					√														√				
	Achnanthes spp											√						√						
	Amphora veneta											√												
	Aulacoseria ambigua		√	√			√				√					√							√	
	Aulacoseria granulate				√	√			√	√	√											√		√
	Centric diatom			√	√				√		√	√	√	√	√	√	√		√	√				√
	Cocconeis pediculus											√												
	Cocconeis placentula																√							
	Cymbella spp											√			√			√						
	Cyclostephanodiscus spp												√		√									
	Navicula gastrum			√		√					√	√				√		√						√
	Navicula hungarica											√												
	Navicula muticoides													√										
	Navicula smithii																√							
	Navicula subplacenta												√											
	Nitzschia acicularis		√	√	√		√		√		√	√	√	√	√	√	√	√	√	√		√	√	√
	Nitzschia fonticola					√				√	√			√	√					√				
	Nitzschia spp						√												√					
	Nitzschia nyassensis					√						√	√	√		√	√		√					
	Pinnularia interrupta			√																				
	Rhopalodia spp			√									√	√										
	Surillera spp		√		√	√	√	√		√	√		√					√	√					
Dinoflagellates	*Glenodinum species*											√												
Green algae	*Actinastrum hantzchii*											√		√						√				
	Ankistrodesmus falactus		√	√	√		√		√	√	√	√								√	√			√

		AL 1			AL 2			AL 4		AL 4B		AL 7			AL 7B			AL 8B			AL 12	AL 13		
Family	**Species**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**		**1**	**2**	**3**
	Ankistrodesmus fusformis				√	√																√		
	Ankistrodesmus stegera						√						√	√			√							
	Arthrodesmus spp											√												
	Chlorella vulgaris	√			√					√	√			√			√			√	√			
	Chodatella subsalsa														√	√								√
	Closterium kuetzingii		√	√	√						√				√							√		
	Coelastrum microporum				√																			
	Cosmarium spp		√									√					√							√
	Crucigenia fenestrate				√																	√		
	Didymocystis tuberculate										√													
	Kirchneriella obesa					√	√			√	√			√									√	
	Monoraphidium contortum	√	√	√	√	√	√	√	√	√	√	√										√		√
	Oocystis gigas					√			√	√	√				√	√								
	Oocystis turgidus														√									√
	Pediastrum boryanum																					√		
	Pediastrum simplex		√	√	√	√	√		√	√	√		√									√		
	Scenedesmus abijugatus		√							√														
	Scenedesmus acuminatus		√	√	√		√		√		√					√						√	√	√
	Scenedesmus arcuatus		√							√														
	Scenedesmus armatus		√	√	√	√	√			√									√			√	√	√
	Scenedesmus perfolatus			√	√	√	√		√	√	√	√	√	√	√	√	√	√	√					√
	Scenedesmus quadricauda	√					√		√	√	√			√										
	Tetraedron trigonum		√	√													√							√
Total species		**11**	**22**	**21**	**26**	**25**	**22**	**2**	**18**	**24**	**33**	**22**	**16**	**16**	**13**	**17**	**16**	**11**	**14**	**9**	**14**	**15**	**14**	**26**

Table 3-5: Taxonomic checklist, species composition and distribution of Phytoplankton in surface waters of CA-1, and LA-2 North - December, 2016

		AL 1			AL 2			AL 4		AL 4B		AL 7			AL 7B			AL 8B			AL 12
Family	**Species**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	
Blue-green	*Anabaena circinalis*																	√	√	√	
	Anabaenopsis																	√	√	√	
	Aphanocapsa delicatissima									√	√				√						
	Aphanocapsa holistica																√				
	Aphanocapsa incerta								√												
	Aphanocapsa limneticus								√												
	Aphanocapsa nubilium	√	√	√	√		√	√		√	√			√						√	
	Aphanocapsa spp	√							√									√	√	√	
	Chroococcus aphanocapsoides																	√			
	Chroococcus disperses	√	√	√		√	√	√	√		√										
	Chroococcus limneticus		√	√		√	√			√	√	√		√			√	√	√	√	
	Chroococcus minutus			√	√	√		√	√		√					√		√	√	√	
	Chroococcus spp							√													
	Chroococcus targidus		√			√		√							√	√			√	√	
	Coelomoron pusillum			√														√			√
	Coelomoron tropicale					√			√								√				
	Coelosphaerium kuetzinganianum	√									√							√	√	√	
	Cylindrospermopsis africana	√								√		√						√	√	√	
	Cylindrospermopsis astrea	√																			
	Cylindrospermopsis raciborskii																			√	
	Merismopedia glauca	√	√		√	√	√	√	√		√										
	Merismopedia tenuissima	√	√	√	√	√		√		√	√							√	√	√	
	Microcystis flos-aquae						√				√							√	√		
	Microcystis wasenbergii							√													
	Monoraphidium tropicale				√																
	Planktolyngbya circumcreta	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	
	Planktolyngbya contorta																			√	
	Planktolyngbya limnetica	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Psuedanabena limnetica										√						√	√	√	√	√
Diatoms	*Achnanthes*					√															
	Aulacoseria ambigua				√	√		√	√	√	√					√					
	Aulacoseria glance															√					
	Aulacoseria granulate	√	√	√	√	√	√	√		√	√	√									
	Cocconeis pediculus																				
	Cocconeis placentula						√										√				
	Cybella spp							√											√		
	Cyclostephanodiscus astrea						√							√		√	√	√	√	√	
	Cyclotella spp										√			√							
	Epithemia argus		√			√		√		√								√			
	Flagilaria longissimi										√										
	Navicula gastrum		√		√	√	√		√	√	√	√						√	√	√	√
	Nitzschia acicularis	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Nitzschia fonticola	√	√		√	√	√	√	√	√				√	√			√			
	Nitzschia mediocris	√			√	√				√											
	Nitzschia nyassensis		√							√											
	Rhizosolenia curviseta									√											
	Surillera spp									√											
	Synedra cunningtonii					√															
Dinoflagellates	*Glenodinum species*											√	√		√		√				
	Peridinium species													√					√	√	
Green algae	*Actinastrum hantzchii*	√				√						√								√	

		AL 1			AL 2			AL 4		AL 4B		AL 7			AL 7B			AL 8B			AL 12
Family	**Species**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	
	Ankistrodesmus falactus				√	√	√					√	√			√	√	√			√
	Arthrodesmus spp					√															
	Arthrodesmus triangularis								√												
	Chlorella vulgaris		√				√				√				√		√			√	
	Chlorococcum infusionum		√																		
	Chodatella subsalsa														√						
	Closterium kuetzingii		√				√	√								√		√			√
	Cosmarium moniliforme														√						
	Cosmarium spp				√																
	Cosmarium subcucumis												√		√	√					
	Cosmarium triangularis													√							
	Crucigenia crusifera		√														√				
	Crucigenia feuestrata								√	√				√		√		√			
	Crucigenia tetrapedia	√			√																
	Euastrum engleri			√		√															
	Kirchneriella obesa									√				√							
	Monoraphidium contortum	√	√					√	√					√				√			
	Monoraphidium neglectum		√																		
	Monoraphidium tropicale			√																	
	Oocystis gigas	√	√		√		√				√			√	√						
	Oocystis lacustis					√				√						√					
	Pediastrum boryanum		√					√													
	Pediastrum duplex				√	√					√										
	Pediastrum simplex		√	√	√			√	√	√								√		√	
	Richteriella botryoides		√																		
	Scenedesmus acuminatus	√	√	√	√	√	√		√	√				√	√			√			
	Scenedesmus arcuatus		√																		
	Scenedesmus armatus	√	√	√			√														
	Scenedesmus perfolatus				√	√	√		√	√		√		√	√	√		√	√	√	
	Scenedesmus quadricauda									√											
	Tetraedron trigonum	√	√													√				√	
Total species		**22**	**29**	**16**	**22**	**27**	**21**	**21**	**20**	**25**	**22**	**12**	**6**	**17**	**15**	**16**	**13**	**27**	**20**	**25**	**7**

3.3 Zooplankton

3.3.1 Species composition and spatial distribution

The zooplankton at all sampled sites were dominated by Copepoda (cyclopoids in particular), Cladocera and Rotifera. A total of twenty-nine species were recorded comprised of 5 Copepoda, 9 Cladocera and the 15 Rotifera (Table 3-6). In comparison with the dry season data collected in December 2016, these broad taxonomic groups did not vary much with only copepods returning one more species and rotifers recording one species less. Total species richness didn't change from that recorded in December 2016 report. Victoria-Nile sites: AL 1, AL 2, AL 4 and AL 13 were characterized with very few species - ranging from 0 – 3 compared to other riverine sites: AL 11A (6 species), AL 12 (3 species) and AL 13 (10 species) (Table 3-7). Species diversity recorded at Lake Albert (Lentic) sites AL 7, AL 8 and AL 8B) during the rainy season was lower(ranging from 6 – 11) species, lower than the range of 8 to 16 species previously collected during the dry season. A combined checklist for the three categories of zooplankton sampled in the dry and wet seasons (December 2016 and May 2017) recorded 37 species in total. Rotifers returned the highest species number (20) followed by cladocerans (10 species) and copepods (7 species) see (Table 3-8). Transects AL7 (May 2017) and AL8B (December 2016) recorded the highest species diversity of 19 each while AL4 (December 2016) recorded lowest (Table 3-9). The common species among copepods were *Mesocyclops* sp. and *Thermocyclops neglectus*; Cladocera included *Ceriodaphnia cornuta*, *C. dubia*, *Diaphnosoma excisum* and *Moina micrura* while *Syncheata* sp., *Brachionus anguralis* and *Keratella tropica* were the commonest among rotifers. Diaptomid copepods continued to miss out in the current data sets, in this lake and surrounding rivers, though Lehman et al. (1998) reported collection of the diaptomid species *Thermodiaptomus galebi* in Lake Albert at very low densities (< 1 m-3) (Table 3-10).

Table 3-6: Zooplankton species composition and spatial distribution in surface waters of CA-1, and LA-2 North in May 2017 (P indicates presence).

Sites	AL1-S1	AL1-S2	AL1-S3	AL2-S1	AL2-S2	AL2-S3	AL4-S1	AL4-S2	AL4B-S1	AL4B-S2	AL7-S1	AL7-S2	AL7-S3	AL8-S1	AL8-S2	AL8-S3	AL8B-S1	AL8B-S2	AL8B-S3	AL11A	AL12	AL13 - S1	AL13-S2	AL13-S3	AL14
Copepoda																									
Afrocyclops sp.																				p					
Mesocyclops sp.											p	p	p	p	p	p	p	p	p						
Thermocyclops neglectus	p	p	p									p	p	p	p	p	p	p	p						
Tropocyclops confinnis													p			p									p
Tropocyclops tenellus													p												
Copepoda_spp. (5)	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**4**	**2**	**2**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**
Cladocera																									
Bosmina longirostris																	p								
Ceriodaphnia cornuta							p			p	p	p	p	p	p	p		p	p						
Ceriodaphnia dubia												p	p	p	p	p	p	p	p						
Chydorus spp.												p										p			
Daphnia lumholtzi												p													
Daphnia lumholtzi(helm)													p		p			p	p						
Diaphanosoma excisum								p				p	p	p	p	p	p	p	p						
Macrothrix sp.																									p
Moina micrura	p	p									p	p		p	p	p	p	p	p		p				p
Cladocera spp (9)	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**2**	**6**	**4**	**4**	**5**	**4**	**4**	**5**	**5**	**-**	**1**	**1**	**-**	**-**	**2**
Rotifera																									
Ascomorpha sp.																									p
Asplanchna spp.											p									p					
Brachionus angularis	p			p		p			p	p		p	p											p	p
Brachionus bidentatus																									p
Brachionus calyciflorus																									p
Brachionus falcatus																			p						

Sites	AL1-S1	AL1-S2	AL1-S3	AL2-S1	AL2-S2	AL2-S3	AL4-S1	AL4-S2	AL4B-S1	AL4B-S2	AL7-S1	AL7-S2	AL7-S3	AL8-S1	AL8-S2	AL8-S3	AL8B-S1	AL8B-S2	AL8B-S3	AL11A	AL12	AL13 - S1	AL13-S2	AL13-S3	AL14
Cephalodella sp.											p						p			p	p				
Euclanis sp											p														
Keratella tropica								p				p		p		p	p	p	p					p	
Lecane bulla											p									p			p		p
Lecane luna																			p	p					p
Polyarthra vulgaris.											p		p				p		p						
Synchaeta pectinate							p																		
Synchaeta spp.					p	p			p	p	p						p			p	p				p
Trichocerca cylindrical					p																				
Rotifera_spp (15)	**1**	**-**	**-**	**1**	**2**	**2**	**1**	**1**	**2**	**2**	**6**	**2**	**2**	**1**	**-**	**1**	**4**	**1**	**4**	**5**	**2**	**-**	**1**	**2**	**7**
Total species (29)	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**3**	**9**	**10**	**10**	**7**	**7**	**8**	**10**	**8**	**11**	**6**	**3**	**1**	**1**	**2**	**10**

Table 3-7: Comparison of zooplankton species composition and spatial distribution in surface waters of CA-1, and LA-2 North in May 2017 and December 2016 (P indicates presence).

Transects	AL1		AL2		AL4		AL4B	AL5A	AL7		AL7B	AL8		AL8B		AL11A	AL12		AL13	AL14
Date	May-17	Dec-16	May-17	Dec-16	May-17	Dec-16	May-17	Dec-16	May-17	Dec-16	Dec-16	May-17	Dec-16	May-17	Dec-16	May-17	May-17	Dec-16	May-17	May-17
Copepoda																				
Afrocyclops sp.								P								P				
Mesocyclops sp.								P	P	P	P	P	P	P	P					
Thermocyclops neglectus	P							P	P	P	P	P	P	P	P			P		
Thermocyclops oblongatus								P												
Tropocyclops confinnis								P	P	P	P	P								P
Tropocyclops tenellus									P											
Copepoda_Species. (7)	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**5**	**4**	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**1**	**-**	**1**
Cladocera																				
Bosmina longirostris														P						
Ceriodaphnia cornuta					P		P	P	P	P	P	P	P	P	P					
Ceriodaphnia dubia									P	P	P	P	P	P	P					
Chydorus sp.								P	P									P	P	
Daphnia lumholtzi									P		P									
Daphnia lumholtzi(helm)									P		P	P	P	P	P					
Diaphanosoma excisum					P				P	P	P	P	P	P	P					
Macrothrix sp.																				P
Moina micrura	P							P	P	P	P	P	P	P	P		P	P		P
Semocephalus sp								P										P		
Cladocera Species (10)	**1**	**-**	**-**	**-**	**2**	**-**	**1**	**4**	**7**	**4**	**6**	**5**	**5**	**6**	**5**	**-**	**1**	**3**	**1**	**2**
Rotifera																				
Ascomorpha sp.														P						P
Asplanchna sp.									P				P		P	P				
Brachionus angularis	P		P	P			P	P	P	P	P		P		P				P	P

Transects	**AL1**		**AL2**		**AL4**		**AL4B**	**AL5A**	**AL7**		**AL7B**	**AL8**		**AL8B**		**AL11A**	**AL12**		**AL13**	**AL14**
Date	May-17	Dec-16	May-17	Dec-16	May-17	Dec-16	May-17	Dec-16	May-17	Dec-16	Dec-16	May-17	Dec-16	May-17	Dec-16	May-17	May-17	Dec-16	May-17	May-17
Brachionus bidentatus																				P
Brachionus calyciflorus										P			P		P					P
Brachionus falcatus													P	P	P					
Brachionus patulus								P					P		P					
Cephalodella sp.									P					P		P	P			
Euclanis sp									P											
Filinia longiseta										P			P		P					
Filinia opoliensis											P		P		P					
Keratella cochlearis		P								P					P					
Keratella tropica		P			P			P	P	P	P	P	P	P	P			P	P	
Lecane bulla								P	P							P			P	P
Lecane luna								P						P	P	P				P
Platyas quadricornis								P												
Polyarthra vulgaris.								P	P	P			P	P						
Synchaeta pectinata					P															
Synchaeta sp.			P	P		P	P	P	P				P	P	P	P	P			P
Trichocerca cylindrica		P	P																	
Rotifera Spp (20)	1	3	3	2	2	1	2	8	8	6	3	1	10	6	12	5	2	1	3	7
Total Spp (37)	3	3	3	2	4	1	3	17	19	13	12	9	17	14	19	6	3	5	4	10

Table 3-8: Abundance (Individuals per sq. m) of zooplankton sampled at various surface water stations in CA-1, and LA-2 North in the rainy season of May 2017

Sampled Stations	AL1		AL2		AL4		AL4B		AL7		AL8		AL8B		AL11	AL12	AL13		AL14
	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE			Mean	±SE	
Copepoda																			
Afrocyclops sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	-	-	-	-
Mesocyclops sp.	-	-	-	-	-	-	-	-	6,130	1,226	2,897	1,013	2,425	933	-	-	-	-	-
Thermocyclops neglectus	225	45	-	-	-	-	-	-	7,186	3,598	3,413	1,825	17,313	8,235	-	-	-	-	-
Tropocyclops confinnis	-	-	-	-	-	-	-	-	3,368	3,368	1,011	1,011	-	-	-	-	-	-	30
Tropocyclops tenellus	-	-	-	-	-	-	-	-	4,042	4,042	-	-	-	-	-	-	-	-	-
Young copepods																			
Cyclopoid copepodite	135	135	202	202	-	-	202	202	94,786	48,850	10,217	2,110	81,043	29,757	-	202	-	-	152
Nauplius larvae	3,458	314	202	202	1,364	758	1,314	505	125,909	65,358	18,212	4,726	168,553	70,343	101	101	-	-	91
Cop. Abundance	**3,817**	**225**	**404**	**404**	**1,364**	**758**	**1,516**	**303**	**241,421**	**122,605**	**35,750**	**9,986**	**269,334**	**107,306**	**152**	**303**	**-**	**-**	**273**
Cladocera																			
Bosmina longirostris	-	-	-	-	-	-	-	-	-	-	-	-	135	135	-	-	-	-	-
Ceriodaphnia cornuta	-	-	-	-	152	152	404	404	8,960	4,467	4,424	1,566	12,934	6,958	-	-	-	-	-
Ceriodaphnia dubia	-	-	-	-	-	-	-	-	3,795	3,023	1,684	853	4,244	2,123	-	-	-	-	-
Chydorus spp.	-	-	-	-	-	-	-	-	135	135	-	-	-	-	-	-	67	67	-
Daphnia lumholtzi	-	-	-	-	-	-	-	-	135	135	-	-	-	-	-	-	-	-	-
Daphnia lumholtzi(helm)	-	-	-	-	-	-	-	-	449	449	180	180	404	233	-	-	-	-	-
Diaphanosoma excisum	-	-	-	-	152	152	-	-	13,137	7,892	5,075	1,033	39,006	12,554	-	-	-	-	-
Macrothrix sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121
Moina micrura	135	78	-	-	-	-	-	-	3,234	2,651	9,813	740	18,391	4,960	-	101	-	-	61
Clad. Abundance	**135**	**78**	**-**	**-**	**303**	**-**	**404**	**404**	**29,844**	**15,178**	**21,176**	**1,004**	**75,114**	**24,128**	**-**	**101**	**67**	**67**	**182**
Rotifera																			
Ascomorpha sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30
Asplanchna sp.	-	-	-	-	-	-	-	-	808	808	-	-	-	-	51	-	-	-	-
Brachionus angularis	45	45	606	350	-	-	303	101	472	294	-	-	-	-	-	-	67	67	91
Brachionus bidentatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61
Brachionus calyciflorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61
Brachionus falcatus	-	-	-	-	-	-	-	-	-	-	-	-	135	135	-	-	-	-	-
Cephalodella sp.	-	-	-	-	-	-	-	-	1,415	1,415	-	-	472	472	253	505	-	-	-
Euclanis sp.	-	-	-	-	-	-	-	-	202	202	-	-	-	-	-	-	-	-	-
Keratella tropica	-	-	-	-	152	152	-	-	6,737	6,737	1,190	632	13,945	4,448	-	-	67	67	-
Lecane bulla	-	-	-	-	-	-	-	-	3,032	3,032	-	-	-	-	354	-	67	67	30
Lecane luna	-	-	-	-	-	-	-	-	-	-	-	-	135	135	51	-	-	-	61
Polyarthra vulgaris.	-	-	-	-	-	-	-	-	3,189	2,396	-	-	1,347	972	-	-	-	-	-
Synchaeta pectinata	-	-	-	-	152	152	-	-	-	-	-	-	-	-	-	-	-	-	-

Sampled Stations	AL1		AL2		AL4		AL4B		AL7		AL8		AL8B		AL11	AL12	AL13		AL14
	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE			Mean	±SE	
Synchaeta sp.	-	-	404	202	-	-	303	101	1,617	1,617	-	-	606	606	253	707	-	-	30
Trichocerca cylindrica	-	-	202	202	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rot. Abundance	**45**	**45**	**1,213**	**-**	**303**	**-**	**606**	**-**	**17,471**	**7,784**	**1,190**	**632**	**16,640**	**3,985**	**960**	**1,213**	**202**	**117**	**364**
Total abundance	**3,997**	**314**	**1,617**	**404**	**1,970**	**758**	**2,526**	**707**	**288,736**	**130,436**	**58,115**	**9,653**	**361,088**	**135,021**	**1,112**	**1,617**	**269**	**67**	**819**

Table 3-9: Checklist, species composition and spatial distribution of encountered zooplankton in the sampled sites (P indicates presence), December 2016

Sites	AL 1-S1	AL 1-S2	AL 1-S3	AL 2-S1	AL 2-S2	AL 2-S3	AL 4B-S1	AL 4B-S2	AL 5B-S2	AL 5B-S3	AL 7B-S1	AL 7B-S2	AL 7B-S3	AL 7-S1	AL 7-S2	AL 7-S3	AL 8B-S1	AL 8B-S2	AL 8B-S3	AL 8-S1	AL12
Copepoda																					
Afrocyclops sp.									P												
Mesocyclops sp.									P	P	P	P	P	P	P	P	P		P	P	
Thermocyclops neglectus										P	P	P	P	P	P	P	P	P	P	P	P
Thermocyclops oblongatus									P												
Tropocyclops confinnis									P				P			P					
Copepoda species (5)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**1**
Cladocera																					
Ceriodaphnia cornuta									P	P	P	P	P	P	P	P	P	P	P	P	
Ceriodaphnia dubia											P	P	P	P	P	P	P	P	P	P	
Chydorid spp.									P	P											P
Daphnia lumhortzi													P								
Daphnia lumhortzi(helm)											P	P							P	P	
Diaphanosoma excisum											P	P	P	P	P	P	P	P	P	P	
Moina micrura									P		P	P	P	P	P	P	P	P	P	P	P
Semocephalus sp									P												P
Cladocera species (8)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4**	**2**	**5**	**5**	**5**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**3**

Sites	AL 1-S1	AL 1-S2	AL 1-S3	AL 2-S1	AL 2-S2	AL 2-S3	AL 4B-S1	AL 4B-S2	AL 5B-S2	AL 5B-S3	AL 7B-S1	AL 7B-S2	AL 7B-S3	AL 7-S1	AL 7-S2	AL 7-S3	AL 8B-S1	AL 8B-S2	AL 8B-S3	AL 8-S1	AL12
Rotifera																					
Ascomorpha sp.																	P				
Asplanchna spp.																	P	P	P	P	
Brachionus angularis				P								P		P	P	P	P	P	P	P	
Brachionus calyciflorus														P		P	P			P	
Brachionus falcatus																	P	P		P	
Brachionus patulus									P	P							P	P	P	P	
Filinia longiseta																P	P	P	P	P	
Filinia opoliensis													P				P		P	P	
Keratella cochlearis			P											P				P			
Keratella tropica	P								P	P	P	P	P	P	P	P	P	P	P	P	P
Lecane leotina									P												
Lecane luna									P									P			
Platyas quadricornis									P												
Polyarthra vulgaris.									P					P						P	
Synchaeta spp.				P		P	P	P	P								P	P	P	P	
Trichocerca cylindrica	P																				
Rotifera species (16)	**2**	**-**	**1**	**2**	**-**	**1**	**1**	**1**	**7**	**2**	**1**	**2**	**2**	**5**	**2**	**4**	**10**	**9**	**7**	**10**	**1**
Total species (29)	**2**	**-**	**1**	**2**	**-**	**1**	**1**	**1**	**15**	**6**	**8**	**9**	**10**	**11**	**8**	**11**	**16**	**14**	**14**	**17**	**5**

Table 3-10: Abundance of zooplankton in the sampled parts of Lake Albert and surrounding rivers, December 2016.

Transects	AL 1		AL 2		AL 4B		AL 5B		AL 7		AL 7B		AL8-S1	AL 8B		AL12
	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE		Mean	±SE	
Copepoda																
Afrocyclops sp.	-	-	-	-	-	-	130	-	-	-	-	-	-	-	-	
Mesocyclops sp.	-	-	-	-	-	-	520	318	41,134	19,276	84,074	66,491	19,869	16,328	15,329	-
Thermocyclops neglectus	-	-	-	-	-	-	65	53	157,976	70,731	368,936	293,830	260,948	48,433	24,944	487
Thermocyclops oblongatus	-	-	-	-	-	-	130	106	-	-	-	-	-	-	-	-
Tropocyclops confinnis	-	-	-	-	-	-	97	80	990	990	6,467	6,467	-	-	-	-
Cyclopoid copepodite	22	22	-	-	-	-	487	398	769,445	357,353	512,047	310,192	131,136	125,954	76,329	1,705
Nauplius larvae	22	22	22	22	-	-	8,055	4,986	1,022,820	473,121	1,715,494	920,925	1,057,036	594,599	316,317	1,559
Copepoda abundance	**43**	**43**	**22**	**22**	**-**	**-**	**9,419**	**4,084**	**1,992,366**	**896,104**	**2,687,018**	**937,635**	**1,468,989**	**785,314**	**432,844**	**3,752**
Cladocera																
Ceriodaphnia cornuta	-	-	-	-	-	-	292	133	70,608	41,049	27,059	16,181	148,356	72,955	38,247	-
Ceriodaphnia dubia	-	-	-	-	-	-	-	-	21,034	10,568	16,303	10,541	75,503	22,991	7,305	
Chydorid spp.	-	-	-	-	-	-	65	-	-	-	-	-	-	-	-	731
Daphnia lumhortzi	-	-	-	-	-	-	-	-	-	-	719	719	-	-	-	-
Daphnia lumhortzi (helm)	-	-	-	-	-	-	-	-	-	-	359	279	2,649	949	949	-
Diaphanosoma excisum	-	-	-	-	-	-	-	-	128,833	61,198	138,675	84,134	458,976	292,914	209,857	-
Moina micrura	-	-	-	-	-	-	65	53	45,417	21,795	16,651	7,705	78,152	42,392	21,561	1,705
Semocephalus sp	-	-	-	-	-	-	974	796	-	-	-	-	-	-	-	487
Cladocera abundance	**-**	**-**	**-**	**-**	**-**	**-**	**1,397**	**981**	**265,891**	**127,896**	**199,766**	**117,866**	**763,636**	**432,200**	**276,899**	**2,923**
Rotifera																
Ascomorpha sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	56	56	-
Asplanchna spp.	-	-	-	-	-	-	-	-	-	-	-	-	2,649	7,703	2,922	-

Transects	AL 1		AL 2		AL 4B		AL 5B		AL 7		AL 7B		AL8-S1	AL 8B		AL12
	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE	Mean	±SE		Mean	±SE	
Brachionus angularis	-	-	22	22	-	-	-	-	24,064	18,997	303	303	233,131	20,201	14,810	-
Brachionus calyciflorus	-	-	-	-	-	-	-	-	3,252	2,841	-	-	5,298	225	225	-
Brachionus falcatus	-	-	-	-	-	-	-	-	-	-	-	-	60,270	2,169	1,871	-
Brachionus patulus	-	-	-	-	-	-	585	265	-	-	-	-	19,869	3,660	3,157	-
Filinia longiseta	-	-	-	-	-	-	-	-	990	990	-	-	34,440	29,061	10,989	-
Filinia opoliensis	-	-	-	-	-	-	-	-	-	-	719	719	35,764	15,652	9,962	-
Keratella cochlearis	22	22	-	-	-	-	-	-	281	281	-	-	-	1,401	1,401	-
Keratella tropica	43	43	-	-	-	-	2,371	1,565	392,962	188,457	118,488	53,270	955,042	103,941	59,904	4,141
Lecane leotina	-	-	-	-	-	-	650	-	-	-	-	-		-	-	
Lecane luna	-	-	-	-	-	-	650	-	-	-	-	-	-	175	-	
Platyas quadricornis	-	-	-	-	-	-	97	80	-	-	-	-	-	-	-	-
Polyarthra vulgaris.	-	-	-	-	-	-	130	106	281	281	-	-	10,597	-	-	-
Synchaeta spp.	-	-	43	22	65	-	162	133	-	-	-	-	10,597	13,708	8,213	-
Trichocerca cylindrica	22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rotifera abundance	**87**	**57**	**65**	**38**	**65**	**-**	**3,995**	**981**	**421,829**	**196,772**	**119,509**	**53,863**	**1,367,657**	**197,834**	**102,540**	**4,141**
Total abundance	**130**	**38**	**87**	**22**	**65**	**-**	**14,811**	**4,084**	**2,680,086**	**1,218,264**	**3,006,294**	**883,348**	**3,600,282**	**1,415,348**	**810,960**	**10,816**

3.3.2 Zooplankton abundance

Zooplankton density estimates exhibited wide variations within the three broad categories and among the sampled sites, with Victoria Nile having very scanty mean (±SE) abundance of copepods (0 to 3,817±225 individuals per m2), cladocerans (0 to 135±78 individuals per m^2), rotifers (45 to 1,213 individuals per m^2); and total densities ranged between 269±67 to 3,997±314 individuals per m^2 compared to other sampled rivers AL 11A (R. Zoria), AL 12 (R. Waigga) and AL 14 (R. Tangi). The transects within Lake Albert had high mean (±SE): copepods ranging from 35,750±9,986 to 269,334±107,306 individuals per m^2, Cladocera-21,176±1004 to 75,114±24,128 individuals per m^2 and rotifers-(1,190±632 to 17,471±7,784 individuals per m^2); while total mean abundance ranged from 58,115±9,653 to 361,088±135,021 individuals per m^2 (Tables 3-10). The wet season (May 2017) abundances were by far lower than the ones sampled during the dry season (December 2016) see Figure 3-1.

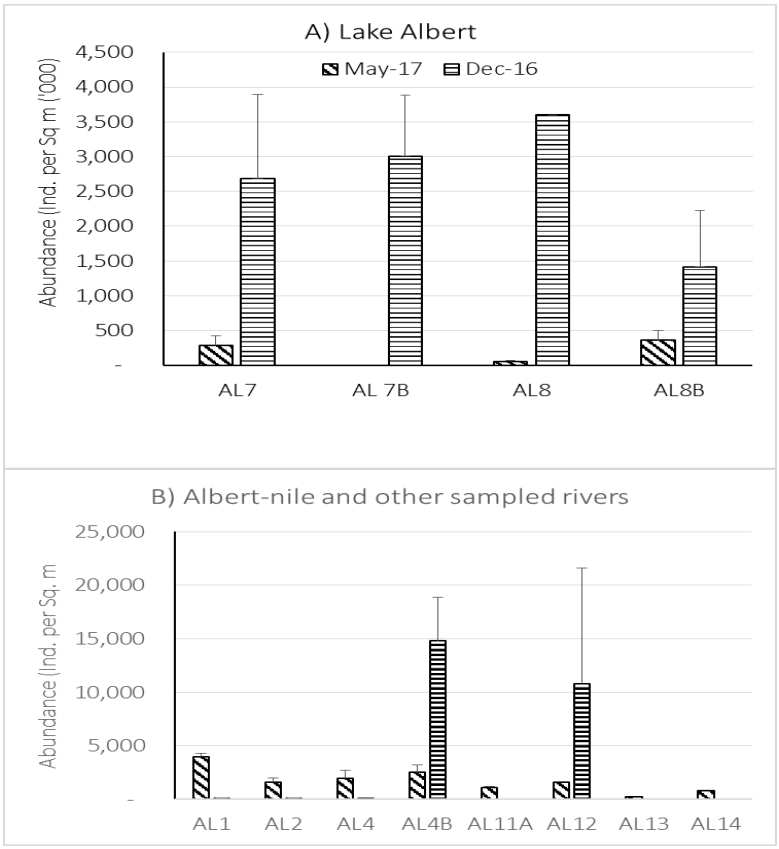

Figure 3-1: Comparison of total mean abundance of various zooplankton types sampled in December 2016 and May 2017 at various stations in surface waters of CA-1, and LA-2 North.

NB: A refers to Lentic waters and B to sampled site in Lotic environment. (Note differences in scale on the Y-axis).

3.3.3 Discussion of results

The data collected suggest that zooplankton species composition in Lake Albert does not differ significantly from that of associated surface water bodies within the study area. In most cases, they are dominated by medium-sized cyclopoid copepods while the numbers of Cladocera and Rotifera are lower (Lehman *et al*., 1998, Mwebaza-Ndawula, 1998, Vincent *et al*., 2012, Isumbisho *et al*., 2006, Dumont, 2009). Absence of calanoids in Lake Albert and associated rivers sampled so far, while common in Lakes Victoria, Kyoga and upper Victoria Nile (Branstrator *et al*., 1996, Mwebaza-Ndawula *et al*., 2005), may be due to the high conductivity of Lake Albert (> 600 µs cm^{-1}). The general decrease in abundance for sites within Lake Albert in the current data set can be explained by the observed reduction in the water depth of approx. 1m and with very transparent water up to the bottom. The distribution of these organisms is sometime affected by reduction in water depth as it impacts on habitable area and thus decreased abundance. Dual Vertical Migration (DVM) is another reason that can be considered for this variation. During such migration, zooplankton are assumed to check instantaneous variations

of environmental parameters and invoke behavioural strategies to maximize food intake under less mortality risk, avoiding predation mainly from visual and non-visual or tactile predators by moving to deeper waters during day time (Liu *et al*., 2003). However, some of the possible reasons for low abundance and species richness in sampled sites of Victoria-Nile compared to the upper Victoria-Nile (Mwebaza-Ndawula *et al*., 2005), were outlined in the previous report of December 2016, as being; high turbidity of floating plant materials resulting from mainly the infestation of *Salvinia molesta*, the fast and uninterrupted flow in this section of the river a characteristic of many lotic systems (Baranyi *et al*., 2002, Basu and Pick, 1996, Mwebaza-Ndawula *et al*., 2005) and being unable to sample close to the shoreline and floodplains considered species rich because of the nature of boats used and the high risk of wild animals, the area being in a National Park.

Much as earlier studies by Green, (1971) recorded 21 species of Cladocera, this current baseline studies revealed fewer numbers of Cladocera (9 and 8 species from May 2017 and December 2016 surveys respectively). This could be a discrepancy in sampling methods as well inadequate taxonomic resolution. On the other hand, it may reflect changes in the fish population, especially the current decreased numbers of piscivorous fishes such as the Nile perch. There have been arguments that the intensity of fish predation on zooplankton was low in Lake Albert because of the presence of Nile perch (Green, 1967) while others suggested that visual planktivory was more intense in Lake Edward than in Lake Albert because the former had a lower ratio of zooplankton to phytoplankton biomass (Lehman *et al*., 1998). The population of Nile perch has decreased in Lake Albert while the small planktivores have increased to the point where they support a major fishery. This must have had some impacts on zooplankton communities, and a reduction in cladoceran diversity as the Cladocera are considered vulnerable due to their sluggish movement.

3.4 Macro-invertebrates

3.4.1 Ephemeroptera, Plecoptera and Trichoptera (EPT) index

On the average, EPT indices ranged from 0 to 3 during the dry seasons, the highest (5) was recorded at River Waiga (AL12). EPT indices for the wet season were lower, ranging from 0 to 1 (Fig. 3-2).

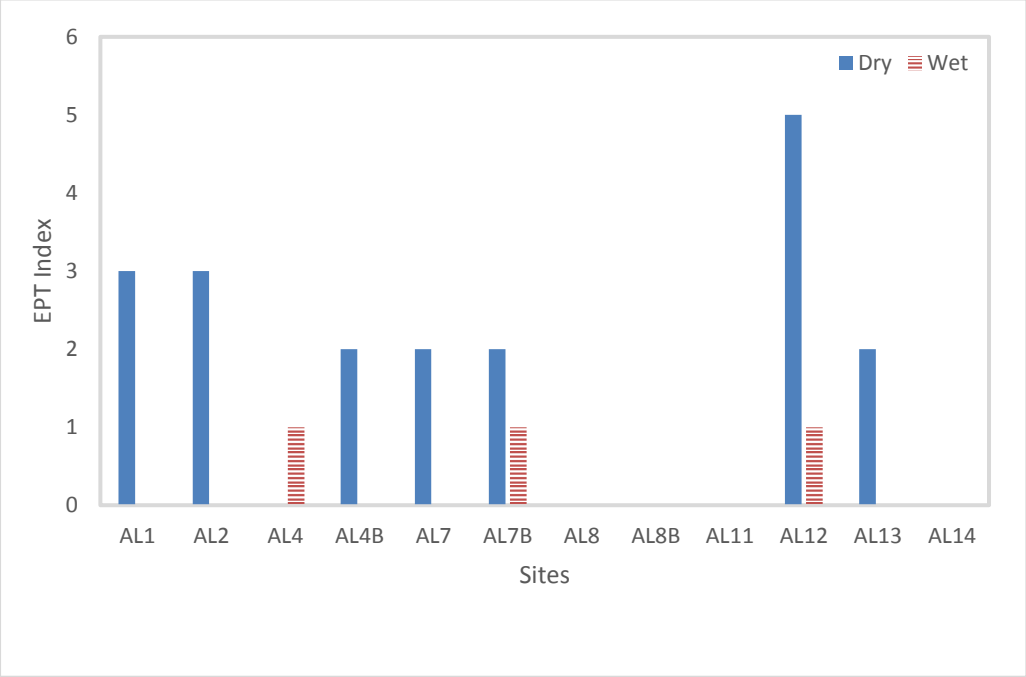

Figure 3-2: Ephemeroptera, Plecoptera and Trichoptera (EPT) indices at various sampling stations in surface waters of CA-1, and LA-2 North during dry, (December 2016) and wet (May 2017) seasons.

3.4.2 Total taxa index

During dry season, the lowest total taxa indices (2 - 5) were recorded at Lake Albert sampling sites AL8, AL8B and the Nile Delta site AL4; those of 8 - 12 were at the offshore Nile Delta site AL4B, River Waiga station AL12 and River Nile stations AL1 and AL2, The highest (17) was recorded at AL7 (Lake Albert nearshore around Kaloro fish landing). During the wet season sampling round, the total taxa indices in all sites, ranged from 1 to 6, the highest 6 being at AL7 (Lake Albert nearshore around Kaloro fish landing), as was the case during the dry season. Total taxa indices from wet season samples were generally much lower than those of the dry season (Fig. 3-3).

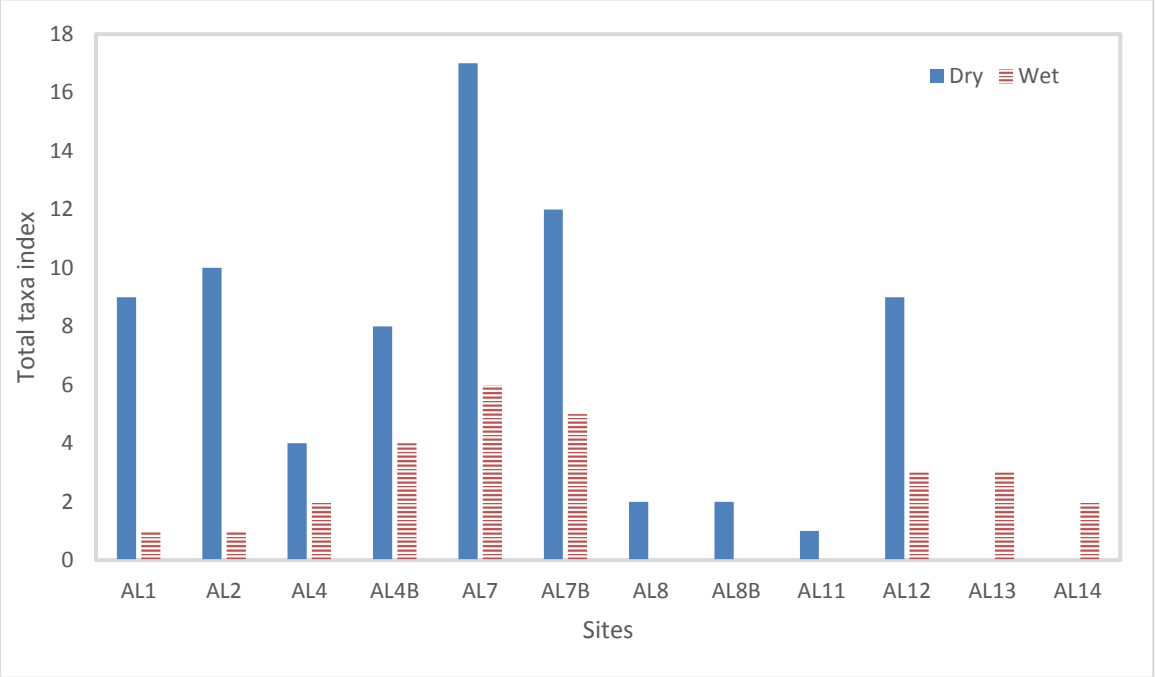

Figure 3-3: Total taxa indices at various sampling stations in surface waters of CA-1, LA-2 North during dry, (December 2016) and wet (May 2017) seasons.

3.4.3 Macro-invertebrate densities (Mean no. /m2), composition and distribution

As shown in Table 3-11, Ephemeroptera taxa were generally rare within River Nile, Lake Albert and other riverine stations during both dry and wet seasons. In dry season, the few Ephemeroptera taxa found in these stations had densities (No. /m^2) ranging from 5 to 19 and these were at AL1 (River Nile), AL2 (River Nile), AL4B (Nile Delta station), AL7 (Lake Albert) and AL7B (Lake Albert). It was only AL12 station (R. Waiga) which had the highest occurrences and densities (1-135) of Ephemeroptera during dry season. In wet season, the few Ephemeroptera taxa found were at AL4 (Nile Delta), AL7B (Lake Albert) and AL12 (River Waiga). Ephemeroptera taxa and their respective densities, during dry season, at AL12 were *Caenis* (Caenidae) – 135, *Baetis* (Baetidae) – 75, *Ophelmatostoma* (Baetidae) – 9, *Heptagenia* (Heptageniidae) – 1 and *Tricorythus* (Tricorythidae) – 4. Trichoptera taxa were markedly rare at the stations and were only found during dry season at AL1, AL2 and AL4B, with densities of 5, 5, and 21 of Leptoceridae, *Dipseudopsis* (Dipseudopsidae) and *Cheumatopsyche* Hydropsychidae), respectively. In wet season, the family Leptoceridae with a density of 5, was the only Trichoptera found and they were at AL8B (Lake Albert). The most common and abundant gastropods in the sampled stations during both seasons, were *Melanoides tuberculata* (Thiaridae), *Gabbia humerosa alberti* and *Gabbia tilhoi* (Bythyriidae), *Bellamya unicolor rubecunda* (Viviparidae) and *Cleopatra pirothi* (Thiaridae). These were mainly within Lake Albert bottom substrates.

Among bivalves, during the two seasons, *Sphaerium victorae* (Spharidae) were the most common and abundant at the stations, occurring mostly in Lake Albert sediments. The densities ranged from 5-1653 at stations where they were found; with the highest density (1653) being at AL4B (Nile Delta offshore dry season). Other bivalves found included *Corbicula africana* (Corbiculidae) with a density of 28 and 14 at AL4B (Lake –River station) and AL7 (Lake Albert), and 9 at AL7 during wet season, respectively. *Byssanodonta parasitica* (Spharidae) with a density of 14 and 5 at AL4B (Lake –River station) and AL7 (L. Albert), were only recovered during dry season. The *Caelatura bakeri* (Unionidae) were present at AL2 (River Nile) and AL7B (L. Albert) with densities of 5 and 8, respectively, during dry season. In wet season, they were only present at AL8B (Lake Albert), with a density of 9. *Mutela* sp (Mutelidae) were only at AL1 (R. Nile) with a density of 5 and *Etheria elliptica* (Mutelidae) with a density of 14 at only AL1, and were only found during dry season. Chironomidae (Diptera) with densities ranging from 5-343 were found in almost all the stations during both dry and wet seasons. Oligochaetes with densities of 5-135, were found in all sites except AL1 (R. Nile), AL7B (L. Albert) and AL12 (R. Waiga) during dry season; and only found at AL8B with a density of 9 and at AL14 with a density of 238, during wet season. Other organisms found during both dry and wet seasons but rarely were *Caridina* (Atyiidae), *Aphelocheirus* (Aphelocheiridae)-Hemiptera, Coleoptera, *Orectogyrus* (Gyrinidae), Ostracoda and Hirudinea.

Table 3-11:Macro-invertebrate densities (Mean no./m2), composition and distribution at River Nile, Lake Albert and other associated river study sites – Dry, D (December 2017) and Wet, W (May 2017)

Taxa				AL1		AL2		AL4		AL4B		AL7		AL7B		AL8		AL8B		AL11A		AL12		AL13		AL14	
Order	Family	Genus	Species	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W
Unionoida	Unionidae	*Caelatura*	*Caelatura bakeri*	0	0	5	0	0	0	0	0	0	0	8	0	0	0	0	9	ND	0	0	0	ND	0	ND	0
Unionoida	Unionidae	*Caelatura*	*C. acuminata*	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0		0	0	0		0		0
Unionoida	Mutelidae	*Mutela*		5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Unionoida	Mutelidae	*Etheria*	*Etheria elliptica*	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Veneroida	Corbiculidae	*Corbicula*	*Corbicula africana*	0	0	0	0	0	0	28	0	14	9	0	0	0	0	0	0		0	0	0		0		0
Veneroida	Sphaeridae	*Sphaerium*	*Sphaerium victoriae*	14	0	5	0	77	0	1653	133	0	0	84	56	126	0	103	163		0	0	0		0		0
	Sphaeridae	*Byssanodonta*	*Byssanodonta parasitica*	0	0	0	0	0	0	14	0	5	0	0	0	0	0	0	0		0	0	0		0		0
Ctenobrachiata	Viviparidae	*Bellamya*	*Bellamya unicolor rubecunda*	0	0	0	0	0	0	0	0	9	5	18	0	0	0	0	5		0	0	0		0		0
Ctenobrachiata	Bithyniidae	*Gabbia*	*G. humerosa alberti*	0	0	0	0	0	0	0	0	19	5	275	0	0	0	0	0		0	0	0		0		0
Ctenobrachiata	Bithyniidae	*Gabbia*	*G. tilhoi*	0	0	0	0	0	0	0	0	5	0	7	0	0	0	0	0		0	0	0		0		0
Ctenobrachiata	Thiaridae	*Cleopatra*	*Cleopatra pirothi*	0	0	0	0	0	0	0	7	33	19	5	0	0	0	0	0		0	0	0		0		0
Ctenobrachiata	Thiaridae	*Melanoides*	*Melanoides tubertulata*	0	0	0	0	105	0	42	7	56	9	28	33	0	0	37	42		0	0	0		0		0
Plumonata	Planorbidae	*Biomphalaria sp.*	*Biomphalaria* sp.	0	0	0	0	0	0	0	0	14	9	7	0	0	0	0	0		0	0	0		0		0
Plumonata	Planorbidae	*Anisus*	*Anisus natalesis*	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0		0	0	0		0		0
Ephemeroptera	Caenidae	*Caenis*	*Caenis* sp.	0	0	5	0	0	0	0	0	0	0	5	0	0	0	0	5		0	135	0		0		0
Ephemeroptera	Polymitarchidae	*Povilla*	*Povilla adusta*	0	0	0	0	0	7	0	0	5	0	19	9	0	0	0	0		0	0	0		0		0
Ephemeroptera	Baetidae	*Baetis*	*Baetis* sp.	0	0	0	0	0	0	14	0	9	0	0	0	0	0	0	0		0	73	0		0		0
Ephemeroptera	Baetidae	*Cloeon*	*Cloeon* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1		0		0
Ephemeroptera	Baetidae	*Ophelmatostoma*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	9	0		0		0
Ephemeroptera	Baetidae	*Acanthiops*		0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Ephemeroptera	Tricorythidae	*Tricorythus*	*Tricorythus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		2		0
Ephemeroptera	Oligoneuriidae	*Ellasoneuria*		19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Ephemeroptera	Tricorythidae	*Tricorythus*		19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	4	0		0		0
Ephemeroptera	Heptageniidae	*Heptagenia*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	0		0		0

Taxa				AL1		AL2		AL4		AL4B		AL7		AL7B		AL8		AL8B		AL11A		AL12		AL13		AL14	
Order	**Family**	**Genus**	**Species**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**	**D**	**W**
Odonata	Gomphidae	*Neurogomphus*	*Neurogomphus* sp.	0	0	5	0	0	0	0	7	0	0	0	0	0	0	0	0		0	0	0		0		0
Odonata	Gomphidae	*Hagenius*		0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Odonata	Protoneuridae			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	1		0		0
Odonata	Cordulidae	*Phyllomacromia*		0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Diptera	Chironomidae			5	0	42	14	343	7	21	14	65	0	5	0	0	0	23	28		14	11	13		0		14
Diptera	Ceratopogonids	*Palpomyia*	*Palpomyia* sp.	9	0	0	0	0	0	0	0	14	0	0	0	0	0	0	5		0	1	0		0		0
Diptera	Simulidae	*Simulium*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	20	0		0		0
Trichoptera	Leptoceridae			5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5		0	0	0		0		0
Trichoptera	Hydropschidae	*Cheumatopsyche*	*Cheumatopsyche* sp.	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Trichoptera	Hydropschidae	*Aethaloptera*	*Aethaloptera* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		6		0
Trichoptera	Polycentropodidae	*Polycentropus*	*Polycentropus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Trichoptera	Dipseudopsidae	*Dipseudopsis*		0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		0		0
Decapoda	Atyiidae	*Caridina*		0	0	0	0	0	0	0	0	33	0	5	0	0	0	5	0		0	0	0		0		0
Hemiptera	Aphelocheiridae	*Aphelocheirus*	*Aphelocheirus* sp	5	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0		0	0	0		0		0
Coleoptera	Elmidae	*Neoelmis*	*Neoelmis* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0		1		0
Coleoptera	Gyrinidae	*Orectogyrus*		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	0		0		0
Ostracoda				0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0		0	0	0		0		0
Hirudinea				0	0	0	0	0	0	0	0	145	0	0	0	0	0	0	0		0	0	0		0		0
Oligochaetes				0	0	5	0	105	0	28	0	65	0	0	0	156	0	135	9		0	0	0		0		238

3.4.4 Statistical comparison between macro-invertebrate abundances (Mean no. /m2) during dry (December 2016) and wet (May 2017) seasons

The outputs of T-test, 2-tailed and paired at 95% confidence level (p = 0.05), indicated no significant differences (p > 0.05) in macro-invertebrate abundances in all sites within the two samplings, except at AL1, AL2 and AL7 where the abundances during dry season were significantly higher (p < 0.05) than those of wet season.

3.4.5 Discussion results

The lower EPT indices, total taxa indices and macro-invertebrate abundances (mean no./m2) during wet season relative to dry season, are contradictory as far as the effects of rains on macro-invertebrate richness and abundances are concerned.The macro-invertebrate abundance recorded during the second sampling (May 2017), were either the same or less than those found during dry season sampling. The T-test output indicated that the on-set of rains just before the second sampling in May 2017, had not caused any improvement on the occurrences of benthic macro-invertebrates within the lake and river substrates. It is probable that the long dry spell that hit Uganda until late April 2017, could have significantly reduced the food resources and habitats that support macro-invertebrates in such benthic environments and the rain which had just began, had not brought in any improvement. In a related study (Beauchard et al., 2003), the duration of rains was found to account for temporal persistence of suitable habitats that support more macro-invertebrates in water bodies and drying summer period was associated with conditions that reduce taxa richness. Apart from this seasonal effect, the present lotic and lentic environments of study could still be considered free from any serious pollution, as reported for the dry season survey of December 2016.

The dry and wet season findings on the occurrences of gastropod and bivalve taxa at the mentioned stations within northern Lake Albert and River Nile delta areas, are in line with one of the historical findings reported (Mandahl-Berth, 1954) regarding the composition and distribution of freshwater molluscs in water bodies of Uganda. Occurrences of Chironomidae (Diptera) and Oligochaetes in most of the present study stations both in dry and wet season indicate that they can survive under a range of seasons and environmental conditions (clean to polluted) as it was reported in a similar study (Everaert *et al*., 2014) that such organisms do have clear abiotic preferences and occurred in various locations and time. Due to the big ecological roles the macro-invertebrates play in the aquatic system, it is further put to the attention of project (e.g. oil exploration/exploitation) implementers, that aspects such as siltation and oil spills, in these study areas, should be highly mitigated. In order to understand the trends in macro-invertebrate occurrences, more sampling and periodic monitoring of the area during the onset of the project activities would be required.

3.5 Fish studies

The following section focuses mainly on the findings from the wet season survey, rather than the dry season, as the results from the wet season were more complete than those from the dry season. The findings from the dry season, and a discussion, is set out in Annex A.

3.5.1 Species composition and relative abundance by numbers and weight

Taxa composition and numerical relative abundance of fish species at the selected aquatic biodiversity survey stations of northern Lake Albert, Victoria Nile and its affluent rivers are summarized in Table 3-12. During the wet season data collection (May 2017), a total of 32 fish species, 12 families and 24 genera were recovered compared to 25 species from 10 families and 22 genera recovered during the dry season (December 2016). Seven species namely; *Alestes macrolepidotus* (Characidae), *Neobola bredoi*, and *Garra johnstonii* (Cyprinidae); *Hyperopisus bebe*, *Marcusenius petherici (*Mormyridae*)*; *Afromastecembalus frenatus (*Mastacembelidae) and *Aplocheilichthys sp*. (Cyprinodontidae) that were not caught during the dry season were recovered during the wet season sampling. On the other hand *Gnathonemus victoriae, Petrocephalus catastoma, Marcusenius grahami Synodontis nigrita,* and *Barillus niloticus* present in the catches during the dry season were not recovered during rainy season samples. The observed differences in the fish species recovery could be due to the migratory guilds and patterns, and the sampling efficiency of the electrofishing gear used only during rainy season.

Table 3-12: The wet season taxa composition and relative abundance (% numbers) of fish species caught in surface waters of CA-1, and LA-2 North (May, 2017)

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Total
Polypteridae	*Polypterus senegalis*	0.90	0.28	7.14		20.90		36.84	2.00	40.00	5.05
Mormyridae	*Hyperopisus bebe*	0.90									0.22
	Mormyrus kannume	0.45									0.11
	Marcusenius petherici	0.45									0.11
	Marcusenius nigricans			1.19							0.11
	Mormyrops anguilloides	0.45			12.50						0.54
Characidae	*Hydrocynus forskhalii*			4.76	59.38		7.69				2.69
	Alestes baremose				6.25						0.22
	Alestes macrolepitodes	0.45									0.11
	Brycinus nurse	9.01	3.35	2.38		0.75					3.76
Cyprinidae	*Labeo horie*							21.05			0.43
	Garra johnstonii	0.45	0.56								0.32
	Neobola bredoi	75.23	90.22	1.19			7.69		62.00		56.34
	Barbus jacksonii				3.13				4.00		0.32
	B. perince	1.35		36.90				31.58			4.30
	Barbus sp.	2.70	1.40	1.19	9.38				6.00	20.00	2.04
Bagridae	*Bagrus bayad*			1.19		2.99					0.54
	Auchenoglanis occidentalis					0.75					0.11
Schilbeidae	*Schilbe intermedias*				3.13						0.11
Clariidae	*Clarias gariepinus*							5.26			0.11

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Total
Mochokidae	*Synodontis schall*				3.13						0.11
	S. frontosus	0.45									0.11
Cyprinodontidae	*Aplocheilichthys sp.*	1.80	3.35	8.33					20.00		3.55
Centropomidae	*Lates niloticus*	1.35		1.19		9.70	3.85				1.94
Cichlidae	*Tilapia zillii*					0.75	3.85				0.22
	Oreochromis niloticus			1.19		5.22		5.26	2.00	20.00	1.18
	O. leucostictus									20.00	0.11
	Sarotheradon galilae					0.75					0.11
	Thoracochromis avium					32.09	76.92				6.77
	T. wingati					0.75					0.11
	Haplochromis sp.	4.05	0.84	2.38	3.13	25.37			4.00		5.48
Mastacembelidae	*Afromastecembalus frenatus*			2.38							0.22
	Relative contribution (%)	23.87	38.49	9.03	3.44	14.41	2.80	2.04	5.38	0.54	100.00
	No of fish species	15	7	13	8	11	5	5	7	4	32

Neobola bredoi was the most abundant species by numbers in the wet season samples, contributing over 56% followed by, Haplochromines (13%) and *Polypterus senegalis* (5%); compared to dry season samples where *Haplochromines* contributed over 60% of the catch. The differences in abundance and dominance by numbers are simply due to the congregatory hehaviour of the small cyprinid that accounts to their being caught in large numbers. There was an observed variation in the contribution of the keystone commercial fish species of the region were the Tiger fish *Hydrocynus forskahlii* contribution increased from 1% (dry season) to 2.7% (wet season); tilapias from <1% to about 2%; *Alestes baremose* decreased from 0.6% to 0.2% as Nile perch remained relatively stable at approx 2%.

The highest percentage catch by numbers across the experimental stations were recorded at AL2 (38%), followed by AL1 (28%) – both along the banks of Victoria Nile - and AL7 (14%) – from the inshore waters of Lake Albert. The lowest with only 0.5% percentage of the catch was recorded from the new station AL14 (River Tangi). Stations AL1 and AL2 dominated the catches by numbers due to the abundance of the small sized congegatory *Neobola bredoi*. Station AL14, contributed less possibly due to the risk of wildlife that restricted proper electro fishing and setting of gillnets. Secondly sampling was done soon after onset of the rainy season when the impact of the rains especially in the affluent rivers was yet to take effect. Water level in River Tangi for example was still very low and the water extremely muddy. The expected upstream fish migration would have barely begun. In comparison to the dry season, station AL7 yielded most of the catch (68%) dominated by Haplochromines.

In terms of species richness and evenness, *Polypterus senegalis* were caught at almost all the experimental stations. *Haplochromines*, Barbus spp and tilapia species were also evenly distributed (Table 3-12). The numbers of fish species recorded at each of the experimental stations during the wet and dry season are compared in Figure 3.4. Station AL1 contributed the highest number of species (15) during wet season followed by AL4 (13) and the least were from AL14 (4). During dry season AL8 (Waiga –Waisoke delta) contributed highest with 12 species followed by AL12 (River Waiga) with 10 species. Site AL8 is the delta of river Waiga sampled at station AL12, hence the likely interdependence. The low species recovery from AL8 and AL12 could be due to prolonged drought that resulted into low water levels and interference with normal upstream fish migration. AL5, “dry river” within the park was not sampled during this wet season.

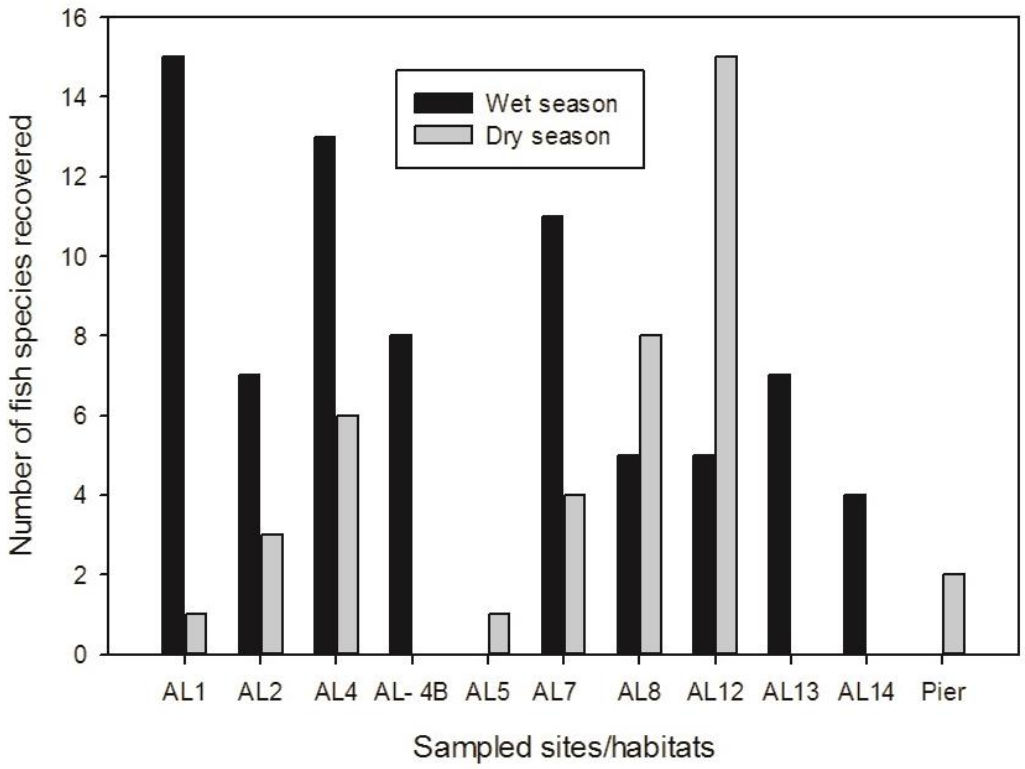

Figure 3-4: Seasonal variation in the number of fish species recovered from CA-1, and LA-2 North - December, 2016 (dry season and May 2017 (wet season)

The wet season relative abundance (% weight) (biomass) of fishes caught in the nearshore areas of Victoria Nile, northern Lake Albert and its affluent rivers are detailed in Table 3-13. The Tiger fish *Hydrocynus forskahlii, Alestes baremose, Polypterus senegalis* and *Haplochromines* yielded the highest individual biomass contributing 53%, 7%, 6% and 5% of the total biomass respectively. The silver fish Neobola bredoi which contributed the catch by numbers only yielded 2% of the total biomass. In comparison with the dry season (December, 2016), Haplochromines contributed most to the biomass with 32%, followed by *Polypterus senegalis* with 10%, and *Tilapias* contributing approx...8%. The larger commercial fish species such as Nile perch *Lates niloticus* recovered during this wet season were very small and immature yielding only 1.5% compared to the dry season where it contributed about 5% of the total biomass.

Experimental Station AL4 (Nile Delta) dominated the wet season fish biomass with 69% and 9.8% respectively. This was followed by AL1 (6.1%) and AL7B (5.7%) and the least yield site was AL13 (0.2%) (Table 3-13). This wet season variation was brought about by the kind of fish species caught at those respective sites. Unlike in the wet season, during the dry season sampling (December, 2016), sites AL7 yielded most of the fish biomass with 41%, followed by AL8 yielding 18% and AL12 (R. Waiga) yielding 14% by weight of the species caught. These big differences are subject to the key fish species that were not recovered during this sampling.

Table 3-13: The wet season taxa composition and relative abundance (% weight) of fish species caught near-shore areas of Victoria Nile, northern Lake Albert and its ephemeral rivers (May, 2017)

Species	AL1	AL2	AL4	AL4D	AL7B	AL8	AL12	AL13	AL14	Total(g)
Polypterus senegalis	2.947	13.81	16.62		21.28		73.58	18.95	95.55	6.67
Hyperopisus bebe	22.2									1.38
Mormyrus kannume	16.71									1.04
Marcusenius petherici	10.11									0.63
Marcusenius nigricans			0.06							0.01
Mormyrops anguilloides	14.88			14.7						11.13
Hydrocynus forskhalii			30.69	71.8		18.80				53.36
Alestes baremose				10.19						7.07
Alestes macrolepitodes	0.78									0.05
Brycinus nurse	14.38	10.85	0.32		0.03					1.11
Labeo horie							23.57			0.74
Garra johnstonii	0.063	0.42								0.01
Neobola bredoi	12.94	74.05	0.04			0.44		51.27		2.17
Barbus jacksonii				0.033				10.83		0.04
B. prince	1.007		12.40				0.477			1.30
Barbus sp.	0.039	0.05	0.04	0.015				5.076	0.027	0.03
Bagrus bayad			10.33		1.89					1.12
Auchenoglanis occidentalis					0.40					0.02
Schilbe intermedias				1.72						1.19
Clarias gariepinus							2.291			0.07
Synodontis schall				1.505						1.04
S. frontosus	2.938									0.18
Aplocheilichthys sp.	0.043	0.56	0.03					5.753		0.03
Lates niloticus	0.236		2.70		14.12	3.67				1.19
Tilapia zillii					2.39	4.75				0.27
Oreochromis niloticus			26.44		2.75		0.076	2.876	1.053	2.77
O. leucostictus									3.374	0.04
Sarotheradon galilae					2.28					0.13
Thoracochromis avium					51.90	72.33				4.94
T. wingati					0.76					0.04
Haplochromis sp.	0.722	0.26	0.19	0.023	2.20			5.245		0.22
Afromastecembalus frenatus			0.02							0.002
Relative contribution	6.198	1.708	9.824	69.41	5.751	2.702	3.128	0.176	1.106	100

3.5.2 The endemicity, distribution and habitat range, ecological guild and IUCN status

Of the 32 fish species recovered during this wet season sampling, majority of them were of ‘not assessed’ and of ‘least concern’ according to the International Union of Conservation of Nature (IUCN) (Table 3-14). Although several fish species have not been assessed or entered into the catalogue of life, they are considered vulnerable and endangered due to their low populations and being endemic to Lake Albert and the River Nile system.

Table 3-14: The endemicity, distribution and habitat range, ecological guild and IUCN status of fish species recovered from the near shore areas of Lake Albert, Victoria Nile and its affluent rivers caught in December 2016 (D- Dry Season) and May (W – Wet Season), 2017

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Endemicity	Distribution	Ecological guild	IUCN status
Polypteridae	*Polypterus senegalis*	W	W	W	-	W	D	W/D	W	W	Restricted range within Uganda	L.Albert, Victoria Nile and its catchment rivers	Riverine and marginal regions of lakes and rivers with emergent vegetation	Not evaluated
Mormyridae	*Hyperopisus bebe*	W	-	-	-	-	-	-	-	-	Restricted range within Uganda	L. Albert, Victoria Nile and its catchment rivers	Fluvial areas but also common in the swamps	Least concern
	Mormyrus kannume	W	D	-	-	-	-	-	-	-	Not endemic	Wide spread in most water bodies	Riverine and migratory. Occurs inshore and deep open waters.	Least concern
	Marcusenius petherici	W	-	-	-	-	-	-	-	-	Endemic	Victoria Nile	Riverine and migratory.	Not assessed
	Marcusenius nigricans	-	-	W	-	-	-	-	-	-	Not endemic	Marginal vegetation of water bodies and swamps	Little is known or reported	Not assessed
	Mormyrops anguilloides	W			W						Not endemic	L. Albert, Victoria Nile and its catchment rivers	Little is known or reported	Least Concern
	Petrocepahlus catastoma							D			Not endemic	L. Albert, Victoria Nile and its catchment rivers	Wide range of habitats, shallow and muddy waters, sheltered bays, in lagoons, and swampy areas	Not assessed
	Marcusenius victoriae							D				L. Albert, Victoria Nile	Broad habitat distribution that	Least Concern

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Endemicity	Distribution	Ecological guild	IUCN status
												and its catchment rivers	includes extremely hypoxic swamps and the open waters of lakes and river	
	Marcusenius grahami		D										Shallow, coastal waters including in sandy areas and areas overgrown by water lilies	Least concern
Characidae	*Hydrocynus forskhalii*			W /D	W P		W /D				Restricted range within Uganda	L. Albert and Victoria Nile	Riverine, migratory and congregatory; Inshore and offshore areas	Least concern
	Alestes baremose				W		D				Restricted range within Uganda	L. Albert and Victoria Nile	Shoreline and deeper open waters	Least concern
	Brycinus macrolepidotus	W									Restricted range within Uganda	L. Albert, Victoria Nile and its catchment rivers	Inshore areas with marginal vegetation	Least concern
	Brycinus nurse	W	W	W		W /D	D				Restricted range within Uganda	L. Albert, Victoria Nile and its catchment rivers	Shallow inshore areas	Least concern
Cyprinidae	*Labeo horie*							W			Endemic	L. Albert, Victoria Nile and its catchment rivers	Riverine and migratory. Occurs inshore areas with marginal vegetation; Common in delta and affluent rivers	Not assessed
	Garra dembeensis	W	W								Not endemic	Wide spread in most turbulent rivers	Riverine and marginal areas with vegetation	Not assessed

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Endemicity	Distribution	Ecological guild	IUCN status
	Neobola bredoi	W	W	W			W		W		Endemic	L. Albert and Victoria Nile	Shallow areas of surface water	Not assessed
	Barbus jacksonii				W				W		Not endemic	Wide spread in most water bodies	Riverine and migratory in both fast flowing and sluggish waters	Least concern
	B. perince	W		W/D			D	W/D			Not endemic	Wide spread in most water bodies	Riverine and migratory in both fast flowing and sluggish waters	Least concern
	Barbus sp.	W	W	W	W				W	W	Not endemic	Wide spread in most water bodies	Riverine and migratory in both fast flowing and sluggish waters	Least concern
	Barillus niloticus						D				Not endemic	L. Albert, Victoria Nile and its catchment rivers	Demersal, potamodromous species found in running waters	Least concern
	Labeo coubie							D			Not endemic	L. Albert, Victoria Nile and its catchment rivers	Benthopelagic and potamodromous species. It inhabits rivers and lakes particularly sheltered bays	Least concern
	Barbus altianalis			D							Not endemic		Barbus altianalis inhabits inshore waters of lakes and rivers, including fast-flowing waters.	Least Concern
Bagridae	*Bagrus bayad*			W		W	D				Restricted range within Uganda	L. Albert and Victoria Nile	Demersal species found in lakes, swamps and rivers in water less than 12 m deep	Least concern
	Auchenoglanis occidentalis				D	W					Not endemic	L. Albert, Victoria Nile	Inshore areas, deep open water and	Least concern

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Endemicity	Distribution	Ecological guild	IUCN status
												and its catchment rivers	marginal floodplain	
Schilbeidae	*Schilbe intermedius*				W			D			Not endemic	L. Albert, Victoria Nile and its catchment rivers	Congregatory and migratory. Occurs in shallow inshore areas	Least concern
Clariidae	*Clarias gariepinus*						D	W/D			Not endemic	Wide spread in most water bodies	Potamodramous and congregatory. Occurs in affluent rivers and streams, and marginal floodplain	Least concern
Mochokidae	*Synodontis schall*				W			D			Restricted range within Uganda	L. Albert, Victoria Nile and its catchment rivers	Inshore areas, deep open water and marginal floodplains	Least concern
	S. frontosus	W/D	D				D				Endemic	L. Albert, Victoria Nile and its catchment rivers	Inshore areas, deep open water and marginal floodplain	Least concern
	Synodontis nigrita							D			Not endemic	L. Albert, Victoria Nile and its catchment rivers	A benthopelagic and potamodromous specie	Least concern
Cyprinodontidae	*Aplocheilichthys sp.*	W	W	W					W		Not endemic	Almost all water bodies	Not specific	Least concern
Centropomidae	*Lates niloticus*	W		W	D	W/D	W/D				Not endemic	Wide spread in most water bodies where they were	Inshore and deep open waters	Least concern

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	Endemicity	Distribution	Ecological guild	IUCN status
												introduced		
Cichlidae	*Tilapia zillii*				D	W/D	W	D			Not endemic	Wide spread in most water bodies	Inshore areas, sheltered bays and lagoons	Least concern
	Oreochromis niloticus			W		W	D	W	W	W	Not endemic	Wide spread in most water bodies	Inshore areas, sheltered bays and lagoons	Least concern
	O. leucostictus						D			W	Not endemic	Wide spread in most water bodies	Inshore areas, sheltered bays and lagoons	Least concern
	Sarotheradon galilaeus					W	D				Restricted range within Uganda	L. Albert and Victoria Nile	Inshore areas, sheltered bays and lagoons	Least Concern
	Haplochromis avium					W	W				Endemic to Lake Albert	Wide spread along River Nile	Inshore areas, sheltered bays and	Not evaluated
	Thoracochromis wingatii					W					Nile basin	Lake Albert and tributaries.	lagoons	Data deficient
	Haplochromis spp.	*W*	W	W	W	W/D	D		W		n/a	n/a	n/a	n/a
Mastacembelidae	*Mastecembalus frenatus*			W							Not endemic	Wide spread in most water bodies	Inshore areas, marginal floodplain	Least concern

3.5.3 The species catch rates by numbers and weight

The wet season catch rates followed the same pattern as the relative contribution of the individual fish species to the total catch. By numbers, the catch rates were dominated by the silver fish *Neobola bredoi* with over 1000 fish/hour of electrofishing and 393 fish /gears/day. This reduction in catch rates is because of the use of 25.4 mm net mesh size instead of the recommended 8-10 mm used in the light fishery on Lake Albert. This numerical abundance was followed by *Haplochromines* 80 fish/gear/day, *Polypterus senegalis* with 35 fish/gear/day, Barbus sp. 30 fish/gear/day, and *Brycinus nurse* 26 fish/gear/day. Other fish species ranged between 1 to 20 fish/gear/day (Table 3-15). In comparison to the dry season (December, 2016), numerical abundance were dominated by the *Haplochromines* 239 fish/gear/day followed by *Schilbe intermedius* with 23 fish/gear/day, *Tilapias* with 11 fish/gear/day, *Nile perch* with 9 fish/gear/day, *Polypterus senegalis* 6 fish/gear/day and *Hydrocynus forskhalii* with only 4 fish/gear/day.

Table 3-15: The wet season fish catch rates by numbers (fish/gear/day) caught in the near-shore areas of Victoria Nile, northern Lake Albert and its ephemeral rivers (May, 2017)

Species	AL1	AL2	AL4	AL- 4B	AL7B	AL8	AL12	AL13	AL14	Total
Polypterus senegalis	12.0	6.0	4.5		21.0		5.3	6.0	1.5	35.3
Hyperopisus bebe	12.0									1.5
Mormyrus kannume	6.0									0.8
Marcusenius petherici	6.0									0.8
Marcusenius nigricans			0.8							0.8
Mormyrops anguilloides	6.0			3.0						3.8
Hydrocynus forskhalii			3.0	14.3		1.5				18.8
Alestes baremose				1.5						1.5
Alestes macrolepitodes	6.0									0.8
Brycinus nurse	120.0	72.0	1.5		0.8					26.3
Labeo horie							3.0			3.0
Garra johnstonii	6.0	12.0								2.3
Neobola bredoi	1002.0	1938.0	0.8			1.5		186.0		393.0
Barbus jacksonii				0.8				12.0		2.3
B. prince	18.0		23.3				4.5			30.0
Barbus sp.	36.0	30.0	0.8	2.3				18.0	0.8	14.3
Bagrus bayad			0.8		3.0					3.8
Auchenoglanis occidentalis					0.8					0.8
Schilbe intermedias				0.8						0.8
Clarias gariepinus							0.8			0.8
Synodontis schall				0.8						0.8
S. frontosus	6.0									0.8
Aplocheilichthys sp.	24.0	72.0	5.3					60.0		24.8
Lates niloticus	18.0		0.8		9.8	0.8				13.5
Tilapia zillii					0.8	0.8				1.5
Oreochromis niloticus			0.8		5.3		0.8	6.0	0.8	8.3
O. leucostictus									0.8	0.8

Species	AL1	AL2	AL4	AL- 4B	AL7B	AL8	AL12	AL13	AL14	Total
Sarotheradon galilae					0.8					0.8
Thoracochromis avium					32.3	15.0				47.3
T. wingati					0.8					0.8
Haplochromis sp.	54.0	18.0	1.5	0.8	25.5			12.0		38.3
Afromastecembalus frenatus			1.5							1.5
Total	**1332.0**	**2148.0**	**63.0**	**24.0**	**100.5**	**19.5**	**14.3**	**300.0**	**3.8**	**697.5**

However, by weight, the commercial keystone species the Tiger fish *Hydrocynus forskahlii* yielded the highest biomass 13,406 g/gear/day and *Mormyrops anguilloides* yielded 2,796 g/gear/day, *Alestes baremose* at 1,777.5 g/gear/day, while the least was *Afromastecembalus frenatus* with 0.6 g/gear/day. This was in contrast to the dry season (December, 2016) sampling when *Haplochromines* yielded 2,387 g/gear/day followed by *Polypterus senegalis* 754 g/gear/day, *Tilapia zillii* with 588 g/gear/day, *Lates niloticus* 422 g/gear/day and *B. altianalis* with 420 g/gear/day.

Considering all the sampled sites and fish species caught, there have been clear differences between the wet and dry seasons. This wet season catch rates by both numbers and weight at sites AL1, AL2 and AL4 were significantly higher than that recorded during the dry season (Figure 3-5). The significantly high numbers of fish was due to the use of the electrofisher that recovered a diverse array of smaller schooling fishes. Unlike at site AL7, AL8 and AL12 where there were more fish recovered in terms of both numbers and weigh in the dry season. This numerical and biomass relative abundance data across experimental sites; and catch rates (number and biomass/gear/day) represent a strong multispecies fishery in the near-shore waters of Victoria Nile, northern Lake Albert and its ephemeral rivers.

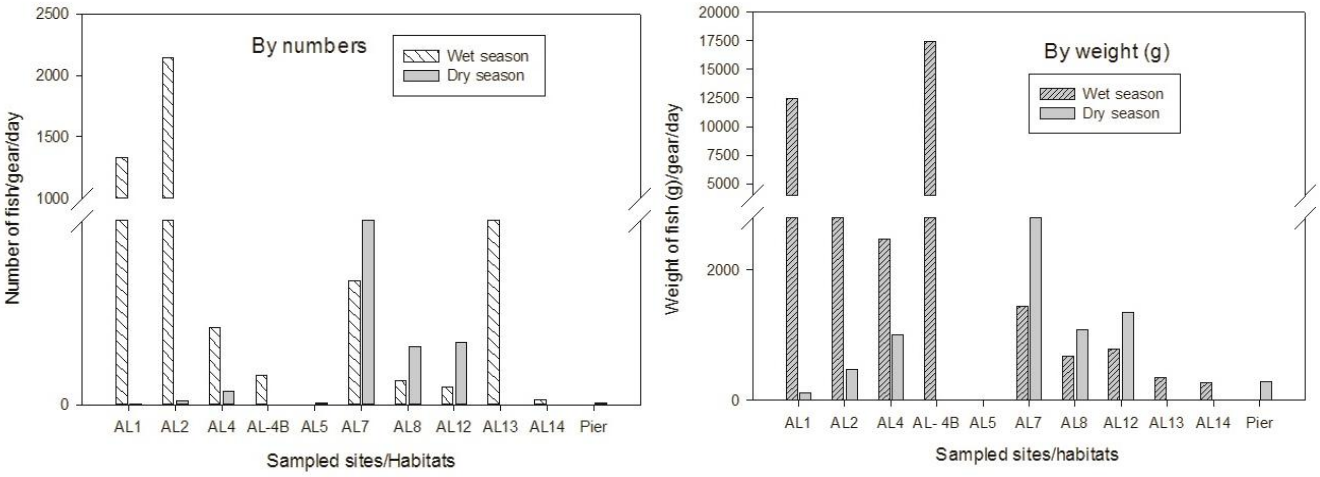

Figure 3-5: Seasonal variation in the number of fish caught and weight /gear/day from the near- shore waters of Victoria Nile, northern Lake Albert and its affluent rivers

3.5.4 Biological notes on *Neobola bredoi*

The dominance of the silver fish prompted the in-depth analysis of its biology and ecology. The size ranged from 38 to 58 mm Fork length (FL), the mean size of *Neobola bredoi* was 47±0.5 mm FL although majority of the fish were 45 mm FL (Figure 3-6). Majority of the specimen recovered during this wet season sampling were mature with the size at first maturity of 42 mm FL (dotted line) and breeding. These breeding populations were dominated by females with a sex ration of Males: Females being 1:1.3. Although the food and feeding habits were not extensively studied, the few specimen examined indicated that the fish fed mainly on zooplankton.

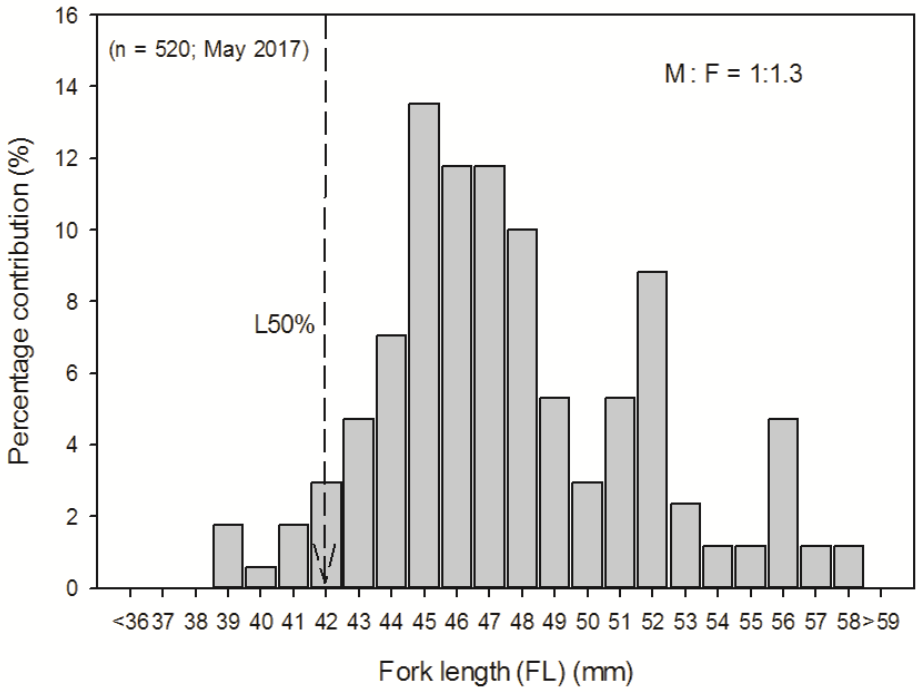

Figure 3-6: Length frequency distribution of the silver fish Neobola bredoi (Muziri), caught from sites AL1 and AL2 on Victoria Nile. (The vertical dotted line indicates the size at first maturity for both sexes).

3.5.5 Fecundity of keystone species

During this wet season sampling, absolute fecundity of the Tiger fish *H. forskhalii*, *Labeo* sp., *Mormyrops anguilloides* and *Schilbe intermedius* were determined. Absolute fecundity in ripe ovaries of Tiger fish *H. forskhalii* ranged from 124,975 to 179,924 in females of 41.2 to 46 cm FL, weighing 643 g to 1,104 g. The mean fecundity of *H. forskhalii* was 139,121. ± 27,205 and the diameter of the ripe oocytes ranged from 0.46 to 1.02 mm with a mean of 1.77 ± 0.009 mm (Figure 2-7). Considering the other fish species such as *Mormyrops anguilloides*, the fecundity was estimated between 4,659 and 7,136 (mean = 5,997 ± 1,250). The oocyte diameter was much bigger ranging from 1.62 to 2.43 mm with a mean of 1.92 ± 0.02 mm. The estimated fecundity of *Labeo horie* from AL12 ranged from 13,020 to 17,156 (mean = 15,445 ± 2158). The oocytes were also small ranging from 0.49 to 0.95 mm (0.83 ± 0.01 mm).

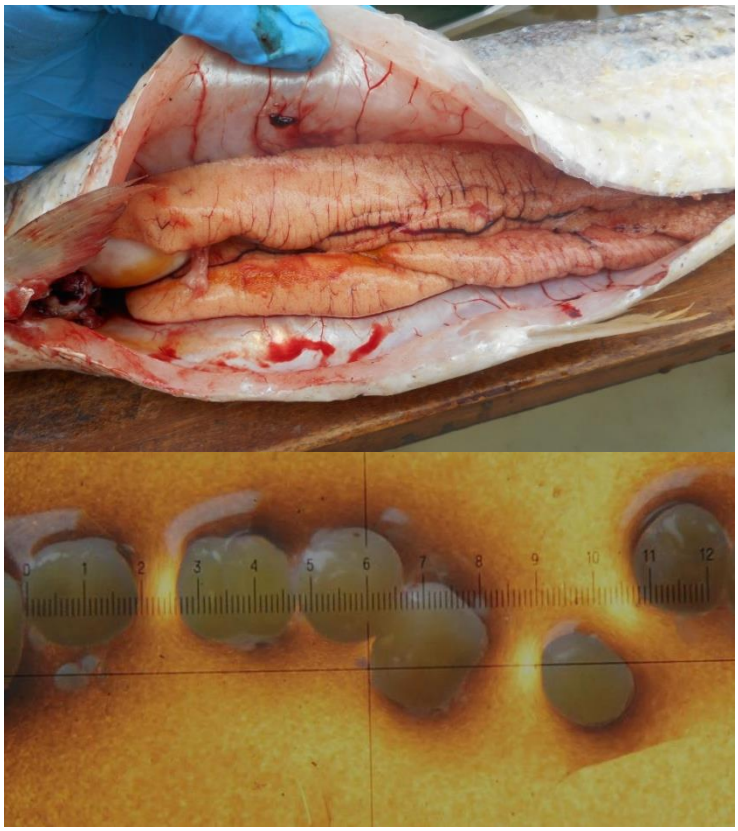

Figure 3-7: Upper panel: A gravid female Tiger fish. Lower panel: Diameter of ripe oocytes of the Tiger fish H. forskhalii as observed on the stage micrometer. Note, all the other oocytes diameter for the different fish species were measured the same way at different magnifications.

3.5.6 Summary of the biology and ecology of selected dominant fish species

Most of the large fish species caught from this wet season survey where all mature and breeding while the small sized fish were immature except for *Neobola bredoi* and *Haplochromines*. Table 3-16 summaries most of the biology and ecology of the selected fish species. It is clearly observed that *H. forskhalii* caught during this wet season were significantly larger than those from the dry season. The fish species exhibited both positive isometric and allometric growth and the relative fish condition (Kn) showed that the fish were in good condition. The abundant Neobola was evident in the stomach contents of *Mormyrops anguilloides*. The predatory Nile perch caught during this wet season survey were immature, while all the momyrids were mature and breeding and feeding mainly on detritus.

Table 3-16: Some of the selected biological parameters of the selected dominant fish species caught around shore waters of Victoria Nile, northern Lake Albert and its affluent rivers in the dry season (December, 2016) and wet season (May, 2017)

Fish species	Selected parameters	December, 2016 (Dry season)	May, 2017 (Wet season)
P. catastoma	Size range (cm)	7.1 – 8.2	
	Mean length (cm TL)	7.6±0.1	
	Maturity (%)	-	
	Main food type (Increasing importance)	-	
	Relative condition factor (Kn)	1.4±0.07	
	Sample size (n)	8	
Hydrocynus forskhalii	Size range (cm)	12.5 – 18.4	17.7 – 49.5
	Mean length (cm FL)	16.0±1.4	40.7±7.4
	Maturity (%)	33%	100% (All mature and breeding)
	Main food type (Increasing importance)	Fish remains	Fish remains
	Relative condition factor (Kn)	1.01 ±0.09	1.03 ±0.01
	Sample size (n)	4	19
Brycinus nurse	Size range (cm)	8.0 – 11.6	
	Mean length (cm TL)	8.9±0.3	
	Maturity (%)	40%	
	Main food type (Increasing importance)	Insect remains, *Povilla*,	
	Relative condition factor (Kn)	1.02±0.07	
	Sample size (n)	10	
Lates niloticus	Size range (cm)	10.5 – 21.6	
	Mean length (cm TL)	15.2±2.1	
	Maturity (%)	0%	
	Main food type (Increasing importance)	Fish remains, *Caridina*	
	Relative condition factor	1.00±0.01	
	Sample size (n)	5	
Labeo sp	Size range (cm)	9.5 – 12.8	14.1 – 16.4
	Mean length (cm TL)	10.7±0.2	15.4±0.9
	Maturity (%)	-	100%
	Main food type (Increasing importance)	-	Detritus, Insect remains
	Relative condition factor	1.00±0.02	1.04±0.05
	Sample size (n)	14	4
Mormyrops anguilloides	Size range (cm)		34.8 – 58.0
	Mean length (cm TL)		47.7±8.2
	Maturity (%)		100%
	Main food type (Increasing importance)		Fish (Barbus sp. Neobola sp.) and Insect remains

Fish species	Selected parameters	December, 2016 (Dry season)	May, 2017 (Wet season)
	Mean condition factor		1.00±0.08
	Sample size (n)		5
Barbus prince	Size range (cm)	7.85 - 9.5	
	Mean length (cm TL)	8.5 ±0.15	
	Maturity (%)	100%	
	Main food type (Increasing importance)	-	
	Mean condition factor	1.00±0.02	
	Sample size (n)	11	
Tilapia zillii	Size range (cm)	8.0 – 20	
	Mean length (cm TL)	12.6±3.7	
	Maturity (%)	33.7%	
	Main food type (Increasing importance)	Algae (Green algae)	
	Mean condition factor	1.00±0.05	
	Sample size (n)	3	
S. frontosus	Size range (cm)	20.2 – 21.2	
	Mean length (cm TL)	20.7±0.5	
	Maturity (%)	0	
	Main food type (Increasing importance)	Tricoptera, Insect remain	
	Mean condition factor	0.9±0.001	
	Sample size (n)	2	
Schilbe intermedius	Size range (cm)	8.9 – 12.6	
	Mean length (cm TL)	10.9±1.08	
	Maturity (%)	0	
	Main food type (Increasing importance)	Insect, Detritus and flatworms	
	Mean condition factor	1.00±0.02	
	Sample size (n)	8	

P.4 Conclusion

In general, there has been an increase in species recovery around inshore waters of Victoria Nile, northern Lake Albert and its affluent rivers. Species recovery increased from 45% (25 species) to 58% (32 species) of the 55 fish species recorded in Lake Albert and its catchment compared to the dry (December 2016) season. Although some species previously caught were not recovered during this wet season, this catch represent a multi-species fishery.

The native fishery of the region is dependent on *Lates niloticus, Brycinus nurse, Hydrocynus forskhalii, Alestes baremose* and *Neobola bredoi.* All of which have been recovered around inshore waters of Victoria Nile, northern Lake Albert. While most of the potamodramous fish species such as *Claris gariepinus* have been retrieved from site AL12 as expected together with the typical riverine species such as *Labeo* sp. and *Barbus* sp. These findings highlight the ecological importance of the ephemeral rivers to Lake Albert fisheries. Available data clearly show that the fish species are in good condition - a reflective inference of adequate food supply notably insects and smaller fishes for the top predators. There are a number of poachers who frequent Victoria Nile towards the Delta (site AL-4D). They are using illegal and destructive fishing methods mainly targeting the breeding fish species moving upstream to spawn. The appropriate authorities should take key measures to stop these destructive fishers “poachers”. The availability of the electrofisher was very instrumental in increasing the fish species recovery in habitats that were not adequately sampled during the dry season.

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P.6 Annex A- Dry Season Fish Survey Results and Discussion

Fish species composition by numbers and weight (Tilenga ESIA Fish data –Dry season)

A total of 25 fish species belonging to 10 families and 22 genera were recovered from Victoria Nile, rivers Waiga and Waisoke, and northern Lake Albert. This was achieved in a 10 days fishing event. The species richness was highest at AL8 (Waiga –Waisoke river mouth) in Lake Albert followed by AL12 (River Waiga) and the least number of species were recovered from AL1 and AL5 (Victoria Nile and) the "dry river"- Murchison Park North - respectively (Table 1). The one species from the "dry river" was recovered during macro-invertebrates sampling using a dip net in the remnant pools of water. Over all, Haplochromines were the most abundant species during this survey. They contributed over 60% of the catch by numbers followed by *Barbus perince* 8% and Schilbe intermedius with 6%. The least species recovered were mostly those in the family Mormyridae: *Mormyrus anguiloides, Marcusenius victoriae and Mormyrus kannume,* with 0.2% while *Synodontis nigrita, Barbus altianalis and Auchinoglanis ocidentalis* also contributing only 0.2% each to the catch by numbers. The keystone species which include *Hydrocynus forskahlii* contributed 1%, Nile perch with 2%, *Alestes baremose* made 0.6% and tilapias contributing <1% to the catch. However considering the sampled habitats, site AL7 (Water abstraction site) yielded 68% of the catch as sites AL12 and AL10 yielding 13% and 12% by numbers respectively. Site AL12 is at the delta of two rivers - Waiga sampled at site AL8) and River Waisoke which was not sampled. The high species richness at both sites indicates interdependence of the river and Lake Albert.

Table 1: Dry season taxa composition and relative abundance (% numbers) of fish species caught around Victoria Nile and Northern Lake Albert (December, 2016)

Family	Species	AL1 R.Nile	AL2 R.Nile	AL4 Nile Delta	AL5	AL7	AL12 R. Waiga	AL8-Waiga Waisoke delta	Pier	Total
Polypteridae	Polypterus senegalis						0.61	1.22		1.83
Mormyridae	Petrocephalus catastoma						1.62			1.62
	Marcusenius victoriae						0.2			0.2
	Marcusenius grahami		0.41							0.41
	Mormyrops anguiloides								0.2	0.2
	Mormyrus kannume		0.2							0.2
Characidae	Hydrocynus forskhalii			0.2				0.81		1.01
	Alestes baremose							0.61		0.61
	Brycinus nurse					2.43		0.81		3.25
Cyprinidae	Barillus niloticus							0.61		0.61
	Labeo coubie						2.43			2.43
	Barbus perince			1.22	0.41		1.22	5.27		8.11
	B. altianalis			0.2						0.2
Mochockidae	Synodontis nigrita						0.2			0.2
	S. frontosus	0.2	0.2					0.2	0.2	0.81
Bagridae	Bagrus bayad							0.41		0.41
	Auchinoglanis occidentalis			0.2						0.2
Schilbeidae	Schilbe intermedias						6.29			6.29
Claridae	Clarias gariepinus						0.2	0.2		0.41
Centropomidae	Lates niloticus			0.81		1.01		0.61		2.43
Cichlidae	Oreochromis niloticus							0.41		0.41
	O. leucostictus							0.2		0.2
	Sarotheradon gallilae							0.2		0.2
	Tilapia zillii			0.41		2.23		0.41		3.04
	Haplochromines					63.08		1.62		64.71
	Total	**0.2**	**0.81**	**3.04**	**0.41**	**68.76**	**12.78**	**13.59**	**0.41**	**100**
	Species Nos	1	3	6	1	4	8	15	2	25

By weight, the Haplochromines were still the dominant group yielding over 32% followed by *Polypterus senegalis* with 10%, *Tilapias* with >8%, both Nile perch and *B. altianalis* each (5%), *Mormyrus kannume* (4%) while the least was *Barillus niloticus* yielded only 0.06% (Table 2). Considering the sampled habitats/sites, the trend is similar to that of the numbers of fish caught. Whereas sites AL7 yielded 41%, followed by AL8 (Waiga-Waisoke delta) yielding 18% and AL12 (R. Waiga) yielding 14% by weight of the species caught. The least amount of fish were recovered from site AL1 with only 1.5%.

Table 2: The dry season taxa composition and relative abundance (% weight) of fish species caught around Victoria Nile and Northern Lake Albert (December, 2016)

Row Labels	AL1	AL2	AL4	AL5	AL7	AL12	AL8	Pier	Total
Polypterus senegalis						3.33	7.01		10.34
Petrocephalus catastoma						0.65			0.65
Marcusenius victoriae						0.3			0.3
Marcusenius grahami		0.9							0.9
Mormyrops anguiloides								3.23	3.23
Mormyrus kannume		4.36							4.36
Hydrocynus forskhalii			0.21				1.76		1.97
Alestes baremose							0.19		0.19
Brycinus nurse					1.53		0.43		1.96
Barillus niloticus							0.06		0.06
Labeo coubie						4.35			4.35
Barbus perince			0.79	0.05		0.78	3.98		5.6
B. altianalis			5.76						5.76
Synodontis nigrita						0.1			0.1
S. frontosus	1.54	1.16					0.15	0.66	3.51
Bagrus bayad							2.52		2.52
Auchinoglanis occidentalis			1.45						1.45
Schilbe intermedias						4.39			4.39
Clarias gariepinus						0.93	0.35		1.28
Lates niloticus			2.98		2.11		0.7		5.79
Oreochromis niloticus							0.12		0.12
O. leucostictus							0.2		0.2
Sarotheradon gallilae							0.17		0.17
Tilapia zillii			2.48		5.46		0.13		8.07
Haplochromines					31.99		0.74		32.73
	1.54	**6.43**	**13.67**	**0.05**	**41.09**	**14.83**	**18.51**	**3.89**	**100**

The species catch rates by numbers and weight

The catch rates from this dry season survey were dominated by the Haplochromines 239 fish/gear/day followed by Schilbe intermedius with 23 fish/gear/day, Tilapias with 11 fish/gear/day, Nile perch with 9 fish/gear/day, *Polypterus senegalis* 6 fish/gear/day and *Hydrocynus forskhalii* with only 4 fish/gear/day (Table 3). Among the least fishes caught per gear was one of the keystone species Nile tilapia with only 1 fish/gear/day.

Table 3: The dry season fish catch rates by numbers (fish/gear/day) caught around Victoria Nile and Northern Lake Albert (December, 2016)

Species/Sites	AL1	AL2	AL4	AL5	AL7	AL12	AL8	Pier	Total
Polypterus senegalis						2.25	4.5		6.75
Petrocephalus catastoma						6			6
Marcusenius victoriae						0.75			0.75
Marcusenius grahami		1.5							1.5
Mormyrops anguiloides								0.75	0.75
Mormyrus kannume		0.75							0.75
Hydrocynus forskhalii			0.75				3		3.75

Species/Sites	AL1	AL2	AL4	AL5	AL7	AL12	AL8	Pier	Total
Alestes baremose							2.25		2.25
Brycinus nurse					9		3		12
Barillus niloticus							2.25		2.25
Labeo coubie						9			9
Barbus prince			4.5	1.5		4.5	19.5		30
B. altianalis			0.75						0.75
Synodontis nigrita						0.75			0.75
S. frontosus	0.75	0.75					0.75	0.75	3
Bagrus bayad							1.5		1.5
Auchinoglanis occidentalis			0.75						0.75
Schilbe intermedius						23.25			23.25
Clarias gariepinus						0.75	0.75		1.5
Lates niloticus			3		3.75		2.25		9
Oreochromis niloticus							1.5		1.5
O. leucostictus							0.75		0.75
Sarotheradon gallilae							0.75		0.75
Tilapia zillii			1.5		8.25		1.5		11.25
Haplochromines					233.25		6		239.25
Total	**0.75**	**3**	**11.25**	**1.5**	**254.25**	**47.25**	**50.25**	**1.5**	**369.75**

However, by weight, the Haplochromines still dominated the catch contributing 2387 g/gear/day followed by Polypterus senegalis 754 g/gear/day, *Tilapia* (mainly *Tilapia zillii*) with 588 g/gear/day, *Lates niloticus* 422 g/gear/day and *B. altianalis* with 420 g/gear/day (Table 4). Some keystone species such as Nile perch, *Hydrocynus forskahlii, Alestes baremose* and *Barbus altianalis* still contribute to the fisheries of Victoria Nile and northern Lake Albert.

Table 4: The dry season fish catch rates by weight (g/gear/day) caught around Victoria Nile and Northern Lake Albert (December, 2016)

Species/Sites	AL1	AL2	AL4	AL5	AL7	AL12	AL8	Pier	Total
Polypterus senegalis						243	511.5		754.5
Petrocephalus catastoma						47.25			47.25
Gnathonemus victoriae						21.75			21.75
Marcusenius graham		66							66
Mormyrops anguiloides								235.5	235.5
Mormyrus kannume		318							318
Hydrocynus forskhalii			15				128.625		143.625
Alestes baremose							13.575		13.575
Brycinus nurse					111.75		31.2		142.95
Barillus niloticus							4.2		4.2
Labeo coubie						317.25			317.25
Barbus prince			57.75	3.75		57	290.25		408.75
B. altianalis			420						420
Synodontis nigrita						7.5			7.5
S. frontosus	112.5	84.75					10.95	48	256.2
Bagrus bayad							183.75		183.75
Auchinoglanis occidentalis			105.75						105.75
Schilbe intermedius						320.25			320.25
Clarias gariepinus						67.5	25.5		93
Lates niloticus			217.5		153.75		51		422.25
Oreochromis niloticus							9		9
O. leucostictus							14.25		14.25
Sarotheradon gallilae							12.75		12.75
Tilapia zillii			180.75		398.25		9.6		588.6
Haplochromines					2333.25		54		2387.25
Total	**112.5**	**468.75**	**996.75**	**3.75**	**2997**	**1081.5**	**1350.15**	**283.5**	**7293.9**

Biology of selected dominant fish species

From the selected fish species, Nile perch, *Tilapia zillii* and *Brycinus nurse* exhibited positive isometric growth, while *H. forskhalii*, Labeo sp, *B. perince*, and *S. frantosus* exhibited positive allometric growth. The relative condition factor (Kn) of the selected fish species showed they were in good condition (Table 5). The majority of the fish caught were immature fish since less than 40% of the respective fish were mature and breeding.

Table 5: Some of the selected biological parameters of the selected dominant fish species caught around Victoria Nile and Northern Lake Albert (December, 2016)

Fish species	Selected parameters	December, 2016
P. catastoma	*Size range (cm)*	*7.1 – 8.2*
	Mean length (cm TL)	*7.6±0.1*
	Maturity (%)	-
	Main food type (Increasing importance)	-
	Relative condition factor (Kn)	*1.4±0.07*
	Sample size (n)	*8*

Fish species	***Selected parameters***	***December, 2016***
Hydrocynus forskhalii	*Size range (cm)*	*12.5 – 18.4*
	Mean length (cm TL)	*16.0±1.4*
	Maturity (%)	*33%*
	Main food type (Increasing importance)	*Fish remains*
	Relative condition factor (Kn)	*1.01 ±0.09*
	Sample size (n)	*4*
Brycinus nurse	*Size range (cm)*	*8.0 – 11.6*
	Mean length (cm TL)	*8.9±0.3*
	Maturity (%)	*40%*
	Main food type (Increasing importance)	*Insect remains, Povilla,*
	Relative condition factor (Kn)	*1.02±0.07*
	Sample size (n)	*10*
Lates niloticus	*Size range (cm)*	*10.5 – 21.6*
	Mean length (cm TL)	*15.2±2.1*
	Maturity (%)	*0%*
	Main food type (Increasing importance)	*Fish remains, Caridina*
	Relative condition factor	*1.00±0.01*
	Sample size (n)	*5*
Labeo sp	*Size range (cm)*	*9.5 – 12.8*
	Mean length (cm TL)	*10.7±0.2*
	Maturity (%)	*-*
	Main food type (Increasing importance)	*-*
	Relative condition factor	*1.00±0.02*
	Sample size (n)	*14*
Barbus prince	*Size range (cm)*	*7.85 - 9.5*
	Mean length (cm TL)	*8.5 ±0.15*
	Maturity (%)	*100%*
	Main food type (Increasing importance)	*-*
	Mean condition factor	*1.00±0.02*
	Sample size (n)	*11*
Tilapia zillii	*Size range (cm)*	*8.0 – 20*
	Mean length (cm TL)	*12.6±3.7*
	Maturity (%)	*33.7%*
	Main food type (Increasing importance)	*Algae (Green algae)*
	Mean condition factor	*1.00±0.05*
	Sample size (n)	*3*
S. frontosus	*Size range (cm)*	*20.2 – 21.2*

Fish species	*Selected parameters*	*December, 2016*
	Mean length (cm TL)	*20.7±0.5*
	Maturity (%)	*0*
	Main food type (Increasing importance)	*Tricoptera, Insect remain*
	Mean condition factor	*0.9±0.001*
	Sample size (n)	*2*
Schilbe intermedius	*Size range (cm)*	*8.9 – 12.6*
	Mean length (cm TL)	*10.9±1.08*
	Maturity (%)	*0*
	Main food type (Increasing importance)	*Insect, Detritus and flatworms*
	Mean condition factor	*1.00±0.02*
	Sample size (n)	*8*

Discussion

The 25 fish species recovered represent about 45% of the 55 fish species recorded in Lake Albert and its catchment. The occurrence of these fish species is subjective to their respective habitats and sampling variation. Most of the fishes retrieved from Waiga-Waisoke delta (AL8), and the Victoria Nile delta (AL4), are potamodromous fish. They are known to occur in these shallow and sheltered bays and move upstream during breading, e.g *B. altianalis*, *Claris gariepinus*, among others.

The feeding ecology of these fishes are still normal, especially the insectivores such as Schilbe intermedius and all the Mormyrids are feeding on insect larvae and other invertebrates. Typical riverine fish species such as *Labeo* sp and *Barbus* sp were also retrieved. Although none of the open water, pelagic fishes such as *Hydrocynus forskhalii* and *Lates niloticus* were found breeding. They were preying on the other fish as expected. It's clear that much more data over several seasonal rounds would be required to visualize clear trends. Tentatively, available data points to likely conditions in biological parameters like feeding habits and spawning and percentage maturity of various fish species.

The Haplochromines recovered during this sampling survey were mainly returned back after identification. It was clear that site AL7 dominated the catch and there are mainly two species from the genus *Thoracochromis albertanius* and *T. avium* from this sampling.

Summary

A total of 25 fish species belonging to 10 families and 22 genera were recovered during this survey. The species richness was highest at AL8 (Waiga –Waisoke river mouth) in Lake Albert followed by AL12 (River Waiga) and the least number of species – one each - were recovered from AL1 and AL5 (Victoria Nile) and the "dry river" respectively. The respective species caught were *Synodontis frontosus* and *Barbus perience*). Haplochromines were the most abundant fish species around the proposed water abstraction area by both numbers and weight. However, considering the sampled habitats site AL7 yielded 68% of the catch as sites AL8 (Waiga-Waisoke) and AL12 (R. Waiga) contributing 13% and 12% by number of fish respectively. The same trend was observed in the yield by weight where AL7, AL8 (Waiga-Waisoke) and AL12 (R. Waiga) yielded 41%, 18% and 14% respectively. The fish catch rates from this survey ranged from 0.75 - 239 fish/gear/day and yielded 4 – 2395 g/gear/day. Most riverine species were recovered and its catch was species rich. Majority of the fish caught during this survey were juvenile/immature fish, with less than 40% of them breeding and in good condition.

P.7 Summary Tables

The summary tables detailed below, provide a high level overview of the habitats and species assessed throughout Chapter 15: Aquatic Life. They represent the worst case scenario in terms of residual impacts, which are related to indirect impacts. For a more detailed assessment of both direct and indirect impacts on aquatic life, please refer to the topic chapter, Chapter 15.

Murchison Falls–Albert Delta Wetland System Ramsar Site							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**Wildlife Reserve**	**IUCN:**	**III**	**KBA:**	**No**

Summary Description
Designated in 2006, this Ramsar site covers an area of 17,293 ha, stretching from the top of Murchison Falls to the Albert Delta. It lies predominantly within the Murchison Falls National Park (MFNP), although a small area along the southern edge is outside the park. It is also designated as an Important Bird Area (IBA). The Ramsar site was designated as it supports rare, vulnerable and endangered species, including shoebill and grey crowned cranes. It also supports the largest known population of the Nile crocodile in Uganda, and a number of indigenous fish species and is a spawning ground on which fish stocks depend (Byaruhanga & Kigoolo 2005). The river contains several sandbanks and Papyrus islands. The delta area of the Ramsar site has never been fully surveyed and data about its importance for fish are likely to be incomplete. (The Project Proponents are currently conducting surveys in the Area). Whilst this protected area itself is not a Key Biodiversity Area (KBA), it is worth noting that it falls within Murchison Falls National Park which is classified as a KBA.

Relation to project		
Planned project facilities within the protected area	**Core infrastructure**	• A single flowline (Victoria Nile HDD Crossing) will pass through the area, beneath the river bed and two isolation valves will also be located in the area.
	Supporting infrastructure / associated facilities	• Approximately 7-8km worth of roads currently pass through the area, however no roads will be upgraded or constructed within the protected area.
	Activities	• Flowline construction will occur during the construction phase. Activity related to flowlines will be minimal during the operational phase.
Planned project facilities in proximity to the protected area	**Core infrastructure**	• Two well pads will be located within 1km of the protected area. These include NGR-01 and JBR-10. Flow lines associated with these well pads will also be present.
	Supporting infrastructure / associated facilities	• No further activities will take place within close proximity to the protected area boundary.
	Activities	• Construction and operation of the well pads and flowlines mentioned above.

Key features of the Protected Area	
Key Habitats & Quality	The Murchison Falls-Albert Delta Wetland System includes both the lotic (riverine) habitat of the Victoria Nile and the transitional habitat of the Nile Delta. The Nile Delta is considered to be a particularly sensitive habitat, and forms a key part of this protected area. Both habitats are of very high ecological quality, and bring a significant amount of tourism to the area. The Victoria Nile is a larger moderately fast flowing watercourse with a depth of 1-6.5m, a width from 300-600m (based on ESIA baseline survey sites), and a substrate dominated by hard sandy clay. The Nile Delta consists of the Victoria Nile split into multiple channels by islands covered in vegetation. Water depth ranges from 1-4m and the substrate is dominated by hard sandy clay.

Species Significance	The following species of fish are particularly sensitive and limited primarily to the Victoria Nile/ Nile Delta area: - *Citharinus latus* - *Nannocharax niloticus* - *Synodontis victoriae* - *Marcusenius victoriae* - *Synodontis afrofischeri* The following species of shrimp are particularly sensitive and limited primarily to the Victoria Nile/ Nile Delta area: - *Caridina nilotica*
Protected area management	
Management authority	• The Uganda Wildlife Authority (UWA) is in charge of managing the protected area (PA). The area falls within the management area of Murchison Falls Protected Area (MFPA), , and so is managed by the Wetlands Management Department.
General management objectives	• The general management objectives of a Ramsar site include: • Water management, habitat management, species management, creation of zones, and the management of the multiple values of the site. • Preparedness for and responses to emergency situations (e.g. flooding, fire, disease outbreak) are another important component of management activities. • Guidance on how to implement management activities can be found at pages 37-44 of Wetlands Management Planning: A guide for Site Managers.
Relevant management plans:	• Alongside management activities, it is important to undertake activities related to the collection and management of information. • This could include surveys, surveillance and other forms of data gathering and recording. Typically, species and their habitats or physical and environmental variables are monitored through repeated surveys. • Monitoring should also cover important ecosystem components, processes, benefits and services that characterise your wetland. • **Murchison Falls Protected Area General Management Plan** (2012 – 2022), Uganda Wildlife Authority. Published: September 2013 •
Specific management Objectives:	Specific management objectives from the MFPA General Management Plan are divided into 4 programs, each with its own subset of objectives: 1. Resource Conservation program - To maintain the integrity of the PA by end of the plan period. - To ensure that all activities related to petroleum, hydropower and tourism developments do not adversely harm the integrity of the PA. - To reduce adverse effects of fires, exotics and invasive species, vegetation changes on ecosystem health. - To ensure the conservation of wildlife outside the protected area. - To contain and manage wildlife diseases. 2. Community Conservation program - Objective: To ensure harmonious coexistence between the PA/wildlife and the neighboring communities by 2022. 3. Tourism Development program - To improve revenue for the protected area without having negative environmental and community impacts. 4. Monitoring and Research program - To establish the impact of climate and vegetation changes on the ecosystem health by the end of the plan period. - To monitor ecosystem health, socio-economic dynamics of neighboring communities and generate information for decision making throughout the planned period. - To establish the impact of oil, hydropower and tourism developments on ecosystems by the end of the plan period.
Management status, existing threats & challenges	
- The PA is actively managed by the UWA. - Key threats to aquatic life include heavy overfishing of the Victoria Nile and Nile Delta, as well as the impact of changing land usage altering nutrient ratios and creating high levels of suspended sediments decreasing water quality. - Tourist lodges, fires by locals, agriculture, - A recent law enforcement review concluded that MFPA is significantly under-resourced (in terms of numbers of staff, staff training and capacity, funding and logistics) for tackling these key threats.	

Potential Project Impacts:				
Potential Direct Impacts	• Accidental incidents could occur during nearby well pad and flowline construction and operation and during HDD operations. Major events as described in Chapter 20: Unplanned events could have major and long-lasting impacts on these sensitive environments. • Direct disturbance to aquatic life as a result of underwater noise/ vibration during the installation of the flowline beneath the Victoria Nile. This impact is likely to be relatively local and short-term in impact.			
Potential Indirect Impacts	• Increased overfishing as a result of growth in local population size. Potentially major and long-term impact if not appropriately mitigated. • Altered surrounding land use leading to decrease in water quality through run-off. • Increased local population size putting local resources under pressure and making it more difficult to obtain a harmonious existence between the PA/wildlife and local communities. • Potential reduction in tourism to the area due to the presence of the oil industry. . • Extra challenges to maintaining the integrity of the protected area due to the direct and indirect risks the oil development will bring. One of the key challenges here in particular is the unpredictable but potentially severe nature of indirect impacts.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Character of Potential Direct Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**HIGH**	**MEDIUM**
Summary justification for impact magnitude	There will likely be minimal impact during the Site Preparation and Enabling Works. However, moderate habitat degradation is possible during this phase due to the sensitivity of the protected area and pressures from land clearing works. Therefore, it is possible that 10% to 20% of the feature could be affected.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental impact on PA quality. The installation of the Victoria Nile HDD Crossing could cause local disturbance through underwater noise/vibration as well as cause a decrease in water quality through land use change at construction sites. Moderate degradation or disturbance of ecological function, species populations, habitat coverage or functionality could occur. Between 10% and 20% of the feature could be affected by the impact.	This is the longest phase where potential impacts could be greatest if ineffective mitigation measures are in place. Increase in mortality of a range of species could occur as a result of over fishing from induced populations and ease of access, in addition to degradation in water quality. Any major unplanned event could have a severe and long lasting impact. Over 20% of the feature could be affected by the impact.	There will likely be minimal impact on the habitat during the Site Decommissioning Works, especially if the pipe is left in-situ. Despite the likely minimal impact, due to the sensitivity of the protected area it is possible that between 10% and 20% of the feature could be affected.

Potential Impacts Significance	**HIGH**	**HIGH**	**CRITICAL**	**HIGH**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**HIGH**	**HIGH**	**CRITICAL**	**HIGH**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be particularly significant during this phase, as few workers will be present within the project area and limited activities will take place within the vicinity of the PA. However, moderate habitat degradation is possible during this phase due to the sensitivity of the protected area and pressures from land clearing works. Therefore, it is possible that 10% to 20% of the feature could be affected.	Further land-use change for construction works could contribute to increased run-off and a decline in water quality. Of most concern during this phase are the indirect impacts associated with a large workforce influx, and in particular the unpredictable impact this could have.	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in quality of the PA. An increase in overfishing is also a likely indirect impact. The unpredictable nature of these indirect impacts is of particular concern.	Impacts during this phase should be less significant, as there will be fewer workers. Decommissioning works should have a relatively low impact on the PA especially if the pipe is left in-situ. The most significant risk comes from potential accidental spillage of fuels and chemicals and disturbance as a result of the removal of well pads and flowlines.
Mitigation				
	Mitigation measures for direct and indirect impacts are provided in Chapter 15, for each phase of the Project.			
Mitigation Discussion	Mitigation measures related to direct impacts on the aquatic environment seek to understand the baseline conditions for water quality and quantity, prevent deterioration in water quality and quantity and provide mitigation measures should an accidental pollution incident occur. Additionally, where possible, the location of structures such as the water abstraction pipeline and abstraction station, seek to minimise habitat loss. The biggest risk to fish species, during all stages of the development, is a reduction in water quality. Therefore, procedures and protocols need to be in place before construction begins to prevent uncontrollable run-off of contaminated surface waters into Lake Albert, Victoria Nile and connected waterbodies. A potential increase in suspended sediments may occur as plant move across the Site mobilising sediment, especially during the dry season, where the influence of dust may be substantial. More substantial impacts may occur for species found within the shallow waters of the Victoria Nile where the ferry crossing piers are located and Lake Albert, where the water abstraction station may be built. Therefore, mitigation measures to reduce suspended solids and the smothering of aquatic habitats and species are important. Monitoring of water quality will be completed throughout the life cycle of the project to ensure no detrimental impact on water quality. Mitigation measures related to the pipeline location will minimise any direct impacts on habitat or species loss.			

RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of the PA should be minimal and should have a Low impact on the quality of the aquatic habitat assuming all mitigation measures are implemented and are effective. Long-term water quality monitoring should be in place throughout the life of the project and pollution prevention measures put in place. **Population changes** There should be low residual impacts on the PA if all mitigation measures are followed. However, there is still potential for negative impacts during all phases of the project, if mitigation is not effective. However, residual impacts assume that mitigation measures implemented are effective. **Disturbance** Mitigation to protect this PA, if effective, should preserve the environmental and ecological quality of the area. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**NEGLIGIBLE**	**LOW**	**NEGLIGIBLE**
Summary justification for residual impact assessment	The residual impact assumes that additional mitigation measures for direct impacts are successful and any residual impacts are related to indirect impacts, which are more difficult to control. With mitigation measures in place, no discernible degradation or disturbance of the PA should occur. Any impacts will be temporary and reversible.	The residual impact assumes that additional mitigation measures for direct impacts are successful and any residual impacts are related to indirect impacts, which are more difficult to control. With mitigation measures in place, no discernible degradation or disturbance of the PA should occur. Any impacts will be temporary and reversible.	The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	The residual impact assumes that additional mitigation measures for direct impacts are successful and any residual impacts are related to indirect impacts, which are more difficult to control. With mitigation measures in place, no discernible degradation or disturbance of the PA should occur. Any impacts will be temporary and reversible.
Residual Impacts Significance	**LOW**	**LOW**	**MEDIUM**	**LOW**

Freshwater Shrimp, ***Limnocaridella alberti***

Shrimp	Status (IUCN)	Status (Uganda n Red List)	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Limnocaridella alberti	DD	n/a	n/a	**C**	Occurs in the Lake Albert system.	HIGH

Freshwater Shrimp, ***Limnocaridella alberti***	
SPECIES OVERVIEW	
Biodiversity significance	*L. alberti* is endemic to Lake Albert. The species is only known from data collected in 1908 and so is considered Data Deficient by IUCN. It is an endemic species to Lake Albert and so considered to be a High sensitivity receptor.
Species Ecology	A very small planktonic species.
Habitat Preference	Lake-dwelling species.
Population & Trends	Although no specific data is available, the IUCN suggest the population size of this species within Lake Albert may be very substantial due to the size of the lake and the planktonic nature of the species.
Summary of state of knowledge	The species is not utilised by humans. There appears to be very little known about the ecology of this species. Anything likely to impact on zooplankton populations may impact this species. Such impacts include chemical spills, increased levels of suspended solids and change to nutrient ratios. Due to an overall lack of knowledge on this species, a precautionary approach was taken for the assessment.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss and Degradation** Very little information is available on the ecology of this species; however it is likely that it will be present within the vicinity of the works in Lake Albert due to the IUCN suggestion that the population size may be very substantial. As such, construction of the water abstraction pipeline and potential pontoon/station could directly lead to the loss or degradation of this species habitat. Accidental spill of hazardous chemicals or discharge of suspended solids may also directly impact the quality of the habitat this species relies upon. **Population changes** The population of this species could be directly impacted during both construction and operational phases as outlined in this section. **Disturbance** Disturbance may occur during both the construction of abstraction pipeline and potential pontoon/station. This species may also be disturbed during the operational phase of the abstraction pipeline as a result of vibration and possible impingement/entrainment. **Barrier effects** None known
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and

Freshwater Shrimp, ***Limnocaridella alberti***				
	nutrient ratios in areas of Lake Albert of close proximity to the site. This could result in habitat loss/degradation. A key concern in this instance is the lack of ecological understanding for this species and uncertainty surrounding the potential extent and duration of indirect impacts. **Population changes** As a result of habitat loss/degradation one may expect to see a change in population in response to this depending on the severity of the change. Any such changes are likely to be localised and short term in nature. This species of shrimp is not utilised by humans, however it is still possible that the use of destructive fishing techniques could impact this species through habitat loss. **Disturbance** See population changes- disturbance associated with increased fishing pressures. Light and noise pressures from induced population numbers may have a localised impact on this species. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for impact magnitude	Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context are likely to be affected by the impact.	The installation of the water abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Due to the lack of information on the ecology of this species, and due to the uncertainty in terms of extent and duration of indirect impacts, moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20%	This is the longest phase where impacts could be greatest if no effective mitigation measures are in place. Increase in mortality could occur as a result of degradation in water quality and over abstraction (influx). Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There will be minimal impact on Lake Albert during the Site Decommissioning Works, especially if the pipe is left in-situ. However to be conservative it is assumed that up to 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.

Freshwater Shrimp, ***Limnocaridella alberti***				
		of the feature's population and/or distribution within the landscape context could be affected by the impact.		
Potential Impact Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for associated and supporting infrastructure construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *L. alberti* and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Associated and supporting infrastructure construction works will facilitate access to the area, which will be combined to in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques could lead to a reduction in *L. alberti* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Associated and supporting infrastructure construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *L. alberti* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *L. alberti* and their habitat.	Impacts during this phase should be less significant, as there will be fewer workers. Associated and supporting infrastructure decommissioning works should have minimal impact on the habitat of *L. alberti*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. All mitigation measures are relevant to shrimp species			

Freshwater Shrimp, ***Limnocaridella alberti***				
	As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *L. alberti* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for an increase in mortality during all phases of the development as induced pressures may not be regulated, but impacts are still considered to be minimal for this shrimp species. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	The residual impact assumes that additional mitigation measures for direct impacts are successful and any residual impacts are related to indirect impacts, which are more difficult to control. With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will	The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate. With mitigation measures in place, no discernible degradation or disturbance of the PA should occur. Any impacts will be temporary and reversible.	The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.

Freshwater Shrimp, ***Limnocaridella alberti***				
	be temporary and reversible.			
Residual Impacts* Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Bellamya rubicunda

Ceratophallus bicarinatus

Ceratophallus faini

Gabbiella candida

Gabbiella humerosa ssp. alberti

Gabbiella walleri

Biomphalaria stanleyi

Freshwater Mollusc	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Tier / Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 & 2, Critical Habitat Qualifying						
Gabbiella candida	CR	n/a	C	**C**	Lake Albert	VERY HIGH
Gabbiella humerosa ssp. Alberti	EN	n/a	Tier 1 (1a, b & 2a)	**C**	Lake Albert	VERY HIGH
Criterion 2, Tier 1 & 2, Endemic/Restricted Range						
Bellamya rubicunda	NT	n/a	Tier 1 (2a)	**C**	Lake Albert	VERY HIGH
Biomphalaria stanleyi	NT	n/a	Tier 2 (2b)	**C**	Lake Albert	HIGH
Ceratophallus bicarinatus	LC	n/a	Tier 2 (2b)	**C**	Lake Albert	HIGH
Ceratophallus faini	DD	n/a	Tier 1 (2a)	**C**	Lake Albert	VERY HIGH
Gabbiella walleri	DD	n/a	Tier 1 (2a)	**C**	Lake Albert	VERY HIGH

Freshwater Mollusc	
SPECIES OVERVIEW	
Biodiversity significance	**These species have been grouped because they are all mollusc species associated with Lake Albert and are therefore likely to be vulnerable to the same types of impacts.** ***Gabbiella candida*** The species is endemic to Butiaba, Lake Albert and is known from only one location. This species is classed as Critically Endangered (CR) by IUCN. Based on current knowledge, Lake Albert holds 100% of the global population and is Tier 1 Critical Habitat under Criteria 1 a, b & 2a. The estimated extent of occurrence for this species is <10,000 km². As a Tier 1

Freshwater Mollusc	
	Critical Habitat-qualifying CR species it is considered to have a Very High sensitivity. ***Gabbiella humerosa ssp. alberti*** Globally, this mollusc species is only known from Lake Albert in Uganda, with an estimated extent of occurrence of less than 5000 km² as Lake Albert is 5,335 km² and it only occurs in the shallow waters. It is estimated to occur at fewer than five locations in the lake. Based on current knowledge Lake Albert holds 100% of the global population and is therefore Tier 1 Critical Habitat under Criteria 1 a,b & 2a. As a Tier 1 Critical Habitat- qualifying EN species it is considered to have a Very High sensitivity. ***Bellamya rubicunda*** This species is only known and recorded from Lake Albert and is considered to be endemic to it. The estimated extent of occurrence for this species is <5,000 km². It only occurs down to a depth of 18 m and is close to meeting the IUCN criteria for Endangered. However, the number of locations where it is present is unknown and threats appear to be localised and dispersed, hence the classification is Near Threatened. Based on current knowledge Lake Albert holds 100% of the global population and is therefore Tier 1 Critical Habitat under Criteria 1 a,b & 2a. As a Tier 1 Critical Habitat-qualifying restricted-range species it is considered to have a Very High sensitivity. ***Biomphalaria stanleyi*** This species occurs in Lake Albert (Uganda/The Democratic Republic of Congo) and there is some uncertainty as to whether it also occurs in Lake Cyohoha (Burundi). If the species were to occur in both lakes then its area of occupancy (AOO), based on the area of suitable habitat, would be approximately 3,000 km² and its extent of occurrence (EOO) would be approximately 30,000 km². If the species is restricted to Lake Albert then its EOO would be 5,300 km² (based on the area of the lake). This is a relatively rare species with a fragmented distribution in the lakes but there is insufficient information to support severe fragmentation. Therefore, this species is listed as Near Threatened. Lake Albert holds a significant part of the global population of this restricted range species. As a Tier 2 Critical Habitat-qualifying restricted-range species its sensitivity is rated as High. ***Ceratophallus bicarinatus*** Globally, this species is known from Ethiopia, Uganda, and possibly also Lake Chad. Although there are no specific threats, there is declining quality of habitat due to erosion and silting from agriculture and water pollution. The estimated extent of occurrence for this species is <10,000 km². Based on available information, Lake Albert potentially holds an important part of the global population, therefore this species qualifies for Tier 2 Critical Habitat under Criterion 2. As a Tier 2 Critical Habitat-qualifying restricted-range species its sensitivity is rated as High. ***Ceratophallus faini*** Endemic to Lake Albert, on the western shore between Kawa and Sabiloko. Based on the information available, it is considered likely that this species qualifies as Restricted Range. On current knowledge Lake Albert holds all of the global population and is therefore Tier 1 Critical Habitat under Criterion 2. There is insufficient information on population status, distribution, threats and ecology to make a Red List assessment. As a Tier 1 Critical Habitat-qualifying restricted-range species it is considered to have a Very High sensitivity. ***Gabbiella walleri*** The species is endemic to Lake Albert, which holds all of the global population. Therefore, it is considered a Tier 1 Critical Habitat qualifying species under criterion 2, with Very High sensitivity. **It should be noted that none of these species have been evaluated in the Red List assessment for Uganda.**
Species Ecology	**Little is known about the ecology, population and distribution of many of these species and therefore a precautionary approach was taken in this assessment.** ***Bellamya rubicunda*** Large, freshwater snail. ***Ceratophallus bicarinatus*** This is a small freshwater snail found in deep water within Lake Albert.

Freshwater Mollusc	
	Ceratophallus faini This is a small freshwater snail found in Lake Albert. ***Gabbiella candida*** This is a freshwater snail found in Lake Albert. ***Gabbiella humerosa ssp. alberti*** Small freshwater snail. Generally this *Gabbiella* species occur in major lakes and surrounding swampy areas, tributaries and marshes. ***Gabbiella walleri*** A freshwater snail species endemic to Lake Albert. ***Biomphalaria stanleyi*** Considered). It is a broad and high-shelled lacustrine morphotype endemic to Lake Albert.
Habitat Preference	***Bellamya rubicunda* -** Lake Albert system in shallow freshwater habitat, down to 18m (Kyambadde, 2010) ***Ceratophallus bicarinatus* -** In Uganda, the species is only found at Butiaba in Lake Albert, where it is found at 18 m deep. It has also been found in fine gravels in the shallow waters of Lakes Zwai and Awasa in Ethiopia (and possibly also Lake Chad). ***Ceratophallus faini* -** Unknown ***Gabbiella candida* -** Only known from a small stretch of shoreline at Butiaba in Lake Albert, associated with freshwater/aquatic habitat and the Lake shoreline. ***Gabbiella humerosa ssp. alberti* -** Only known from shallow waters (< 12 m deep) in Lake Albert. *Gabbiella* species are detritivores/omnivores living on (muddy) bottoms and plants. ***Gabbiella walleri* -** Freshwater habitat between 8 and 40 m depth. *Gabbiella* species are detritivores/omnivores living on (muddy) bottoms and plants. ***Biomphalaria stanleyi* -** This species is associated with vegetation in shallow parts of Lake Albert (Brown, 1994).
Population & Trends	The population and current population trends are unknown for all species (IUCN, 2017)
Summary of state of knowledge	Little is known about the species ecology, population and distribution of these mollusc species; however, it is generally known that they exist within the shore/shallow areas of Lake Albert and associated wetlands. Therefore, a precautionary approach to development should be taken within these areas. The presence of *Gabbiella humerosa* ssp*. alberti* and *Bellamya rubicunda* in Lake Albert was confirmed by surveys completed in 2017.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts – direct	**Habitat Loss and Degradation** These species are associated with Landscape Context C (Lake Albert, rivers and wetlands) and already face a declining quality of habitat due to erosion and silting from agriculture and water pollution. The Tilenga Project Footprint includes this area and there are potential direct impacts from the installation of the water abstraction pipeline and pontoon within Lake Albert. There is potential for loss or degradation of wetland habitat utilised by some (or all) of these species due to potential accidental spillage of fuels/hazardous substances and uncontrolled release of suspended solids during the construction phase. Waste water from the well pads and service areas could also cause habitat degradation if not treated and disposed of correctly, such that contaminated water enters the hydrological regime. **Population changes** See indirect impacts (below). **Disturbance**

Freshwater Mollusc				
	Localised disturbance of mollusc habitat will occur during the construction phase, due to the installation of the water abstraction pipeline and pontoon. General noise from population increase could also disturb this species. **Barrier effects** None known			
Potential Impacts – indirect	**Habitat Loss and Degradation** Population changes induced by the Project, where worker economic dependents and others are attracted to the wider area may impact on habitats and species populations. This would be associated with land use changes, resulting in loss of vegetation and therefore, increase in surface water run-off and degradation of habitats, as well as increased disturbance. **Population changes** Human activity within mollusc habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat. Increased pressures on natural resources such as water may reduce water/habitat availability. Evidence of shell harvesting has been identified on the shores of Lake Albert. With population changes induced by the Project, pressures on this practice could be increased, potentially having a detrimental impact on population numbers. **Disturbance** Induced population changes in the landscape may potentially increase levels of disturbance through an increase in fishing, particularly the use of trawling fishing techniques. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH / HIGH**			
Character of Potential Direct Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**LOW**
Summary justification for impact magnitude	A small proportion of the species population is expected to be impacted during this phase, probably corresponding to between 10% and 20%, given the extent of direct impacts, the smaller duration of this phase also limits the effect of indirect impacts. During this phase, minor	Direct impacts are likely to affect mollusc species and their habitat, particularly the installation of the water abstraction pipeline along the bed of Lake Albert and the construction of the ferry landing facilities on the Victoria Nile. Both have the potential to influence water quality through	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already been put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of mollusc populations could be potentially affected,	A small proportion of the species population is expected to be impacted during this phase. Probably corresponding to between10% and 20%, given the extent of direct impacts, the smaller duration of this phase also limits the effect of indirect impacts. During this phase, minor

Freshwater Mollusc				
	habitat degradation or disturbance is expected. Change during this phase is not expected to be enough to result in a significant loss of mollusc species and/or their habitat. This impact will be mainly temporary.	increased suspended solids or potential accidental spills. Indirect impacts have the potential to be more significant, specifically related to pressures on fishing and shell collection using trawling and dredging methods and an increase in suspended solids from changes in land use. Therefore, between 10% and 20% of mollusc populations could be affected by the Project through direct and indirect impacts, notably through habitat degradation and disturbance. However, this phase is temporary and impacts can be reversed, therefore the magnitude is considered to be Moderate.	related to poor water quality from over abstraction, fuel/chemical spillage and/or increase in suspended solids from surface water run-off. Project in-migration could result in High habitat degradation or disturbance, leading to reduction in species population or habitat functionality.	habitat degradation or disturbance is expected. Change during this phase is considered unlikely to result in a significant loss of mollusc species and/or their habitat. This impact will be mainly temporary.
Potential Impacts Significance	**MODERATE**	**MODERATE - HIGH**	**MODERATE - CRITICAL**	**MODERATE - HIGH**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**HIGH**	**CRITICAL**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation	Direct impacts could be significant during this phase, especially related to the installation of the water abstraction pipeline and station and Victoria Nile HDD crossing, which could increase pressure on mollusc species and their habitat. A potentially significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilities	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and associated facilities construction works will facilitate access to the area, which will be combined to in-migration of people coming to the area in search of work. A high degradation or loss of habitat through pressures on water abstraction and water	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilities decommissioning works should have minimal impact on the habitat of mollusc species. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake bed through removal of the abstraction pipeline (if removed).

Freshwater Mollusc				
	status of the species or habitat. This impact will be temporary.	construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. Human activity within mollusc habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat. Increased pressures on natural resources such as water may reduce water/habitat availability.	quality could negatively influence populations of molluscs and their habitat.	
Mitigation (General)	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for mollusc species will be minimal and unlikely to significantly reduce habitat availability if mitigation measures are in place. Mitigation measures will ensure that water quality is not significantly impacted and there is no increase in pressures on shell harvesting. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no significant residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality via induced fishing pressures and habitat degradation, therefore, a precautionary approach has been taken in the assessment of impact. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**

Freshwater Mollusc				
Receptor Sensitivity	**VERY HIGH / HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**LOW**	**NEGLIGIBLE**
Summary justification for residual impact assessment	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate. .	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.
Residual ImpactsSignificance	**LOW**	**MODERATE**	**MODERATE**	**LOW**

Freshwater Mussel, ***Coelatura bakeri***							
Freshwater Mussel	**Status (IUCN)**	**Status (Uganda n Red List)**	**PS6 Tier / Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Coelatura bakeri	NT	n/a	Tier 2 (Criterion 2b)	**C**	**A**	Lake Albert and the Victoria Nile	HIGH

Freshwater Mussel, ***Coelatura bakeri***	
SPECIES OVERVIEW	
Biodiversity significance	*C. bakeri* has a restricted range (Lake Albert; and also parts of the Victoria Nile according to baseline surveys conducted by the Project) and is classed at Near Threatened on the IUCN Red List. Owing to its restricted range it is classified as a high sensitivity receptor.
Species Ecology	Unknown
Habitat Preference	Mandahl-Barth (1988) notes that the species is found in shallow waters in Lake Albert. It is only found above 10-15 m depth (D. Van Damme pers. comm. 2016). The species requires a host fish to complete its life cycle.
Population & Trends	Unknown
Summary of state of knowledge	This species is not utilised by humans. Threats from different types of pollution (sewage, run-off and agricultural pollution) are present in Lake Albert and there are additional potential threats from drilling for oil in areas at the north of the lake. The species is assessed as Near Threatened on the IUCN Red List as it almost meets the thresholds and

Freshwater Mussel, ***Coelatura bakeri***	
	conditions for criterion B1: it has a small distribution (extent of occurrence (EOO) of 5,300 km²), is present in single lake* with fragmented subpopulations due to polluted areas and 10-20 locations based on the threats from pollution and oil exploration. (*This assessment is based on the species being restricted to Lake Albert, but it was also recorded in the Victoria Nile in Project baseline surveys). Primary surveys found this species in Lake Albert as well as the Victoria Nile. Densities ranged from between 5 and 9/m^2 in both the dry and wet seasons. Therefore, information provided in secondary data is incorrect as it is not restricted to Lake Albert. Although the distribution of this species is understood, little is known about its ecology and therefore a precautionary approach has been taken in the Impact Assessment.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts – direct	**Habitat Loss and Degradation** As this species is found in the shallow waters of Lake Albert and the Victoria Nile, the construction of the water abstraction pipeline, ferry crossing piers and potential pontoon/station could directly lead to the loss or degradation of this species' habitat. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** The population of this species could be directly impacted during both construction and operational phases. **Disturbance** Disturbance may occur during the construction of the water abstraction pipeline, ferry crossing piers and potential pontoon/station. This species may also be disturbed during the operational phase of the water abstraction pipeline as a result of noise and vibration. Disturbance in the Victoria Nile may also be experienced during the tunnelling phase of the Victoria Nile HDD Crossing. **Barrier effects** None known
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert and the Victoria Nile have potential to increase suspended solids and nutrient ratios in areas of Lake Albert and the Victoria Nile, especially in close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of habitat loss/degradation one may expect to see a change in population in response to this. This species of mussel is not utilised by humans, however, it is still possible that the use of destructive fishing techniques could impact this species through habitat loss. Similarly, as this species is dependent on a host fish to complete its life cycle, indirect pressures on fishing may inadvertently have an effect on population numbers of mussels. **Disturbance** See population changes- disturbance associated with destructive fishing techniques. **Barrier effects**

Freshwater Mussel, ***Coelatura bakeri***				
	None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential Direct Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**MEDIUM**	**MEDIUM**	**MEDIUM**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on Lake Albert during the Site Preparation and Enabling Works, However, some localised impacts on the bed of the Victoria Nile could impact this mussel in shallow areas where piling occurs for the ferry crossing piers. Although minor habitat degradation is possible during this phase, no more than 20% of the feature's population and/or distribution within the landscape context will be affected by the impact. Indirect impacts are less likely to have an influence during this period.	The installation of the water abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase where impacts could be greatest if no effective mitigation measures are in place. Increase in mortality could occur as a result of degradation in water quality and loss of habitat (influx). Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There will be minimal impact on the habitat of Lake Albert and the Victoria Nile during the Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline,	This is the longest phase where impacts could be greatest if no mitigation measures are	Impacts during this phase should be less significant, as there will be fewer workers.

Freshwater Mussel, ***Coelatura bakeri***				
	within the Project area and limited activities will take place within the vicinity of Lake Albert. Minimal impacts could occur locally within the vicinity of the ferry crossing piers. Vegetation removal will take place for supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	which could increase pressure on this species and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective.	in place. Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat as well as a reduction in fish numbers, which this mussel is reliant on to complete its life cycle. Between 10% and 20% of the feature's population and/or distribution within the landscape context may be affected by the impact.	Supporting and associated facilitiesdecommissioning works should have minimal impact on the habitat of *C. bakeri.* The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for this species will be minimal and unlikely to significantly reduce habitat availability if all mitigation measures are implemented. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality via induced fishing pressures if fish are not available for the mussel to complete its lifecycle, therefore, a precautionary approach has been taken in the assessment of impact. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation &**	**Construction & Pre**	**Commissioning &**	**Decommissioning**

Freshwater Mussel, ***Coelatura bakeri***				
	Enabling Works	**Commissioning**	**Operation**	
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**MEDIUM**	**LOW**	**MEDIUM**
Summary justification for residual impact assessment	Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur as a result of construction within the Victoria Nile. Piling within the river bed may disrupt this species directly by habitat loss and an increase in suspended sediment. However, The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased and will be fully reversed and restored.	Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur as a result of construction within the Victoria Nile and Lake Albert. Piling within the river bed may disrupt this species directly through habitat loss and an increase in suspended sediment in addition to habitat loss caused through the implementation of the pipeline on the bed of Lake Albert. However, The impact can be reversed to baseline levels within 5 years of the activity causing the impact having ceased and/or less than 60% of the population / areas lost / habitat quality will be fully recovered / restored. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	This is the longest phase where impacts could be greatest if no effective mitigation measures are in place. Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat as well as a reduction in fish numbers, which this mussel is reliant on to complete its life cycle. With mitigation measures in place, less than 10% of the feature's population and/or distribution within the landscape context may be affected by the impact The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, it is unlikely any discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Freshwater Mussel, ***Chambardia trapezia***						
Freshwater mussel	**Status (IUCN)**	**Status (Uganda n Red List)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Chambardia trapezia	DD	n/a	n/a	**C**	Lake Albert	HIGH

Freshwater Mussel, ***Chambardia trapezia***	
SPECIES OVERVIEW	
Biodiversity significance	This species can only be found in Lake Albert, Lake Victoria and Lake Kyoga. This species is recognised by the IUCN as being Data Deficient. Due to highly limited distribution and the lack of knowledge on this species it is classified as high receptor sensitivity.
Species Ecology	Unknown
Habitat Preference	Unknown
Population & Trends	Unknown
Summary of state of knowledge	This species is not utilised by humans. Threats from different types of pollution (sewage, run-off and agricultural pollution) are present in Lake Albert and there are additional potential threats from drilling for oil in areas in close procimity to the lake in the North. Although it is understood where this species is found, very little is known about its ecology and therefore a precautionary approach has been taken in the Impact Assessment.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss and Degradation** Although very little is known about this species habitat preferences, it is found in the waters of Lake Albert and so the construction of the water abstraction pipeline and potential pontoon/station could directly lead to the loss or degradation of this species habitat. Potential accidental pollution incidents from hazardous chemicals and suspended solids from Project activities may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** The population of this species could be directly impacted during both construction and operational phases. **Disturbance** Disturbance may occur during the construction of the water abstraction pipeline and potential pontoon/station. This species may also be disturbed during the operational phase of the water abstraction pipeline as a result of noise and vibration. **Barrier effects** None known
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and

Freshwater Mussel, ***Chambardia trapezia***				
	nutrient ratios in areas of Lake Albert, especially in close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of habitat loss/degradation one may expect to see a change in population in response to this. This species of mussel is not utilised by humans, however, it is still possible that the use of destructive fishing techniques could impact this species through habitat loss. **Disturbance** See population changes- disturbance associated with destructive fishing techniques. General noise from population increase could also disturb this species. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**LOW**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on Lake Albert during the Site Preparation and Enabling Works, However, some localised impacts on the bed of the Victoria Nile could impact this mussel where piling occurs for the ferry crossing piers. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact. Indirect impacts are less likely to have an influence	The installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Increase in mortality could occur as a result of degradation in water quality (influx). Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There will be minimal impact on the habitat of Lake Albert and the Victoria Nile during the Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact.

Freshwater Mussel, ***Chambardia trapezia***				
	during this period.			
Potential Impacts Significance	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Minimal impacts will occur locally within the vicinity of the ferry crossing piers. Vegetation removal will take place for supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on this species and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat as well as a reduction in fish numbers, which this mussel is reliant on to complete its life cycle.	Impacts during this phase are expected to be less significant, as there will be fewer workers. Supporting and associated facilitiesdecommissioning works should have minimal habitat impact. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for this species will be minimal and unlikely to significantly reduce habitat availability if all mitigation measures are implemented. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental			

Freshwater Mussel, ***Chambardia trapezia***				
	Monitoring Programme. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality via induced fishing pressures, therefore, a precautionary approach has been taken in the assessment of impact. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Summary justification for residual impact assessment	Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur as a result of construction within and in close proximity tothe Victoria Nile. Piling within the river bed may disrupt this species directly by habitat loss and an increase in suspended sediment. However, The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased	Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur as a result of construction within the Victoria Nile and Lake Albert. Piling within the river bed may disrupt this species directly through habitat loss and an increase in suspended sediment in addition to habitat loss caused through the implementation of the pipeline on the bed of Lake Albert. However, The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased and/or less than 90% of the population / areas lost / habitat quality will be fully recovered / restored. The remaining significant residual impacts are a result of indirect impacts caused by in-migration	This is the longest phase where impacts could be greatest if no effective mitigation measures are in place. Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat as well as a reduction in fish numbers, which this mussel is reliant on to complete its life cycle. With mitigation measures in place, between 10% and 20% of the feature's population and/or distribution within the landscape context may be affected by the impact. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder	With mitigation measures in place, it is unlikely any discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. However, indirect impacts may be significant as a result of in-migration pressures to the region. It is considered that these indirect impacts may be harder to mitigate as they are more difficult to control, and the assessment therefore represents a conservative approach

Freshwater Mussel, ***Chambardia trapezia***				
		pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	to mitigate.	
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**LOW**

Albert Lates, ***Lates macrophthalmus***						
Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Tier / Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1a,b Critical Habitat-qualifying Species						
Albert Lates	EN	n/a	Tier 1 (Criterion1 a,b)	**C**	Occurs in the Lake Albert system.	VERY HIGH

Albert Lates, ***Lates macrophthalmus***	
SPECIES OVERVIEW	
Biodiversity significance	Globally, this species of fish is restricted to the single lake ecosystem of Lake Albert in Uganda where it is confined to waters deeper than 18 m (extent of occurrence <5,000 km²). The species is endemic to Lake Albert and is known from only five locations. It has been proposed as nationally Endangered based on the Red List assessment for Uganda On current knowledge Lake Albert holds 100% of the global population and is Tier 1 Critical Habitat within criterion 1 a, b. Based on its restricted range and IUCN designation this species is considered to have a Very High sensitivity.
Species Ecology	No precise data on feeding habits and breeding behaviour is available. However, it probably takes macro-invertebrates while young and converts to a fish diet at juvenile and adult stages. *L. macrophthalmus* grows to about 50 -70 cm TL and matures at about 32 cm TL. (National Fisheries Resources Research Institute, 2012).
Habitat Preference	Confined to waters deeper than 60 feet deep (Twongo, T. K., 2006).
Population & Trends	Decreasing
Summary of state of knowledge	Lake Albert is the only lake in Uganda where the two species of Nile perch (*Lates macrophthalmus and L. niloticus*) naturally coexist and form an important commercial fishery in the lake. The two species differ in size, shape and distribution, but are often considered as one by various stakeholders. The two species occur in different habitats in the lake; *L. macrophthalmus* fishes occupy mainly deep open waters and large bays while the larger *L. niloticus* prefer the smaller shallow inshore areas and lagoons. Differences in habitat preference result in the two species exposed to different levels of

Albert Lates, ***Lates macrophthalmus***				
	fishing mortality. Research from 2012 estimated put the proportions of the two species in the lake at 90% *L. macrophthalmus and 10% L. niloticus* (National Fisheries Resources Research Institute, 2012). However, recent designations suggest that *L. macrophthalmus* is now endangered and populations are decreasing. This can be attributed to heavy fishing pressure and eutrophication and anoxia in their preferred deep-water habitat.			
POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts - direct	**Habitat Loss and Degradation** *L. macrophthalmus* is sensitive to eutrophication and anoxia in deep-water habitat. The installation of the abstraction pipeline and pontoon has the potential to locally degrade the habitat of this species through direct loss of habitat and also increases in potential accidental pollution incidents from hazardous chemicals and suspended solids. Without mitigation these pressures can increase eutrophication and increase species mortality. **Population changes** See indirect impacts discussed below. **Disturbance** It is understood that the main disturbance could be during the construction phase with the installation of the abstraction pipeline into Lake Albert. In addition to the constant water abstraction from Lake Albert on a 24hr basis, with the potential to cause entrainment and impingement of aquatic species. Vibration within the vicinity of the water abstraction point could also have a detrimental influence on this species. **Barrier effects** None known			
Potential Impacts – indirect	**Habitat Loss and Degradation** *L. macrophthalmus* is sensitive to eutrophication and anoxia in deep-water habitat. Changes in land use around the shores of Lake Albert have the potential to increase suspended solids and have a detrimental influence of this species potentially through reduction in oxygen levels in the lake, potentially increasing fish mortality. **Population changes** Induced population changes in the landscape (Project-related in-migration) may potentially increase levels of disturbance through trawling, gill net and seine net fishing techniques. There is the potential for a significant increase in fishing activities, which has the potential to have a detrimental influence on *L. macrophthalmus* population numbers in Lake Albert, making the population unsustainable. **Disturbance** See population changes **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			

Albert Lates, ***Lates macrophthalmus***				
Character of Potential Direct Impact (Magnitude)	**NEGLIGIBLE**	**MEDIUM**	**HIGH**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**NEGLIGIBLE**	**MEDIUM**	**HIGH**	**LOW**
Summary justification for impact magnitude	There will be minimal influence of the deep water habitat of Lake Albert during the Site Preparation and Enabling Works. No more than 1% of the feature's population and/or distribution within the landscape context will be affected by the impact.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert. Additionally, the installation of the water abstraction pipeline and potential degradation in water quality from other Project activities could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Loss of species could occur as a result of over fishing (Indirect) and degradation in water quality and over abstraction. More than 20% of the feature's population and/or distribution within the landscape context could be affected by the impact	There will be minimal influence of the deep water habitat of Lake Albert during the Site Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact.
Potential Impacts Significance	**LOW**	**HIGH**	**CRITICAL**	**HIGH**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**HIGH**	**CRITICAL**	**LOW**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for supporting and Associated facilities	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *L. macrophthalmus* species and their habitat. A significant impact on these populations could be expected if appropriate	Indirect impacts include project-related in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and Associated facilities construction works will facilitate access to the	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and Associated facilities decommissioning works should have minimal impact on the habitat of *L. macrophthalmus*. The biggest risk comes

Albert Lates, ***Lates macrophthalmus***				
	construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and Associated facilities construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase of fishing could lead to a drastic reduction in *L. macrophthalmus* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	area, which will be combined to in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase of fishing, which could lead to a reduction in *L. macrophthalmus* populations and a degradation in habitat. Similarly, pressures on water abstraction and water quality could negatively influence populations of *L. macrophthalmus* and their habitat.	from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *L. macrophthalmus* species will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be minimal significant residual direct impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for an increase in mortality via indirect impacts if Influx Management Plans and Fisheries Management Plans are not able to fully mitigate the increased pressure on fisheries that may result from Project-related in-migration. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. However, there is still the potential for an increase in mortality via indirect impacts if adopted mitigatiuon measures are not able to fully mitigate the increased pressure on fisheries that			

Albert Lates, ***Lates macrophthalmus***				
	may result from Project-related in-migration In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**NEGLIGIBLE**	**LOW**	**NEGLIGIBLE**
Summary justification for residual impact assessment	During this phase activities are unlikely to influence the deep waters of Lake Albert and are temporary in nature, therefore, impacts are considered to be negligible. With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	During this phase activities are unlikely to influence the deep waters of Lake Albert and are temporary in nature, therefore, impacts are considered to be negligible. With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. However, there is still the potential for an increase in mortality via indirect impacts. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	During this phase activities are unlikely to influence the deep waters of Lake Albert and are temporary in nature, therefore, impacts are considered to be negligible. With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.
Residual ImpactsSignificance	**LOW**	**LOW**	**MODERATE**	**LOW**

Citharinus citharus ***Citharinus latus***						
Freshwater Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 2a Critical Habitat-qualifying Species						
Citharinus citharus	NE	n/a	1e	**C**	Occurs in the Lake Albert system.	HIGH

Freshwater Fish	Status (IUCN)	Status (Ugandan Red List)	PS6 Criterion	Landscape Context		General Location	Receptor Sensitivity
Citharinus latus	LC	n/a	1e	C	A	Occurs in the Lake Albert and Victoria Nile systems.	HIGH

Freshwater Fish, ***Citharinus* spp.**	
SPECIES OVERVIEW	
Biodiversity significance	***C. citharus*** is only found in Lake Albert within Uganda. However, the species is not exclusive to Uganda and can be found in a number of other countries in central Africa. The species is Tier 2 Critical Habitat within criterion 1e. As a result of limited distribution within Uganda, a lack of data and a high Critical Habitat rating, this species is classified as a High receptor sensitivity. ***C. latus*** is abundant throughout many parts of Africa and is an important commercial species of LC IUCN status. The species is Tier 2 Critical Habitat within criterion 1 e, suggesting a restricted range within Uganda. Due to a restricted range within Uganda, this species is classified as High receptor sensitivity.
Species Ecology	***C. citharus*** No information on feeding habits is available. This species is a total spawner (total spawners release all their eggs in a single lifetime event). Preferred temperature range is from 22-28ºC. ***C. latus*** *C. latus* feeds on benthic algae, phytoplankton, detritus and benthic animals. Spawning is thought to take place in perennial wetlands at high water.
Habitat Preference	***C. citharus*** is a demersal species, however, precise habitat preferences appear to be unknown. ***C. latus*** can be found in open water and vegetation beds of flowing water and lakes.
Population & Trends	Unknown
Summary of state of knowledge	***C. citharus*** There appears to be a lack of knowledge as to this species ecological preferences and population trends, and a lack of data as to the status of this species within Lake Albert. Therefore, a precautionary approach should be taken for the impact assessment of this species, based on a lack of knowledge. This species is utilised by humans in the aquarium trade. Whilst there is no evidence to suggest it is also a target of the fishing industry, similar species within the genus *Citharinus* are targeted and so this remains a possibility. ***C. latus*** The IUCN suggest that as a commercially valuable fish species, overfishing is a potential threat to the health of the population. Overall, there appears to be very little data as to the health of this species within Lake Albert. Due to this lack of knowledge, a precautionary approach was taken for the impact assessment.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts – direct	**Habitat Loss and Degradation** ***C. citharus*** is a demersal species, and whilst precise habitat preferences are unknown, it is likely that developments with an impact on the lake-bed may directly degrade local habitat of this species through loss as a result of the abstraction pipeline and potential pontoon/station construction. Potential

Freshwater Fish, ***Citharinus* spp.**	
	accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. ***C. latus*** has a habitat preference for a combination of open water and vegetation beds. Due to preference for open water, this species is unlikely to be found in large numbers in nearshore areas. Despite this it remains a possibility that developments with an impact on the benthic substrate and associated vegetation may impact this species through habitat loss/degradation. As such, the construction of the water abstraction pipeline, ferry crossing piers and potential pontoon/station may have direct impacts on local populations of this species. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** See indirect impacts **Disturbance** Both species are likely to be present in nearshore waters, and may be directly disturbed by the installation of the abstraction pipeline and potential pontoon/station. This species may also be disturbed during the operational phase of the abstraction pipeline as a result of noise, vibration and possible impingement/entrainment, the extent of which will depend on the type of abstraction technique selected, which is outlined in the discussion section of this table. ***C. latus*** is found in lake habitats and flowing water, so the tunnelling phase of the pipeline beneath the Nile could directly disturb this species as a result of vibration transmitted throughout the water column. It is likely this would only cause disturbance on a local scale. **Barrier effects** ***C. citharus*** None known ***C. latus*** This species is thought to breed in perennial wetlands at high water. *C. latus* may partake in migration in order to facilitate this, in which case the construction of the pipeline beneath the River Nile could act as a potential barrier to migration through noise and vibration during the tunnelling process. However, this is difficult to adequately verify as very little is known about the life history traits of this species, particularly regarding migratory habits.
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and nutrient ratios in areas of Lake Albert of close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of the potentially direct impact of habitat loss/degradation, one may expect to see a change in population in response to this, depending on the severity of the change. Any such changes are likely to be localised and short term in nature. Another indirect impact on population change may be the increased fishing pressure expected with an increased local population during the construction and operational phases. Direct fishing pressure as well as habitat loss/degradation as a result of destructive fishing techniques could potentially impact the population of this species on a much larger landscape scale. Appropriate mitigation measures are therefore essential. **Disturbance** See population changes- disturbance associated with increased fishing pressures. Light and noise pressures from induced population numbers may also have a localised impact on this species. **Barrier effects**

Freshwater Fish, ***Citharinus* spp.**				
	None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on the benthic habitat and associated demersal fish species of Lake Albert during the Site Preparation and Enabling Works. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context will be affected by the impact.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert. Additionally, the installation of the water abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase (over 10 years) where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing, degradation in water quality and over abstraction (influx). Over 20% of the feature's population and/or distribution within the landscape context could be affected by the impact. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur.	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. No more than 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**

Freshwater Fish, ***Citharinus* spp.**				
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for the supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *C. citharus* and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilities construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling could lead to a reduction in *C. citharus* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *C. citharus* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *C. citharus* and their habitat.	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilities decommissioning works should have minimal impact on the habitat of *C. citharus*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *C. citharus* are expected to be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly impacted.			

Freshwater Fish, ***Citharinus* spp.**				
	Fishing will be banned for all site personnel to mitigate over fishing and loss of the fishery. Preventing fishing will also reduce disturbance and degradation of fish habitat. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are followed. However, there is still the potential for mortality during construction of the water abstraction pipeline and also induced fishing impacts. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**MEDIUM**	**LOW**
Summary justification for residual impact assessment	Minimal activities will take place within Lake Albert during this phase, therefore, with mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. However, induced pressures on fishing and buffer zones may not be regulated/enforced, therefore, impacts on this species may still occur. However, as this species is demersal impacts are expected to be low as up to 10% of the population is only expected to be influenced during this phase. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. However, induced pressures on fishing and buffer zones may not be enforced/regulated, therefore, impacts on this species may still occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity,	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur during this phase. The impact will be temporary and reversible.

Freshwater Fish, ***Citharinus* spp.**				
		indirect impacts may be more significant than the direct impacts and harder to mitigate.	including connectivity, may occur. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	
Residual Impacts* Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

**In-combination effects are not considered in assessing the residual impact.*

Freshwater Fish, ***Synodontis victoriae***							
Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 2b Critical Habitat-qualifying Species							
Synodontis victoriae	LC	n/a	1e & 2b	**C**	**A**	Occurs in the Lake Albert and Victoria Nile systems.	HIGH

Freshwater Fish, ***Synodontis victoriae***	
SPECIES OVERVIEW	
Biodiversity significance	*S. victoriae* is classified as a species of Least Concern due to its large extent of occurrence across Uganda and neighbouring countries. Previously this species has been classified as Near Threatened (2006). The species is Tier 2 Critical Habitat within criterion 1e &2b. As this species is restricted to between 13m and 80m deep and due to its Critical Habitat status, this species is considered to have a High sensitivity within the Lake Albert region.
Species Ecology	*S. victoriae* feeds on gastropod molluscs and insects (particularly chironomid larvae), and to a lesser extent on fishes and ostracoda. Typically this species does not grow more than 35cm in length.
Habitat Preference	*S. victoriae* can be found in lakes and rivers. It prefers deeper waters, typically found over 13m deep and up to 80m deep. It can be found on both hard and soft substrates, but is more common over soft substrates.
Population & Trends	There are no records as to the status of this species within Lake Albert.
Summary of state of	Although there is insufficient data as to the status of this species within Lake Albert, it appears that this

Freshwater Fish, ***Synodontis victoriae***				
knowledge	species will be most susceptible to impacts in deeper water. Due to an overall lack of knowledge, a precautionary approach should be taken for the impact assessment. Utilised by the aquarium trade.			
POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts - direct	**Habitat Loss and Degradation** Due to the preference of this species for deep waters, it is unlikely direct impacts of the construction works on the shores of Lake Albert will be felt. However, accidental pollution incidents from hazardous chemicals and suspended solids may directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** See indirect impacts **Disturbance** Depending on the location of abstraction selected, there is the potential for this species to be disturbed directly during construction and operation. These are outlined in more detail in the discussion section of this table. Similarly light and noise pollution may have localised impacts on this species. **Barrier effects** The tunnelling works underneath the River Nile may directly impact this species via underwater noise and vibration. This impact will only be present during the construction phase of the project, and is unlikely to have any long term impacts on the species.			
Potential Impacts – indirect	**Habitat Loss and Degradation** The habitat of this species may potentially be impacted by any increases in suspended particles and nutrient ratios in the water column as a result of changes to land use resulting from the project induced influx. **Population changes** This species is not known to be a target fishery species, however, increased fishing pressure as a result of the influx could have an impact on this species through increased bycatch and pressure from destructive fishing techniques such as trawling and gill nets. This could result in a population change, the severity and length of such change would depend on the level of fishing pressure increase and whether or not this can be adequately mitigated. Induced pressures from light and noise could also have a localised influence on species distribution. **Disturbance** Disturbance from fishing pressure suggested in population change above. Light and noise from induced populations may also have a localised impact on species distribution. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			

Freshwater Fish, ***Synodontis victoriae***				
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on the benthic habitat of Lake albert during the Site Preparation and Enabling Works. Similarly, construction works within the Victoria related to the barge crossing piers will only occur in shallow waters and the pipe crossing will only provide minimal disturbance within deep waters, from which the fish can relocate. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert and the Victoria Nile. Additionally, the installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing and degradation in water quality and over abstraction (influx). Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact. Although the impacts could be long term (over 10 years) the scope and severity are considered to be moderate based on the species preference for deep waters (over 13m).	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilities decommissioning works

Freshwater Fish, ***Synodontis victoriae***				
	limited activities will take place within the vicinity of Lake Albert. Similarly, construction works within the Victoria related to the barge crossing piers will only occur in shallow waters and the pipe crossing will only provide minimal disturbance within deep waters, from which the fish can relocate. Vegetation removal will take place for supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	pressure on *S. victoriae* and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling and gill nets could lead to a drastic reduction in *S. victoriae* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	population or habitat. Although the impacts could be long term (over 10 years) the scope and severity are considered to be moderate based on the species preference for deep waters (over 13m). Supporting and associated facilities construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *S. victoriae* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *S. victoriae* and their habitat.	should have minimal impact on the habitat of *S. victoriae*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *S. victoriae* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality during construction of the water			

Freshwater Fish, ***Synodontis victoriae***				
	abstraction pipeline and induced fishing pressures. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. However, induced pressures from light and noise may still have a low localised impact on this species during operation. **Barrier effects** If this species is an inhabitant of the Victoria Nile, there is the potential for it to be influenced by noise and vibration during the construction period of the pipeline beneath the river bed. However, influences will be temporary and not completed during key species spawning and migration periods. Therefore, impacts are considered to be low. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Minimal activities will take place within Lake Albert during this phase, however, direct disturbance will still occur within the Victoria Nile. Fish in the immediate vicinity of the works will be expected to move from the area if works and ramped up. Similarly, with mitigation measures in place, impacts on water quality should be minimal. Therefore, with mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. However, induced pressures on fishing and buffer zones may not be regulated/enforced, therefore, impacts on this species may still occur. As this species is widely distributed across Lake Albert, the Victoria Nile impacts are expected to be low as up to 10% of the population is only expected to be influenced during this phase. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. However, induced pressures on fishing and buffer zones may not be enforced/regulated, therefore, impacts on this species may still occur. Although the duration of this phase is long (over 10 years) the scope and severity based on the species preference for deep waters (over 13m) is expected to be low with mitigation measures in place, with up to 10% of the population with the potential to be influenced. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur during this phase. The impact will be temporary and reversible. However, there is a greater potential of disturbance to the population due to the construction of the water abstraction pipeline and in-migration pressures on fishing.

Freshwater Fish, ***Synodontis victoriae***				
		indirect impacts may be more significant than the direct impacts and harder to mitigate.	is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	
Residual ImpactsSignificance	**LOW**	**LOW**	**MODERATE**	**LOW**

Freshwater Fish, ***Oreochromis leucostictus***						
Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 2b Critical Habitat-qualifying Species						
Oreochromis leucostictus	LC	n/a	2b	**C**	Occurs in the Lake Albert system.	HIGH

Freshwater Fish, ***Oreochromis leucostictus***	
SPECIES OVERVIEW	
Biodiversity significance	This species of cichlid is originally native to Uganda and the Democratic Republic of the Congo, although it can now be found widely across central Africa. It is a widespread species and no threats have been identified that might have a significant impact on the original population. The species is Tier 2 Critical Habitat within criterion 2b. Based on its CHQS status and preference of shallow waters (0-10cm) it is considered a High sensitivity receptor.
Species Ecology	This species can reach a length of 36cm. Feeding is mainly on phytoplankton and filamentous algae, although feeding on bottom deposits has been reported. Maternal mouth brooder, with no evidence of a restricted breeding season or peak in reproductive period. Gonadal development does however appear to be favoured by periods of high temperatures and sunshine.
Habitat Preference	*O. leucostictus* is a species of lagoons, particularly closed or semi-enclosed lagoons. It prefers shallow channels and vegetated shores, and is tolerant of low oxygen and high temperatures of up to 38^{o}C. Depth preference is from 0-10m.
Population & Trends	Unknown
Summary of state of knowledge	Whilst population trends for this species are unknown, a relatively large amount is known about its preferred habitats. This is valuable in ensuring these areas are appropriately considered in any mitigation plans. This is important because despite having a relatively broad distribution throughout central Africa, its presence within native water bodies such as Lake Albert should not be put at risk. This species was found in the River Tangi during primary data collection surveys. There are potential changes to be made to the Tangi bridge, the impact of which will need consideration.

POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts - direct	**Habitat Loss and Degradation** This species is likely to be present along the banks of Lake Albert in shallow vegetated areas. As a result of this it is very likely this species will be directly impacted by the project during the construction phase. During the construction phase, construction of the abstraction pipeline and potential pontoon/station will likely directly remove/degrade local habitat for the species. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** The local population of this species is likely to be directly impacted by both construction and operational activities outlined above and below within section. **Disturbance** Disturbance is likely to occur during both construction and operational phases. The construction of the abstraction pipeline and potential pontoon/station will directly disturb this species, and during the operational phase vibration from abstraction may well cause local disturbance. Depending on the location decided for abstraction to take place, impingement/ entrainment may also cause disturbance, this is outlined in more detail in the discussion section of this table. **Barrier effects** None known			
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and nutrient ratios in areas of Lake Albert of close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of habitat loss/degradation one may expect to see a change in population in response to this depending on the severity of the change. Any such changes are likely to be localised and short term in nature. Another indirect impact on population change may be the increased fishing pressure expected with an increased local population during the construction and operational phases. Although there is no indication this species is a target fishery species, increased fishing pressure may lead to impacts through by-catch and destructive fishing techniques. **Disturbance** Potential changes to the Tangi bridge could potentially result in the disturbance of this species on a local basis. This could also potentially lead to habitat loss and degradation on a local scale. See population changes- disturbance associated with increased fishing pressures. Similarly light and noise pressures from induced population numbers may have a localised impact on this species. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential	**LOW**	**MEDIUM**	**HIGH**	**LOW**

Freshwater Fish, ***Oreochromis leucostictus***				
Direct Impact (Magnitude)				
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Summary justification for impact magnitude	There will be minimal impact on the benthic habitat of Lake albert during the Site Preparation and Enabling Works. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert. Additionally, the installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing and degradation in water quality and over abstraction (influx). Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. Although there is no indication this species is a target fishery species, increased fishing pressure may lead to impacts through by-catch and destructive fishing techniques. No more than between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *O. leucostictus* and its habitat. A significant impact on these	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilities decommissioning works should have minimal impact on the habitat of

Freshwater Fish, ***Oreochromis leucostictus***				
	take place for Supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilities construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling could lead to a drastic reduction in *O. leucostictus* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	associated facilities construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *O. leucostictus* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *O. leucostictus* and their habitat.	*O. leucostictus*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *O. leucostictus* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality from induced fishing pressures during all development stages. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population.			

Freshwater Fish, ***Oreochromis leucostictus***				
	In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**MEDIUM**	**LOW**
Summary justification for residual impact assessment	Minimal activities will take place within Lake Albert during this phase. Therefore, with mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. However, induced pressures on fishing and buffer zones may not be regulated/enforced, therefore, impacts on this species may still occur. With mitigation measures in place, impacts are expected to be low as up to 10% of the population is only expected to be influenced during this phase. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. However, induced pressures on fishing and buffer zones may not be enforced/regulated, therefore, impacts on this species may still occur. The duration of this phase is long (over 10 years), however, with mitigation measures in place, up to 20% of the population has the potential to be influenced. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur during this phase. The impact will be temporary and reversible.
Residual ImpactsSignificance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Freshwater Fish, ***Synodontis afrofischeri***

Fish	Status (IUCN)	Status (Ugandan Red List)	PS6 Criterion	Landscape Context		General Location	Receptor Sensitivity
Criterion 1, Tier 2a Critical Habitat-qualifying Species							
Synodontis afrofischeri	LC	n/a	2b	C	A	Occurs in the Lake Albert and Victoria Nile systems.	HIGH

Freshwater Fish, ***Synodontis afrofischeri***	
SPECIES OVERVIEW	
Biodiversity significance	This species is distributed across central Africa and is considered to be of IUCN Least Concern status due to its relatively wide distribution and little evidence to suggest decline in population. The species is Tier 2 Critical Habitat within criterion 2b and is therefore considered to be a high sensitivity receptor.
Species Ecology	*S. afrofischeri* feeds on insects and molluscs. This species has irregular patterns of spawning, however, breeding prior to the rainy season is common. Rarely grows to more than 15cm in length.
Habitat Preference	*S. afrofischeri* is a benthic dweller found in streams rivers and lakes. This species has a preference for shore regions, and is most common at depths of less than 30m.
Population & Trends	Unknown
Summary of state of knowledge	Water turbidity and siltation as a result of erosion and farming extension on watersheds and floodplains has been identified as a potentially serious threat to this species. Any activities with potential to increase water turbidity and siltation must therefore be appropriately mitigated.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss and Degradation** *S. afrofischeri* is a benthic species with a preference for shore regions. It is likely that developments with an impact on the benthic environment within nearshore regions will directly degrade local habitat of this species through loss as a result of the abstraction pipeline, barge crossing piers and potential pontoon/station construction. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** See indirect impacts **Disturbance** As a benthic species likely to be present in nearshore waters, *S. afrofischeri* may be directly disturbed by the installation of the abstraction pipeline, barge crossing piers and potential pontoon/station. This species may also be disturbed during the operational phase of the abstraction pipeline as a result of vibration noise and possible impingement/entrainment, the extent of which will depend on the type of abstraction technique selected which are outlined in the discussion section of this table. **Barrier effects** This species is also found in rivers, so vibration and noise disturbance from the River Nile pipeline

Freshwater Fish, ***Synodontis afrofischeri***				
	tunnelling could potentially cause local disturbance and prevent this species from passing over the pipeline area.			
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and nutrient ratios in areas of Lake Albert of close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of habitat loss/degradation one may expect to see a change in population in response to this depending on the severity of the change. Any such changes are likely to be localised and short term in nature. This species is not known target fishery species, however, increased fishing pressure on other species may have impacts on this species through bycatch and the use of destructive fishing techniques. **Disturbance** See population changes- disturbance associated with increased fishing pressures. Similarly light and noise pressures from induced population numbers may have a localised impact on this species. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**LOW**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Summary justification for impact magnitude	There will be minimal impact on the benthic habitat of Lake albert during the Site Preparation and Enabling Works, however, construction activities for the barge crossing piers has the potential to influence this species. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert. Additionally, the installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing and degradation in water quality and over abstraction (influx). Over 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. This species is not known target fishery species, however, increased fishing pressure on other species may have impacts on this species through bycatch and the use of destructive fishing techniques

Freshwater Fish, ***Synodontis afrofischeri***				
	could be affected by the impact.	ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	The impact could be long term (more than 10 years) or permanent.	No more than between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. However, localised impacts are expected within the Victoria Nile during the construction of the barge piers. Vegetation removal will take place for Supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *S. afrofischeri* and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling could lead to a drastic reduction in *S. afrofischeri* populations.	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *S. afrofischeri* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *S. afrofischeri* and their habitat.	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilitiesdecommissioning works should have minimal impact on the habitat of *S. afrofischeri*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).

Freshwater Fish, ***Synodontis afrofischeri***				
		In addition, water quality could be severely compromised through increased siltation and pollution incidents.		
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *S. afrofischeri* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. A comprehensive water cycle study will be completed to ensure that abstraction rates are not detrimental to habitat availability or water quality. Similarly, abstraction rates will be sustainable based on the hydrological study. Long-term water quality monitoring should be in place throughout the life of the project and pollution prevention measures put in place. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are followed. However, there is still the potential for mortality via induced fishing pressures during all phases of the development. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	Minimal activities will take place within Lake Albert during this phase, however, direct disturbance will still occur within the Victoria Nile. Fish in the immediate vicinity of the works will be expected to move from the area if	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur during this phase. The impact will be temporary

Freshwater Fish, ***Synodontis afrofischeri***				
	works and ramped up. Similarly, with mitigation measures in place, impacts on water quality should be minimal. Therefore, with mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	reversible. However, induced pressures on fishing and buffer zones may not be regulated/enforced, therefore, impacts on this species may still occur. As this species is widely distributed across Lake Albert, the Victoria Nile impacts are expected to be low as up to 10% of the population is only expected to be influenced during this phase. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	reversible. However, induced pressures on fishing and buffer zones may not be enforced/regulated, therefore, impacts on this species may still occur. Up to 10% of the feature's population and/or distribution within the landscape context may be affected by the impact. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, may occur. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	and reversible.
Residual ImpactsSignificance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Freshwater Fish, ***Marcusenius victoriae***							
Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 2a Critical Habitat-qualifying Species							
Marcusenius victoriae	LC	n/a	1ab & 2a	C	A	Occurs in the Lake Albert and Victoria Nile systems.	HIGH

Freshwater Fish, ***Marcusenius victoriae***
SPECIES OVERVIEW

Freshwater Fish, ***Marcusenius victoriae***	
Biodiversity significance	This species is found in lake basins in Uganda, Tanzania, Rwanda and Kenya. It is relatively widespread throughout many of these lake systems, and forms an important part of the food chain as a food source for predatory fish such as the Nile Perch (Chapman & Hulen 2001). The species is Tier 2 Critical Habitat within criterion 1ab & 2a and is therefore considered to be a high sensitivity receptor.
Species Ecology	This species is predominantly insectivorous, primarily feeding on chironomid larvae, polymitrarcidae and odonatan. Breeds twice a year during the rainy season and migrates up rivers to spawn. Maximum size is 26cm.
Habitat Preference	*M. victoriae* has a broad habitat distribution ranging from extremely hypoxic swamps to the open waters of lakes and rivers.
Population & Trends	The population of this species within Lake Albert is not known, however, in the Lake Victoria basin this species has previously seen a reduction in population due to introduced species. Overfishing of the Nile Perch has since relieved pressure on this species and its numbers are thought to have stabilised in Lake Victoria. No such information is available for Lake Albert.
Summary of state of knowledge	Data is lacking on the population status of this species within Lake Albert, however, overall it appears as though this species is relatively stable. Major threats to this species outlined by the IUCN include increased water turbidity and siltation as a result of erosion and farming expansion, loss of riverine migratory routes, predation by Nile Perch and fisheries pressure. Due to the lack of data on this species within Lake Albert, a precautionary approach should be taken for the assessment. This species was found in primary surveys at the Waiga-Waisoke Delta/Lake Albert downstream of the proposed well pads.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss and Degradation** This species is found in an extremely broad range of habitats, and so it is very likely it will be present within the vicinity of the project works. Therefore, this species is likely to be impacted by habitat loss/degradation as a result of the construction of the abstraction pipeline and potential pontoon/station. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** Population change as a result of habitat loss and disturbance could occur without appropriate mitigation. **Disturbance** Direct disturbance to this species could occur as a result of the construction of the abstraction pipeline and potential pontoon/station. Disturbance may also occur during the operational phase of the abstraction pipeline as a result of vibration and possible impingement/entrainment, the extent of which will depend on the type of abstraction technique selected which are outlined in the discussion section of this table. This species is found in flowing water, and so vibratory disturbance to the River Nile as a result of pipeline tunnelling could directly affect this species. **Barrier effects** This is a migratory species and so the pipeline tunnelling underneath the River Nile and associated

Freshwater Fish, ***Marcusenius victoriae***				
	watercourse vibration could potentially impact this species. However, there is no information available on the migratory pathways of this species, and so whether or not it migrates over this section of the River Nile cannot be confirmed.			
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and nutrient ratios in areas of Lake Albert of close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of habitat loss/degradation one may expect to see a change in population in response to this depending on the severity of the change. Any such changes are likely to be localised and short term in nature. This is not a commercially fished species, however, increased fishing pressure on other species as a result of the project could have a knock-on effect to this species through by-catch and destructive fishing techniques. **Disturbance** See population changes- disturbance associated with increased fishing pressures. Similarly light and noise pressures from induced population numbers may have a localised impact on this species. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on Lake Albert during the Preparation and Enabling Works phase. Impacts on the Victoria Nile will be minimal and due to the wide distribution of this species, impacts are expected to be low. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert and the Victoria Nile Additionally, the installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing and degradation in water quality and over abstraction (influx). Between 10% and 20% of the feature's population and/or distribution within	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.

Freshwater Fish, ***Marcusenius victoriae***				
	and/or distribution within the landscape context could be affected by the impact.	species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	the landscape context could be affected by the impact.	
Potential Impact Significance	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for Supporting and associated facilitiesconstruction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *M. victoriae* and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling could lead to a	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *M. victoriae* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *M. victoriae* and their	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilitiesdecommissioning works should have minimal impact on the habitat of *M. victoriae*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).

Freshwater Fish, ***Marcusenius victoriae***				
		drastic reduction in *M. victoriae* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	habitat.	
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *M. victoriae* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality via induced fishing pressures during all stages of the development. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. Although induced pressures are expected,	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.

Freshwater Fish, ***Marcusenius victoriae***				
		Although induced pressures are expected, the wide ranging distribution and relative tolerance to a number of different habitat types means impacts are considered to be low. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	the wide ranging distribution and relative tolerance to a number of different habitat types means impacts are considered to be low. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	Although induced pressures are expected, the wide ranging distribution and relative tolerance to a number of different habitat types means impacts are considered to be low. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate
Residual Impacts Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Freshwater Fish, ***Mesobola bredoi***						
Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 2a Critical Habitat-qualifying Species						
Mesobola bredoi	LC	n/a	1e & 2a	**C**	Occurs in the Lake Albert system.	HIGH

Freshwater Fish, ***Mesobola bredoi***	
SPECIES OVERVIEW	
Biodiversity significance	*M. bredoi* is endemic to Lake Albert and Tier 2 Critical Habitat within criterion 1e & 2a, therefore, it is considered a high sensitivity receptor.
Species Ecology	Maximum length 4.5cm. Benthopelagic species
Habitat Preference	Demersal species
Population & Trends	Unknown
Summary of state of knowledge	There is very little available information for this species. Its IUCN status of Least Concern suggests a relatively healthy population within Lake Albert, however, due to the fact this species is limited to Lake Albert its sensitivity is ranked as high. Due to an overall lack of knowledge on this species, a

Freshwater Fish, ***Mesobola bredoi***				
	precautionary approach should be taken for the assessment.			
POTENTIAL IMPACTS: ALL PROJECT PHASES				
Potential Impacts – direct	**Habitat Loss and Degradation** *M. bredoi* is a benthopelagic species, and whilst habitat preferences are unknown, it is possible that developments with an impact on the benthic environment may degrade local habitat of this species through loss as a result of abstraction pipeline and potential pontoon/station construction. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** See indirect impacts **Disturbance** As a demersal species likely to be present in nearshore waters, *M. bredoi* may be directly disturbed by the installation of the abstraction pipeline and potential pontoon/station. This species may also be disturbed during the operational phase of the abstraction pipeline as a result of vibration and possible impingement/entrainment, the extent of which will depend on the type of abstraction technique selected which are outlined in the discussion section of this table. **Barrier effects** None known			
Potential Impacts – indirect	**Habitat Loss and Degradation** Land use changes around the shores of Lake Albert have potential to increase suspended solids and nutrient ratios in areas of Lake Albert of close proximity to the site. This could result in habitat loss/degradation. **Population changes** As a result of the potentially direct impact of habitat loss/degradation one may expect to see a change in population in response to this depending on the severity of the change. Any such changes are likely to be localised and short term in nature. Another indirect impact on population change may be the increased fishing pressure expected with an increased local population during the construction and operational phases. Direct fishing pressure as well as habitat loss/degradation as a result of destructive fishing techniques could potentially impact the population of this species on a much large landscape scale. Appropriate mitigation measures are therefore essential. **Disturbance** See population changes- disturbance associated with increased fishing pressures. Similarly, light and noise pressures from induced population numbers may have a localised impact on this species. **Barrier effects** None known			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			

Freshwater Fish, ***Mesobola bredoi***				
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on the habitat of Lake albert during the Site Preparation and Enabling Works. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert. Additionally, the installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing and degradation in water quality and over abstraction (influx). Over 20% of the feature's population and/or distribution within the landscape context could be affected by the impact mainly due to induced impacts. The impact could be long term (more than 10 years) or permanent.	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.
Potential Impacts Significance	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**HIGH**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *M. bredoi* and its habitat. A	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilitiesdecommissionin

Freshwater Fish, ***Mesobola bredoi***				
	vicinity of Lake Albert. Vegetation removal will take place for Supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling could lead to a drastic reduction in *M.bredoi* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	population or habitat. Supporting and associated facilities construction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *m. bredoi* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *M. bredoi* and their habitat.	g works should have minimal impact on the habitat of *M. bredoi*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation (General)	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion table in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *M. bredoi* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly impacted. A comprehensive water cycle study will be completed to ensure that abstraction rates are not detrimental to habitat availability or water quality. Similarly, abstraction rates will be sustainable based on the hydrological study. Long-term water quality monitoring should be in place throughout the life of the project and pollution prevention measures put in place. **Population changes** There should be no residual impacts on population numbers if all mitigation measures are followed. However, there is still the potential for mortality via induced fishing pressures during all phases of the			

Freshwater Fish, ***Mesobola bredoi***				
	development if mitigation measures are not enforced. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**MEDIUM**	**LOW**
Summary justification for residual impact assessment	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. Although induced pressures are expected, impacts are still expected to be Moderate with mitigation measures in place. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. Although induced pressures are expected, impacts are still expected to be Moderate with mitigation measures in place. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. Although induced pressures are expected, impacts are still expected to be Moderate with mitigation measures in place. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.
Residual ImpactsSignificance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Haplochromis albertiae ***Haplochromis avium*** ***Haplochromis loati*** ***Haplochromis mahagiensis*** ***Thoracochromis wingatii***						
Freshwater Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Tier / Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Critical Habitat-qualifying Species						
Haplochromis albertiae	NE	n/a	Tier 1 (Criterion 2a)	**C**	Lake Albert	VERY HIGH
Haplochromis avium	NE	n/a	Tier 1 (Criterion 2a)	**C**	Lake Albert	VERY HIGH
Haplochromis loati	DD	n/a	Tier 2 (Criterion 2b)	**C**	Occurs in the Lake Albert system, Murchison Falls–Albert Delta Ramsar Site and the Albert Nile.	HIGH
Haplochromis mahagiensis	NE	n/a	Tier 1 (Criterion 2a)	**C**	Lake Albert	VERY HIGH
Thoracochromis wingatii	DD	n/a	Tier 1 (Criterion 2a)	**C**	Lake Albert	VERY HIGH

Freshwater Fish	
SPECIES OVERVIEW	
Biodiversity significance	**These species have been grouped because they are all freshwater fish species within the same genus associated with Lake Albert and are therefore likely to be vulnerable to the same types of impacts. All species are considered to have a High or Very High sensitivity based on their restricted range and Critical Habitat qualifying status.** ***Haplochromis albertiae*** Only found in Lake Albert. Not currently included in the IUCN global red list. Due to its restricted range, it is currently classified as a CHQS for Tier 1 Critical Habitat within PS6 Criterion 2a. As a Tier 1 CHQS it is considered to have Very High sensitivity. ***Haplochromis avium*** This species of fish is only known from Lake Albert in Uganda and the Democratic Republic of Congo. It is not currently included in the IUCN global red list. This species of fish is endemic to Lake Albert. It has been proposed as Nationally Endangered based on the Red List assessment for Uganda. On current knowledge Lake Albert holds more than 95% of the global population and is therefore Tier 1 Critical Habitat within criterion 2a. As a Tier 1 CHQS it is considered to have Very High sensitivity. ***Haplochromis loati*** This species of fish is known from two locations in the world: Lake Albert (and associated watercourses) in Uganda and Bahr el Jebel in Sudan. There is a general lack of information on its distribution, abundance and threats. In Uganda, the species has only been found on Lake Albert and is also found regularly but in limited numbers in the Murchison Falls – Albert Delta Ramsar Site and the Albert Nile. It has been proposed as Nationally Endangered on the draft National Red List for Uganda. On current knowledge Lake Albert holds a substantial part of the global

Freshwater Fish	
	population of this restricted range species and is therefore Tier 2 Critical Habitat within criterion 2b. As a Tier 2 CHQS it is considered to have High sensitivity. ***Haplochromis mahagiensis*** This species is endemic to Lake Albert and has been proposed as Nationally Endangered on the draft national Red List for Uganda. This species of fish is only known from Lake Albert in Uganda and the Democratic Republic of Congo. It has not been assessed for the global IUCN Red List of Threatened Species. On current knowledge Lake Albert holds probably more than 95% of the global population and is therefore Tier 1 Critical Habitat within criterion 2a. Therefore, is considered to be a Very High sensitivity receptor, ***Thoracochromis wingatii*** This species of fish is only known from Lake Albert in Uganda and the Democratic Republic of Congo. It is currently regarded as data deficient on the IUCN global red list. This species of fish is endemic to Lake Albert. It has been proposed as nationally Endangered based on the Red List assessment for Uganda. On current knowledge Lake Albert holds probably more than 95% of the global population and is therefore Tier 1 Critical Habitat within criterion 2a. As a Tier 1 CHQS it is considered to have Very High sensitivity.
Species Ecology	A group of ray-finned, benthopelagic fishes with mouthbrooding females. The only other species information available is based on *Haplochromis loati,* which is omniverous, consuming algae, vegetable fragments, zooplankton, and insects.
Habitat Preference	Occurs in the Lake Albert system in shallow freshwater habitat with marginal, submerged vegetation (e.g. hyacinths).
Population & Trends	Population data is scarce. Available information indicates that populations are low and declining due to water pollution and sedimentation of lake margins.
Summary of state of knowledge	Broad distribution and habitat affinity of *Haplochromis* spp. are generally well-understood. However, population size and age class within the study area are unknown. However, there is sufficient data to evaluate impacts on this species based on their habitat preferences. Surveys completed in 2017 confirmed the presence of *Haplochromis* spp. along the shoreline of Lake Albert, as well as records within the Victoria Nile. A precautionary approach should be taken for the impact assessment as these species could be distributed further than just Lake Albert.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss and Degradation** These species are associated with Landscape Context C (Lake Albert, rivers and wetlands) and already face a declining quality of habitat due to erosion and silting from agriculture and water pollution. The Tilenga Project Footprint includes this area and there is potential for further loss or degradation of wetland habitat utilised by these species due to potential accidental spillage of fuels/hazardous substances, an increase in suspended solids from construction works and loss of habitat due to the installation of barge crossing platforms. There are also potential direct impacts from the installation of the abstraction pipeline and pontoon within Lake Albert. **Population changes** Human activity within fish habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat. **Disturbance** Disturbance of fish habitat will occur during the construction phase, due to the installation of the

Freshwater Fish				
	abstraction pipeline and pontoon and barge crossing platforms in the Victoria Nile upstream of Paraa. Fish entrainment and impingement is also possible at the lake water abstraction point if not located sensitively. For example, away from the shoreline where these fish are likely to reside and away from known spawning and nursery sites. **Barrier effects** None known.			
Potential Impacts - indirect	**Habitat Loss and Degradation** Population changes induced by the Project, where worker's economic dependents and others are attracted to the wider area may impact on habitats and species populations. This would be associated with land use changes, resulting in loss of vegetation and therefore, increase in surface water run-off and degradation of habitats, as well as increased disturbance. **Population changes** Human activity within fish habitat areas may impact on population growth due to disturbance and loss/degradation of suitable habitat for fish nursery and spawning areas. Increased pressures on natural resources such as water may reduce water/habitat availability. **Disturbance** Induced population changes in the landscape may potentially increase levels of disturbance through trawling fishing techniques. Although not a targeted species, *Haplochromis* species may be subject to bycatch influences. **Barrier effects** None known.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH - VERY HIGH**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**HIGH**	**LOW**
Summary justification for impact magnitude	A small proportion of the species population is expected to be impacted during this phase probably corresponding to less than 10%, given the extent of direct impacts, the smaller duration of this phase also limits the effect of indirect impacts. During this phase, minor habitat degradation or disturbance is expected.	Direct impacts are likely to affect *Haplochromis* species and their habitat, particularly the installation of the abstraction pipeline along the bed of Lake Albert and the installation of the barge crossing on the Victoria Nile. Both have the potential to influence water quality through increased suspended solids or due to potential	This is the longest Project phase, with potentially significant impacts if effective mitigation measures have not already be put in place during earlier phases of the Project. Without mitigation, between 10% and 20% of *Haplochromis* populations could be affected, related to poor water quality from over	A small proportion of the species population is expected to be impacted during this phase probably corresponding to less than 10%, given the extent of direct impacts, the smaller duration of this phase also limits the effect of indirect impacts. During this phase, minor habitat degradation or disturbance is expected.

Freshwater Fish				
	Change during this phase will not be enough to result in a significant loss of mollusc species and/or their habitat. This impact will be mainly temporary.	accidental spills. Indirect impacts have the potential to be more significant, specifically related to pressures on fishing using trawling methods, which could degrade habitat and increase mortality through bycatch. Therefore, between 10% and 20% of *Haplochromis* populations could be affected by the Project through direct and indirect impacts, notably through habitat degradation and disturbance.	abstraction, fuel/chemical spillage and/or increase in suspended solids from surface water run-off. Fish entrainment and impingement is also possible at the lake abstraction point if not located sensitively. Project in-migration will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat functionality. However, impacts could be long lasting between (over 10 years.	Change during this phase will not be enough to result in a significant loss of *Haplochromis* species and/or their habitat. This impact will be mainly temporary.
Potential Impact Significance	**MODERATE**	**HIGH**	**CRITICAL**	**HIGH**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**HIGH**	**CRITICAL**	**MODERATE**
Justification of in-combination sensitivity	Direct and indirect impacts are not expected to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for Supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	Direct impacts could be significant during this phase, especially related to the installation of the abstraction pipeline and barge crossing platforms, which could increase pressure on *Haplochromis* species and their habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in	Indirect impacts include project in-migration, which will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase of fishing as overall demand for protein increases and destructive fishing techniques such as trawling and gill nets could lead to a reduction in *Haplochromis*	Impacts during this phase should be less significant, as there will be fewer workers. Supporting and associated facilitiesdecommissioning works should have minimal impact on the habitat of *Haplochromis* species. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed) and ferry crossing points.

Freshwater Fish				
		search of work. A high degradation or loss of habitat through an increase of fishing as overall demand for protein increases and destructive fishing techniques such as trawling and gill nets could lead to a drastic reduction in suitable habitat and *Haplochromis* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	populations and a degradation in habitat. Similarly, pressures on water abstraction and water quality could negatively influence populations of *Haplochromis* and their habitat.	
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *Haplochromis* species will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme. **Population changes** There should be no significant residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for an increase in mortality via indirect impacts if Influx Management Plans and Fisheries Management Plans are not completed and adhered to. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**HIGH - VERY HIGH**			
Residual Impact Character	**NEGLIGIBLE**	**LOW**	**LOW**	**LOW**

Freshwater Fish				
Summary justification for residual impact assessment	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. However, there is still the potential for an increase in mortality via indirect impacts if Influx Management Plans and Fisheries Management Plans are not competed and adhered to. The impact will be temporary and reversible. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. The remaining significant residual impacts are a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate.
Residual ImpactsSignificance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**

Other Priority Species

Freshwater Fish, ***Barbus huloti***							
Fish	**Status (IUCN)**	**Status (Ugandan Red List)**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Receptor Sensitivity**
Barbus huloti	VU	n/a	n/a	**C**	**A**	Occurs in the Lake Albert and Victoria Nile systems.	MEDIUM

Freshwater Fish, ***Barbus huloti***	
SPECIES OVERVIEW	
Biodiversity significance	*B. huloti* is only found in the Democratic Republic of Congo and Uganda and is classed as Vulnerable according to the IUCN Red List. Therefore, this species is considered to be a medium sensitivity receptor.

Freshwater Fish, ***Barbus huloti***	
Species Ecology	Unknown
Habitat Preference	Its natural habitats are permanent rivers, creeks and streams.
Population & Trends	Unknown
Summary of state of knowledge	This species has very little information available for assessment. Due to the lack of information available on this species, a precautionary approach should be taken for the assessment. Although *Barbus* spp. were identified during the primary survey, none were identified as *Barbus huloti*.
POTENTIAL IMPACTS: ALL PROJECT PHASES	
Potential Impacts - direct	**Habitat Loss and Degradation** This species is likely to be impacted by habitat loss/degradation as a result of the construction of the abstraction pipeline and potential pontoon/station. Potential accidental pollution incidents from hazardous chemicals and suspended solids may also directly impact the quality of the habitat this species relies upon on a local basis. **Population changes** Population change as a result of habitat loss and disturbance could occur without appropriate mitigation. **Disturbance** Whilst very little is known about the habitat preferences of this species, it is clear that flowing water is necessary. Impacts associated with the River Victoria Nile and smaller tributaries are may have more of an impact than those associated with Lake Albert. The pipeline tunnelling under the River Nile and associated noise and vibration is therefore the primary direct impact may influence this species. Noise and light through all development phases may also influence the distribution of this species on a local level. **Barrier effects** Noise and vibration from the Victoria Nile tunnelling may create a barrier to fish movement.
Potential Impacts - indirect	**Habitat Loss and Degradation** Land use change in the surrounding shorelines as a result of the project may increase suspended sediment load and nutrient ratios in the water column. This could impact the quality and quantity of the habitat this species relies upon. **Population changes** The above potential impact on the local habitat could have a negative impact on the population of this species. **Disturbance** Although not a known target fishery species, it may still be impacted by increased fishing through bycatch and destructive fishing techniques. Similarly light and noise pressures from induced population numbers may have a localised impact on this species. **Barrier effects** None known

Freshwater Fish, ***Barbus huloti***				
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Character of Potential Direct Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Character of Potential Indirect Impact (Magnitude)	**LOW**	**MEDIUM**	**MEDIUM**	**LOW**
Summary justification for impact magnitude	There will be minimal impact on the habitat of Lake albert during the Site Preparation and Enabling Works. Although minor habitat degradation is possible during this phase, no more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There is the potential for a significant increase in fishing activities due to influx, which has the potential to have a detrimental influence on fish population numbers in Lake Albert and Victoria Nile. Additionally, the installation of the abstraction pipeline and potential degradation in water quality could have a detrimental impact on species numbers. Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality could occur. Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	This is the longest phase where impacts could be greatest if no mitigation measures are in place. Increase in mortality could occur as a result of over fishing and degradation in water quality and over abstraction (influx). Between 10% and 20% of the feature's population and/or distribution within the landscape context could be affected by the impact.	There will be minimal impact on the benthic habitat of Lake albert during the Site Decommissioning Works, especially if the pipe is left in-situ. No more than 10% of the feature's population and/or distribution within the landscape context could be affected by the impact.
Potential Impact Significance	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**LOW**	**MODERATE**	**MODERATE**	**LOW**
Justification of in-combination	Direct and indirect impacts are not expected	Direct impacts could be significant during this	Indirect impacts include project in-migration, which	Impacts during this phase should be less significant,

Freshwater Fish, ***Barbus huloti***				
sensitivity	to be significant during this Phase, as few workers will be present within the Project area and limited activities will take place within the vicinity of Lake Albert. Vegetation removal will take place for Supporting and associated facilities construction works, leading to potential impacts on surface-water run-off and consequently a reduction in water quality may occur. However, this impact will not be enough to result in change in conservation status of the species or habitat. This impact will be temporary.	phase, especially related to the installation of the abstraction pipeline, which could increase pressure on *B. huloti* and its habitat. A significant impact on these populations could be expected if appropriate mitigation measures are not implemented early on and/or if mitigation measures are not effective. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increased use of destructive fishing techniques such as trawling could lead to a drastic reduction in *B. huloti* populations. In addition, water quality could be severely compromised through increased siltation and pollution incidents.	will likely result in moderate habitat degradation or disturbance, leading to reduction in species population or habitat. Supporting and associated facilitiesconstruction works will facilitate access to the area, which will be combined to human in-migration of people coming to the area in search of work. A high degradation or loss of habitat through an increase in the use of destructive fishing techniques could lead to a reduction in *B. huloti* populations and degradation in habitat. Similarly, pressures on water quality could negatively influence populations of *B. huloti* and their habitat.	as there will be fewer workers. Supporting and associated facilitiesdecommissioning works should have minimal impact on the habitat of *B. huloti*. The biggest risk comes from potential accidental spillage of fuels and chemicals and disturbance to the lake/river bed through removal of the abstraction pipeline (if removed).
Mitigation	See mitigation tables in Chapter 15 covering each phase of the Project. As so little is known about the ecology of this species, individual mitigation measures cannot be defined at this time. However, if adhered to, general mitigation measures included in the assessment are considered to provide adequate protection to this species.			
Mitigation Discussion	Please refer to the general Mitigation Measures Discussion in Chapter 15.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	**Loss, degradation or fragmentation of species habitat** Loss and/or degradation of habitat and impact for *B. huloti* will be minimal and unlikely to significantly reduce habitat availability. Mitigation measures will ensure that water quality is not significantly reduced. Long-term water quality monitoring will be conducted as part of the overall Project Environmental Monitoring Programme to ensure pollution prevention and contingency measures are effective. **Population changes**			

Freshwater Fish, ***Barbus huloti***				
	There should be no residual impacts on population numbers if all mitigation measures are implemented. However, there is still the potential for mortality through induced fishing pressures during all development phases if mitigation measures are not enforced. **Disturbance** Mitigation to protect habitat and species, if effective, should reduce any pressures on this species population. In-combination effects are not considered in assessing the residual impact.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operation**	**Decommissioning**
Receptor Sensitivity	**MEDIUM**			
Residual Impact Character	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, it is unlikely any discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.	With mitigation measures in place, it is unlikely any discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible. Although induced pressures are expected, impacts are still expected to be Moderate with mitigation measures in place.	With mitigation measures in place, no discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality will occur. The impact will be temporary and reversible.
Residual Impacts Siginificance	**LOW**	**LOW**	**LOW**	**LOW**

TILENGA PROJECT ESIA - APPENDIX Q: Social

May 2018

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TOTAL
COMMITTED TO BETTER ENERGY

Development of Lake Albert Fields, EA-1/EA-1A (Total) and EA-2 North (Tullow)

SOCIAL AND HEALTH BASELINE SURVEY: EXECUTIVE SUMMARY

ARTELIA EAU & ENVIRONNEMENT
Unité Risque, Société & Environnement
6 rue de Lorraine
38130 ECHIROLLES - FRANCE
Tel. : +33 (0)4 76 33 40 00
Fax : +33 (0)4 76 33 43 32

ARTELIA

DATE : 12 2015 **REF : 8541101-Q-**Final

QUALITY FOLLOW-UP SHEET

Project Description	
Project name	**Development of Lake Albert Fields, Blocks 1 (EA1/EA-1A) and EA 2 North**
Project number	**8541101**
Client	TOTAL E&P UGANDA
Place	**Uganda**
Document type	**Baseline Report**
Document name	**8541101_TOTAL_Buliisa_Baseline_report_Executive_Summary**

Study carried out by ARTELIA Eau et Environnement – Branche Environnement - RSE

	Name	Date	Visa
Author	**Armeline DIMIER**	**09/12/2015**	

List of review

N° Document	N° Version	Date	Description
00	Rev-0	09/12/2015	Draft Executive Summary
01	Final	14/12/2015	Final Executive Summary

Distribution List

Document N°	Version N°	Emission	Recipient
00	Rev-0	CGY	Marion MUYOBO (TEPU) Magali POLLARD (TEPU) Christophe DERRIEN (Artelia)
01	Final	CGY	Marion MUYOBO (TEPU) Magali POLLARD (TEPU) Christophe DERRIEN (Artelia)

ARTELIA EAU & ENVIRONNEMENT- RSE
6 rue de Lorraine
38130 Echirolles – France
Tel: +33 (0) 4 76 33 40 00

CONTENT

TABLES

FIGURES

1. INTRODUCTION

Artelia Eau & Environnement has been mandated by Total Exploration and Production Uganda (TEPU) to undertake a study entitled “Social and Health Baseline Survey” (SHBS) for EA-1/1A and EA-2 North development project in the Albertine region.

The study is divided into 6 workstreams:

- Workstream A : Documentary review
- Workstream B : Community Profile
- Workstream C : Land and Natural Resources Use
- Workstream D : Livestock and Grazing
- Workstream E : Tourism
- Workstream F : Community Health

This **Executive Summary** presents the main findings on the socioeconomic context of the SHBS study area, major sensitivities and key recommendations.

2. METHODOLOGY

2.1. RATIONALE AND OBJECTIVES

The study area covers two districts, Nwoya district to the north and Buliisa district to the south (see Figure 1 next page), and reflects a diversity of local contexts. A number of the proposed EA-1/1A and EA-2 North **project facilities** will be located in and around populated areas and/or agricultural land (i.e. arable, under permanent crops or under pastures).

Livelihood patterns clearly vary from one geographic area to another: local factors such as soil and land fertility, water availability, access to markets, infrastructure and social networks all influence these livelihood patterns. While some communities mainly rely on settled agriculture, others practice fishing and/or livestock rearing, and often a combination of several subsistence and income-generating activities. The geographical differences have also influenced human settlements, migration patterns and social dynamics.

Changes in land-use and access to key natural resources, in-migration phenomenon (project employees from outside the study area, opportunistic migrants, entrepreneurs, providers of goods and services, etc.) and new infrastructure, as a result of the Buliisa project, will have **significant positive and negative impacts** on local communities.

Vulnerability and sensitivity to change – *e.g.* project impacts – therefore vary from one community to another and need to be assessed at the community level.

TEPU and TUOP recognise the requirements for their operation to be developed in a demonstrable way to the **highest environmental and social protection standards**. Both companies are committed to conducting business in a manner that seeks to minimise the project footprint within such sensitive areas and manage the environmental and social impacts of the operations. The SHBS is an essential step in this process.

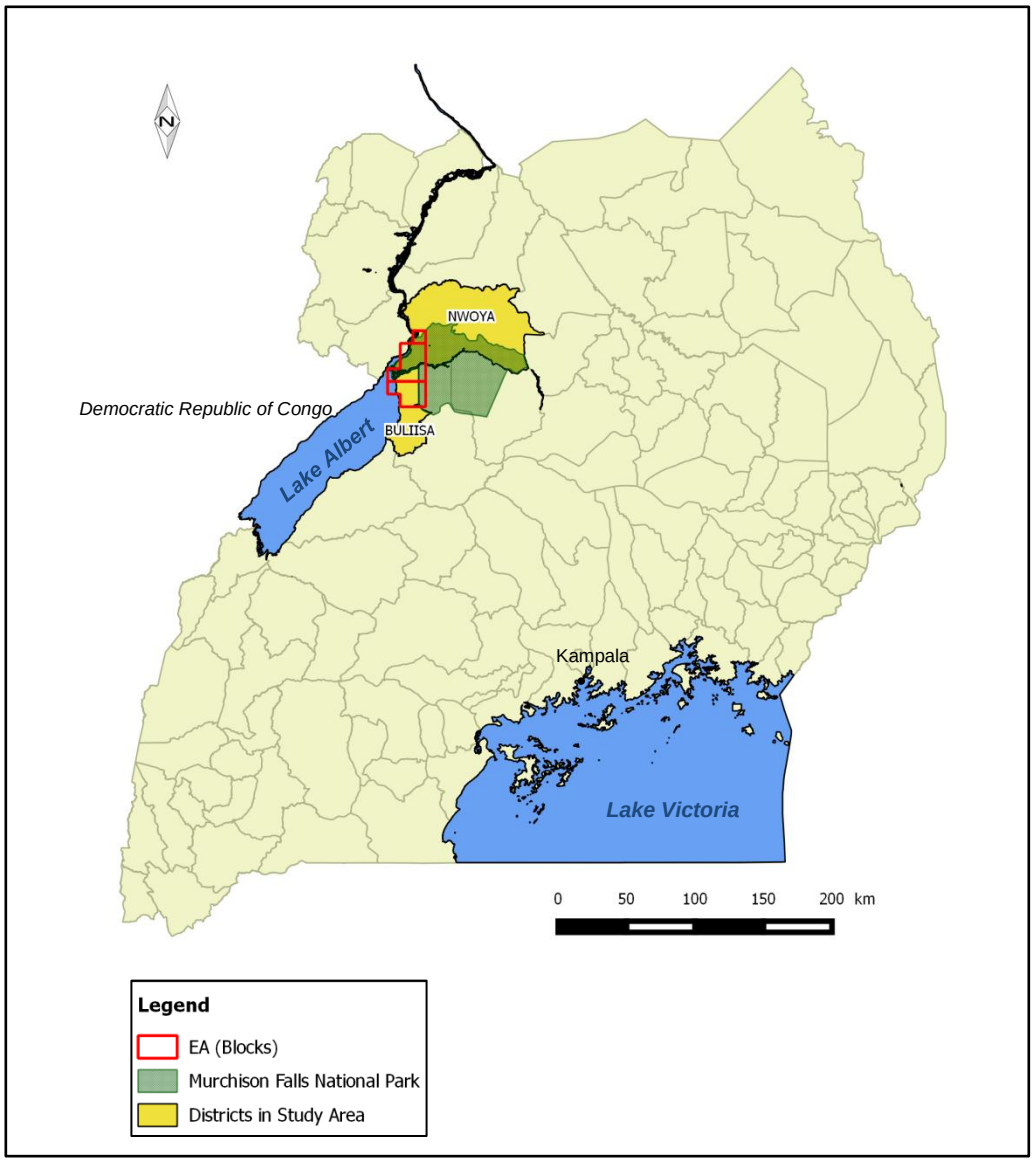
2.2. STUDY AREA

The study area (see Figure 1 for its overview at the scale of Uganda) for the SHBS straddles the **two blocks** respectively operated by TEPU and TUOP.

It encompasses 44 villages and one Town Council (Buliisa TC), located in Buliisa and Nwoya districts (see the full list of villages in Appendix 1).

- 16 villages in EA-1 (TEPU) – 15 villages in Buliisa district and one village (Pajengo) in Nwoya district
- 19 villages and Buliisa Town Council with 8 cells in EA-2 North (TUOP)
- 8 villages overlapping the two blocks.

Figure 1 Location Map of Study Area



Source: Artelia Eau & Environnement

2.3. DATA COLLECTION

2.3.1. Tools

The Consultant used a combination of **qualitative and quantitative data collection tools**, including community mappings, Focus Group Discussion (FGD) guides, semi-structured interview guides, household survey questionnaires, GPS datasheets and village observation forms.

2.3.1.1. Community mapping

The **general objective** was to get a rapid understanding of the spatial organization of a village and identify the main socio-economic features of the community. The **specific objectives** were: (1) Breaking the ice with villagers by gathering them and making them talk about their village; (2) Getting an initial picture of the area through the eyes of the local residents; (3) Identifying the spatial organization of the village and its main social, cultural and economic features; (4) Identifying the village perceived boundaries; (5) Collecting baseline information on the village (governance, main sources of livelihoods, access to basic services, use of natural resources, etc.) through the discussions with the participants.

2.3.1.2. Focus Group Discussions

The **objective** was to get a deeper knowledge and understanding of specific topics through group discussions: the groups were disaggregated by livelihood / main occupation (farmers, pastoralists, fishermen, and traders), gender or age (youth / elders). The community mappings or existing background information (main livelihood strategies and social organization) helped to determine the relevant types of FGD to be conducted in each village.

The FGDs targeted **five main groups**, *i.e.* women, youth, crop farmers, fishermen and livestock owners. Guiding questions, instructions and templates for note taking were used by the team members so as to harmonize data collected across the villages.

2.3.1.3. Key Informant Interviews (KII)

Specific and targeted **semi-structured interviews** were conducted with different key informants such as LC1 chairpersons (or their representatives), Project Officers for NGOs and District Officials. Whereas the same interview guide was used for the LC1 chairperson, questions asked to other key informants were adapted *ad hoc* to interviewee characteristics and the general flow of answers: this flexibility enabled the Consultant to dwell on particular issues.

The objectives of the LC1 chairperson interviews were: (1) Triangulating data obtained in the community mapping, and (2) collecting complementary information such as the timeline of the village history and the main events that shaped it, demographic data (number of households, migration trends and ethnic composition and formal and informal governance mechanisms at the village level.

The quality of data obtained varies considerably from one LC1 chairperson to another, partly explained by the **various levels of education and qualification**.

2.3.1.4. Health Facility Assessment

A health facility assessment was conducted at a representative sample of health facilities serving the study population. The objectives were:

- Assess service availability and readiness
- Identify constraints of the health system

- Document expectations and perceptions of the presence of the oil industry on health and health service delivery.

Data were collected through key informant interviews and direct observations:

- **Semi-structured interviews** were administered to health facility managers (facility in-charges) or their representatives who provided information on staffing, communication and referral systems, common illnesses and community health risk factors, availability and quality of services, major challenges in service delivery and perceptions of the impact of oil industry activities of community health and health service delivery.
- **Direct observation** was used to confirm the availability of equipment, medicines and general supplies and to broadly assess facility infrastructure.

2.3.1.5. Sample household survey

The objective of the household survey was to triangulate data obtained from other sources (documentary review, community mapping, FGD and semi-structured interviews) and collect data at the household level on a number of precise topics (e.g. household composition, land ownership, sources of food and income, crops cultivated, health problems, etc.). The questionnaire was built and the data processed using **Sphinx Software**.

2.3.1.6. GPS survey

Vegetation areas, physical land use and land cover patterns (e.g. grazing areas, cultivated areas, swamps and residential areas) can be quite effectively mapped with the aid of various **spatial datasets**, such as satellite images, aerial photographs and secondary data (e.g. UBOS' GIS data about village boundaries), which was done in preparation for the field visit.

Apart from TEPU and TUOP's existing GIS datasets (including data collected by ARTELIA during the screening study in 2013), there is not much GIS information available for the study area. **A GPS surveying** was thus necessary to identify the location of specific places, such as schools, health units, sacred trees, churches and other points of interest.

The GIS team was always accompanied by community members who volunteered during the Community Mapping or were appointed by the LC1 chairperson. The **participation of local residents** was not only useful to gather spatial data – i.e. to identify places and landmarks of interest – but was also crucial to **understand the social meanings and cultural values** attached to each place.

Information collected included GPS coordinates, name and description of the place and socio-economic characteristics.

2.3.2. Field activities

The data used to produce the SHBS were collected through two field surveys by international and national consultants and direct interviews realised by the national consultants in-between the field surveys.

2.3.2.1. First field visit – February 2015

The first field visit was conducted from the **04th of February to the 21st of February 2015** and included:

- **2 days** in Kampala: HSE induction (TEPU and TUOP), finalization of data collection tools and training of team members and research assistants (overall approach of the SHSB and appropriation of tools to be implemented).
- **15 days** in the Project area (Buliisa district and Nwoya District).

The approach to cover most of the villages in the study area consisted in:

- Spending **half a day** in villages that had been visited for the *2013 Social Screening* (mostly in EA1, Kigwera and Ngwedo sub-counties), with the objective of complementing information and deepening the comprehension of key issues;
- Spending a **full day** in villages for which the level of information available was insufficient to meet the requirements of a detailed baseline SHBS (mostly in EA2 North).

2.3.2.2. Second field visit – April 2015

The second field visit was conducted from the **13th to the 18th of April 2015** and was mainly dedicated to key informant interviews (district authorities, NGOs/CBOs and health workers) and gathering of complementary data to fill in the gaps identified after the first field visit.

2.3.2.3. Activities carried-out

The following activities have been carried out at the village level (the list of activities conducted in each village can be seen in Appendix 3):

- 27 community mappings
- 14 community feedback sessions (about the 2013 Social Screening)
- More than 100 FGDs (fishermen, livestock owners, crop farmers, women, youth)
- 38 KII with LC1 chairperson or their representatives
- 4 personal narratives (life stories)
- 7 health facility assessments
- 173 questionnaires administered at the household level.

Out of the 44 villages, only Kabolwa was not surveyed due to its far distance with planned project infrastructures. For Buliisa Town Council, the Consultant chose to focus on the Town Council cell (i.e. the city centre) and did not survey fully the remaining 7 cells (Kisiimo, Kakindo, Kizongi, Kityanga, Nyapeya, Kitahura, Kiziikya).

Most of the activities were held without any issue and, in general, the consultants were **favourably received by the local communities**. The different activities (FGD, interviews and household survey) proved to be successful, achieving their aim of engaging local residents and gathering baseline date. Only a few inconveniences happened (see the Fieldwork report for more information).

At district and national levels, the main activities consisted in organising **semi-structured interviews** with important stakeholders from the following groups:

- National authorities (ministries essentially);
- District authorities;
- NGOs, local associations, cultural leaders.

Totally, **31 interviews** were organised with various stakeholders (not including dedicated interviews with health practitioners during the health field survey), allowing the collection of essential information to build the SHBS. The detail of these interviews is provided in Appendix 4.

2.3.2.4. GIS data

Spatial and attribute data collected in the field data collected in the field have been processed and integrated into the existing societal GIS database, according to Total's General Specification "Environment – GS EP ENV 501 – GIS deliverables for HSE". Those data can be easily mapped and visualized:

- On one hand, this GIS database helps to **illustrate** the baseline report;
- On the other hand, it will become an essential tool for an **effective monitoring of socio-spatial indicators** through the Project cycle.

GPS readings have been taken in each visited villages, with a total of more than **1200 waypoints**, including social and economic sites of interest (schools, health centres, churches, boreholes, trading centres, market places, etc.), land use (grazing areas, cattle corridors, etc.) and landmarks for village boundaries (trees, valleys, roads, cattle corridors).

All findings shown on the maps were drafted to the best of the Consultant's knowledge, and information as regard to village boundaries should be considered with care. The **delimitation of village boundaries** is a very sensitive issue: there are several sources with inconsistent information (UBOS map from 2011, map used for the 2013 Social Screening, local leaders or residents' perceptions of boundaries, etc.) and several sources of conflict (such as poor demarcation and increasing tensions because of oil activities).

The objective was not to map the boundaries, but to identify the boundaries that are disputed and to estimate the potential for conflict escalation, as a potential result of the Project activities (and thus formulate specific recommendations on which issues to further explore in the future studies such as ESIA and RAP).

2.4. LIMITATIONS

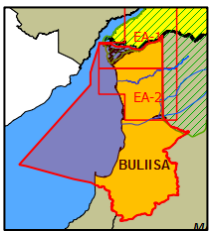
The following limitations were encountered for all workstreams. They should be taken into consideration when reading the present documents and all the SHBS reports.

- Lack of **updated, reliable statistics and quantified data** on certain topics such as demography, village administrative boundaries, land register, etc.
- Difficulties to talk about "**sensitive issues**" with local communities, especially on land grabbing, the role of Balaalo in the local life and community organization, or illegal activities (poaching, fishing in Victoria Nile River, human activities in MFNP).
- Interviews with stakeholders (LC I, district authorities, etc.) enabled to collect important information that needs to be put into perspective with **possible bias** and the **trustworthiness** of human sources of information (for instance, certain stakeholders tended to overstate social issues in a view to obtain future benefits from oil and gas operators).

3. KEY FINDINGS

Study area

Buliisa district



Buliisa district is located in the Western region, Bunyoro sub-region. It is surrounded by Lake Albert, Albert Nile, game reserves/park and Budongo forest. The total area of the district is 2,498 km^2.

It borders Nebbi and Nwoya districts to the north, Masindi to the east, Hoima to the south and the Democratic Republic of Congo (DRC) to the west (across Lake Albert).

Buliisa District was established in 2006/2007 being carved out of Masindi District and includes of 6 sub-counties and one Town Council[1].

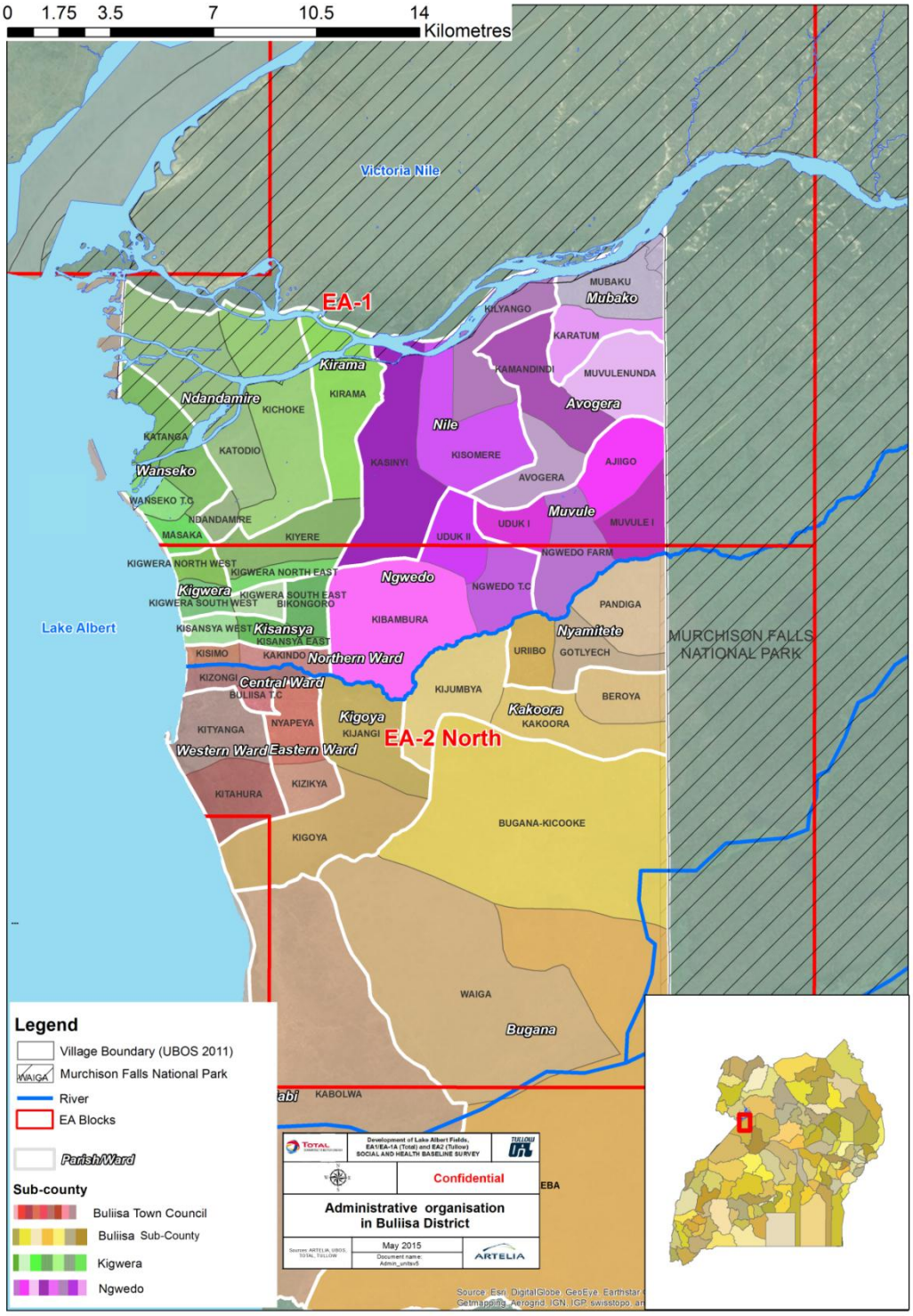
The study area includes (see Figure 2):

- Buliisa sub-county (encompassing 4 parishes and 11 villages)
- Kigwera sub-county (5 parishes and 15 villages)
- Ngwedo sub-county (5 parishes and 16 villages)
- And Buliisa Town Council (4 wards and 8 cells).

The district headquarters are located in Buliisa Town Council. Fred Lukumu, affiliated to the ruling National Resistance Movement (NRM), was elected as Buliisa District Chairperson in 2011 (second mandate). The District Council currently consists of 18 directly elected councillors representing the 7 sub-counties.

[1]Biiso, Buliisa, Butiaba, Kigwera, Kihungya and Ngwedo sub-counties and Buliisa Town Council.

Figure 2 Administrative Map of Buliisa District (Study Area only)



Nwoya district

Nwoya district is located in the Acholi Northern region, Acholi sub-Nwoya region. Geographically, Nwoya district borders the Nile River on the Western edge and hosts the northern third of Murchison Falls National Park in the south, in Purongo sub-county (see Figure 3). The total area of the district is 4,771 km^2, making it one of the largest districts in Uganda.

It borders Gulu and Oyam districts to the east, Amuru to the north, Nebbi to the west, and Buliisa, Masindi, and Kiryandongo to the south.

Nwoya District is one of the newest districts in Uganda. Until 2006, it was part of Gulu district. Then, Gulu district split into Amuru and Gulu districts.

Between 2006 and 2010, Nwoya was part of Amuru District (as a county). Nwoya district was established by Act of Parliament and began functioning on 01 July 2010.

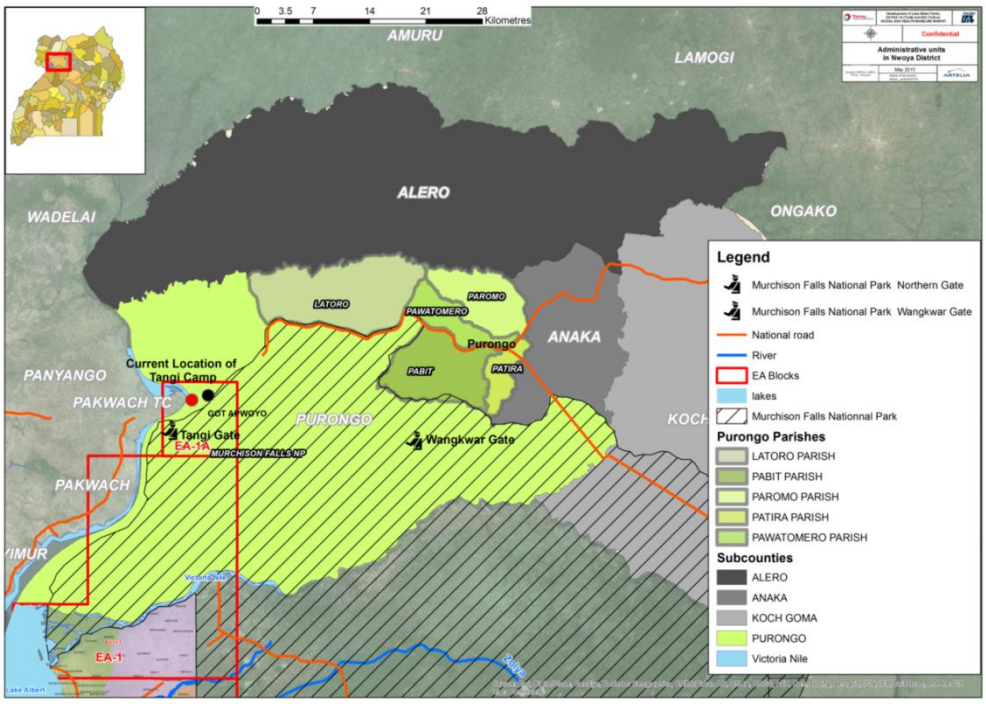
Nwoya district headquarters is now located in Anaka Town Council.

It is comprised of 4 sub-counties[2] ; the project area is located in Purongo sub-county (Got Apwoyo sub-village, Latoro Parish).

Patrick Okello Oryema, former councilor of Purongo Sub-county and affiliated to the Forum for Democratic Change (FDC), was elected as Nwoya District Chairperson in 2010 (when the district was created).

The creation of new districts (Buliisa and Nwoya are both new) poses **serious logistical and administrative challenges**: important files and documents (such as legal land titles, leases, etc.) linger for years in former headquarters before they are sent along to the new district headquarters. A large amount of the available information remains in Gulu and Amuru district headquarters for Nwoya, and Masindi for Buliisa.

Figure 3 Administrative map of Nwoya District



[2]Alero, Anaka, Koch-Goma and Purongo sub-counties.

Administrative organisation and governance

District

The local government system is formed by a **five-tier pyramidal structure**, including district, county, sub-county, parish and village levels. The political organ at all local levels is the **local council (LC)**, whose members are elected.

The district is the highest local government level, responsible to the central government. It is the main service delivery point. The study area straddles two districts: Nwoya to the north and Buliisa to the south.

- The **Resident District Commissioner** (RDC) is a presidential appointee who oversees the running of government programmes in the district, as a central government representative.
- Each district is represented by **2 Members of Parliament (MPs)**.
- Politically, the district is governed by the **District Council**, headed by the district Chairperson.
- The **Chief Administrative Officer** (CAO) is the head of the Public Service in the district.

For the Financial Year (FY) 2014/2015, Buliisa and Nwoya District budgets were respectively 13,824,579,000 UGX (approximately 3,733,000 USD) and 19,659,837,000 UGX (approximately 5,308,000 USD). Both districts are **heavily dependent on external funding (between 70 and 90%)**.

- In terms of **annual budget per capita**, both budgets are relatively low: 33 USD per inhabitant for Buliisa District and 41 USD per inhabitant for Nwoya District.
- Buliisa and Nwoya **proposed annual budgets** for FY 2015/2016 show a **decrease** of respectively 21% and 39% as compared to FY 2014/2015.
- Local governments have been performing poorly in terms of **raising local revenue**, which continues to affect their ability to implement key planned activities.

Poor performance of local governments is underlined in several reports that point out budgetary constraints, with poor local revenue; limited staffing and weak technical capacities; misappropriation and misuse of resources; delayed procurement processes, mainly attributed to inadequate staffing and conflicts of interests, and limited monitoring of service delivery.

Sub-county

Sub-counties in the study area include Purongo in Nwoya District and Kigwera, Ngwedo, Buliisa and Buliisa Town Council in Buliisa District (see Figure 2). Each sub-county is made up of a number of parishes.

- The sub-county is run by the **sub-county chief** on the technical side and by a **LC3 chairperson** and his/her committee. LC3 chairpersons are elected by the residents of the sub-county (by universal suffrage).
- **Sub-county councils** are responsible for service delivery and local economic development within their areas of jurisdiction.

The parish (or ward in the Town Council) is made up of a number of villages: in the study area, parishes consist of between 2 and 5 villages and can host between approximately 900 and 6000 people.

- The **Parish Chief** is appointed by the Government, for an indefinite term; he/she provides technical leadership to the LC2.

- The **LC2 chairperson** is elected by the village LC1 leaders; each LC2 chairperson selects its council (9 members). Since the creation of the parishes in 2010, LC2 leaders have not yet been elected. LC2s are largely involved in settling land distributes and mobilising the communities for various activities.
- Parish councils are responsible for monitoring service delivery at that level.

Village

The village (or cell in the Town Council) is the **lowest political administrative unit**. Beyond that, it is a socio-spatial entity that conveys several meanings. It is a place of shared history, a decision-making unit as well as a social unit, with usually a strong ethnic identity. It is also a land management entity.

Villages in the study area consist of between 80 and 600 households and can host between 200 and over 2000 people[3].

Each village is run by a **LC1** and is governed by a LC1 chairperson and nine other executive committee members.

LC1 chairpersons are elected by residents of the villages. **Last LC1 elections** took place in **2002**, meaning that the great majority of LC1 chairpersons have held their positions for about 14 years.

The delimitation of **village boundaries** is a very sensitive and complex issue, with many inconsistencies among the different sources of information.

Village boundaries are generally formed by linear, permanent natural features (parks, rivers and streams) or road infrastructure. Other boundaries are marked by man-made or man-designated features (e.g. trees, boreholes, etc.).

Inter-village relationship

Most of the disputes or tensions between villages are related to land issues, and more specifically to boundary demarcation issues. Man-made or man-designated features are often more contested than permanent natural elements.

Tensions are due to a combination of factors including poor demarcation and the presence of oil activities that raises expectations of the “impacted/compensated areas”.

Apart from conflicts, efforts of cooperation are made between villages in particular related to access to basic social infrastructure or trade.

Traditional governance

The study area is part of the **Acholi Chiefdom** and the **Bunyoro-Kitara Kingdom**, two of the twelve traditional cultural institutions recognised by the Government of Uganda. Each has a legal mandate, a council or parliament with officers and ministers parallel to official state institutions, and a slate of activities for which they are responsible.

The Alur Kingdom, outside of the study area but which can influence the large Alur population of Buliisa district, is comprised of Nebbi and Zombo districts, and is composed of a number of chiefdoms. The King manages the Kingdom affairs with the support of his cabinet (Primer Minister and ministers).

Clan leaders and elders play an important role in community governance and especially for land-related matters. In Northern Uganda, the clan has always been the basic unit of land governance.

[3] Demographic data at the village level were not available at the time of writing this report (2015 census data not yet published).

The clan's role combined administrative and judicial functions, and included a responsibility to protect land, historically critical for community livelihoods.

Today, in the Bagungu area (Buliisa District), clan leaders and elders are still considered as reliable and legitimate **sources of information in respect to land ownership and land boundaries.** They give consent for land sales, may be expected to lead efforts in view of obtaining customary ownership certificates or land titles and are supposed to protect the community from land grabbing.

In the Acholi sub-region (Nwoya District), while the clan is not anymore the institution that governs land issues, traditional leaders still play an important role and are highly respected as reported by interviewed informants (local authorities and population). Known as ***Rwots***, these traditional leaders have the constitutional mandate to resolve grassroots level disputes, including land conflicts. Their primary function is to guide and foster dialogue among community members.

Due to the recognition of their influence by the Government, local authorities and the population, as cultural leaders and potential conflict mediators (especially for land disputes), the project should consider the traditional or cultural institutions as important stakeholders.

Demography

The Government of Uganda, through the Uganda Bureau of Statistics (UBOS), conducted a **National Population and Housing Census** in August-September 2014, but only provisional results have been made available (at the sub-county level): final census results will be released in December 2015.

Buliisa District provided population data at the parish level (from the last census). There is a slight difference in figures between population data provided by the District and those published in the provisional results of the 2014 census.

Buliisa District

- UBOS estimates that Buliisa District had a population of **113,569 inhabitants in 2014**.
- The population growth rate between 2002 and 2014 is higher (4.86%) than the national average (3.03%).
- The population density is approximately **44 persons per km^2**, much lower than the national average (174 persons per km^2 in 2014).
- The majority (94%) of the population lives in **rural areas**. However, the urban population (Buliisa Town Council, Wanseko and Masaka) is growing fast.
- Life expectancy was around 45 years (47 for women and 43 for men) according to the 2002 census, but is expected to have slightly increased.

Nwoya District

- UBOS estimates that Nwoya District had a population of **128,094 inhabitants in 2014**.
- The population growth rate between 2002 and 2014 is very high, (9.5%), as compared to the national population growth rate (3.03%).
- The population density is approximately **40 persons per km^2**, much lower than the national average (174 persons per km^2 in 2014).
- The majority (89%) of the population lives in **rural areas**.

Village population size ranges **from approximately 200 residents** (from 40 to 80 households in Paara, Kigwera North East and Muvule Nunda) to more than **2 000 residents** (between 250 and 550 households in Bugana-Kichoke and Kabolwa in Buliisa Sub-county). Villages such as Kirama,

Kichoke, Wanseko and Masaka in Kigwera Sub-county, and and Kilyango, Kisomere and Nwgedo Town Centre in Nwgedo Sub-county, and Nyapeya Cell in Buliisa Town Council have a population of over **1 000 inhabitants**.

According to UBOS 2014 national census, the average household size is **5 persons**, both in Buliisa and Nwoya districts (7 according to the SHBS Household Survey)

Ethnic composition

Bagungu and Alur in Buliisa District, and Acholi in Nwoya District, are the dominant ethnic groups in the study area.

- The Bagungu are the original inhabitants of Buliisa district.
- The Alur come from a large area extending from north-western Uganda (Nebbi, Zombo and Arua districts) to north-eastern Democratic Republic of the Congo (DRC). They are part of the larger Luo group.
- The Acholi are a Luo population that gradually migrated from southern Sudan to northern Uganda between the 16th and 17th centuries.

The geographical distribution of ethnic groups across the study area is characterised by linkages with livelihood patterns: the Bagungu population concentrates in the “livestock and grazing areas” (western side of the study area), while the Alur population is mainly found in the cultivated areas.

Other ethnic groups can be found in the study area such as Banyoro, Banyankole and Lugbara, especially along the Lake shore and as cattle keepers in villages where livestock rearing is the major activity. Non-Ugandans from DRC, South Sudan, Kenya or Rwanda are present (in a limited scale) especially in towns such as Buliisa Town Council, Wanseko and Masaka.

Migratory movements

Permanent in-migration is a key driver of social dynamics in the study area, especially in Buliisa district where a variety of regional **geopolitical, historical, social and economic factors has influenced population movements** over a century, in particular **influx of Alur** population (Ugandan, from Nebbi district, or Congolese from neighbouring DRC).

Among these factors: porosity of international borders, cultural ties and marriages (being a migration factor especially for women), violence and conflict in neighbouring countries (especially DRC and South Sudan) and in Uganda, and livelihood strategies (search of arable land, fishing activities, mobile pastoralism, etc.).

Although peaceful contexts both in Uganda and DRC have reduced the influx of Alur migrants, migratory movements continue to occur, mainly for economic or personal reasons. The **discovery of oil** has fuelled expectations of employment and contributed to support these migrations in Buliisa district. There is no figure about the direct link between oil activities and migration. Further studies on this issue should be carried out.

Outward migrations, although poorly documented, are very rare due to a low geographic mobility of inhabitants from the study area.

Important internal population movements (seasonal migration) are observed within the study area, especially between Kigwera and Ngwedo sub-counties during the **rainy season**.

During the rainy season, Bagungu women from the western part of the study area (Kigwera Sub-county and part of Buliisa Sub-county) move temporarily, usually for 2 to 3 months, but sometimes for longer periods, to Ngwedo Sub-county where their family owns small plots of cultivated land.

In the same season, catches are more abundant and temporary migrants come to the Lake shores in search of employment opportunities in the fishing sector.

Bagungu and Alur relationship

Bagungu and Alur have long established ties and a history of **largely peaceful coexistence**. Relations between the different tribes are strongly anchored in marriage relations (many cases of intermarriage between Bagungu and Alur) and mutual dependence (Bagungu cultivate lands in Alur villages in Ngwedo sub-county).

Today, renewed or new sources of tensions emerged between the Bagungu pastoralists and Alur crop farmers:

- **Extension of crop farming areas over grazing land**, especially in villages such as Kasinyi, Uduk I, Kijumbya and Bugana-Kichoke. This adds to the general pressure on grazing land, as it is perceived by crop farmers (urbanisation of the Lake Albert shores, population growth, construction of oil infrastructure, etc.).
- **Encroachment of crops by cattle,** particularly frequent during the rainy season.
- **Exacerbation or instrumentalization of ethnicity** in a number of recent incidents between individuals or groups from different ethnic groups. Some Alur feel that they face discrimination challenges in access to justice and police protection.

Bagungu and Balaalo relationship

In 2007, a bitter conflict opposed Bagungu residents of Buliisa District and Balaalo herdsmen who migrated to the area with large herds of cattle: while the Bagungu accused the Balaalo of grabbing their lands, the Balaalo claimed that they had legally purchased the land a few years earlier. Several violent clashes and numerous injuries resulted from the conflict and the Government eventually intervened to order the **Balaalo's eviction** from the area.

Since these events occurred, the situation has considerably calmed down. The Balaalo have returned to the study area, as herdsmen hired by Bagungu cattle owners, without their own cattle. However, **discriminatory attitudes, stigmatisation and distrust** of Balaalo people persist among local residents and authorities (mainly Bagungu).

Acholi and Jonam

In Nwoya District, the study area is located right in the heart of a contested area: there is an **on-going border dispute** between the Jonam of Nebbi district and the Acholi of Nwoya district.

The conflict has been exacerbated by a combination of socio-economic factors: the creation of Nwoya district in 2010, illegal land sales done by both parties, the perspective of oil benefits. Attempts to build peace were made but conflict stays deeply rooted in the local communities's perception.

Culture

Language

English is the official language in Uganda. However, a large proportion of the population in the study area does not speak English fluently and communicate in local languages.

Acholi, Alur and Bugungu culture follow a **patriarchal structure**. Traditional cultural practices and beliefs may be harmful to women's rights (*e.g.* limited access and control over land, domestic violence, accusation of witchcraft, early marriage, low education level, exclusion from decision-making processes and economic vulnerability).

Matrimonial regime

Customary marriages are most common in the study area. In practice, couples do not register their customary marriages. Formal religious or civil marriages are rare and tend to be reserved to the most educated persons or with higher social status.

Polygamy is a common practice in the study area: men take the initiative to marry a new wife when they have sufficient revenues. **Separation** has become common over the past decade.

Gender roles

Roles and tasks at the household level are **strongly gendered.** Women take on a lot of responsibilities, assuming most of the household daily tasks while men's tasks are often perceived by women as being limited to the provision of "sauce" (fish or meat) for the meals.

Although money management schemes vary from one household to another, men reportedly dominate **finance decision-making.**

Men have more activities outside the household's life than women, in particular through an **active social life** with other men at the trading centres (*e.g.* drinking and playing cards). Women's groups represent a good opportunity for women to meet and feel empowered.

However, beyond the traditional dichotomy between men and women's, **gendered relations have become more complex**, especially in urbanised areas along the Lake shores. At a slow pace, women now broaden their economic activities in typically male-dominated sectors such as fishing or cattle herding.

Youth

In Buliisa District, more than 55% of the population is below 18 with high unemployment rates.

Youth face a major challenge in their **access to employment** due to their limited professional abilities and scarce job opportunities. The arrival of oil and gas activities has created **strong expectations** among the youth to access employment.

Community groups

Village saving and credit groups and self-help groups at large have been reported in most of the villages. They gather villagers who pool their savings as a source for lending funds to group members.

Ethnicity and identity

Animism or paganism, although intensively battled by the different churches in Uganda, continues to be an important part of Bugungu, Alur and Acholi customs.

- Bagungu clans have each their designated **sacred site(s)**, usually materialised by trees with particular physical or longevity features, where they perform rituals and ceremonials. Rivers and streams can also have a cultural importance. The sacred sites are numerous across the study area and were geo-referenced during the field survey.
- Alur individuals settled in the study area have maintained stronger ancestral, animist practices compared to the Bagungu. Most of the ancestral customs and traditions are still part of Alur present customs. Apart from sacred sites for communal ceremonials, households have also their personal cultural shrines within their homes.
- Acholi beliefs and traditions are, similarly to the Bagungu and Alur, rooted in the **worship of ancestors and spirits** and various rituals

- The belief in **witchcraft** cuts across all ethnic groups: like Bagungu and Alur, Acholi's believe in the supernatural powers of witches and unexplained deaths are often seen as acts of bewitchment

Seeking for the recognition of their cultural identity, a group of **Bagungu** leaders claim the secession from Bunyoro-Kitara Kindgom

Although they share most of their value system and socio-cultural features, the Alur from West Nile Sub-region (Nebbi, Arua and Zombo districts), those from DRC and those who have long lived in Ngwedo Sub-county may have distinctive cultural signs

Religion

Along with traditional Roman Catholic and Anglican churches, several Protestant movements (mainly Pentecostal and Adventist) are present in the study area. Presence of Islam and of the African traditional religion

Relations between religious groups are **generally peaceful**, but a certain competition between the different churches was evidenced.

Although community members were frequently reluctant to talk about ancestral practices and denied to practice traditional rituals in the public space, these practices seem actually to persist in the private sphere.

Social disorders

Alcoholism, domestic violence (fuelled by alcoholism) and commercial sex are some of the social ills identified in the study area.

Alcohol abuse is a serious issue in the study area, especially in villages along the Lake shores: landing sites and peri-urbanised areas such as Katanga, Wanseko and Buliisa Town Council are well-known places of alcohol consumption.

Commercial sex is also present in the study area, especially in villages and towns along the Lake shores or more populated trading centres. Fish landing sites are well known **commercial sex and HIV transmission "hotspots"**. Fishing communities, (female and male) sex workers, *boda-boda* drivers and truck drivers are among the most vulnerable groups. NGOs such as Kakindo Orphan Care or associations such as the Alliance of Mayors and Municipal Leaders' Initiative for Community Action on Aids at the Local Level (AMICAAL) distribute free condoms and promote sensitization activities, hiring former sex workers as peer educators.

Petty theft (food from the gardens, cattle, boats and fishing nets), petty crimes, land-related disputes and domestic violence are the most reported cases.

There are several Police Stations at Ngwedo Town Centre, Wanseko, Buliisa Town Council, Butiaba, Warukuba, Kabolwa in Buliisa District and Got Apwoyo in Nwoya District.

Seeking redress can also be done through the judiciary system, organised on three levels of Local Council Courts (LCC) established under the Local Council Courts Act:

- LCC III at the sub county/ Town/Division Council level,
- LCC II at the parish/ward level,
- and LCC I at the village level.

Settlement pattern and housing conditions

In the rural part of the study area, the majority of the population concentrates **along major and minor roads**; most of the villages have a **trading centre** along the main road (or at cross roads), in which main businesses and social activities usually take place (retail shops, community meetings, etc.). Scattered and sparse settlements can also been observed.

While some villages are clearly organised according to clan structure, others have mixed settlement patterns (meaning that they are not spatially organised by clan), especially in Ngwedo sub-county where seasonal migrants come for cultivation and reside in temporary or semi-temporary structures.

Houses remain largely traditional, made of grass-thatched roofs and (painted) mud walls. Materials used to build houses are collected in the open areas, more rarely bought to retailers. The total cost of a traditional hut, without labour, is estimated at **UGX 600,000 (USD 160)** – in the case where all the material is bought.

Iron-roof houses tend to progressively replace grass-thatch roofs, influenced by compensations paid by oil and gas companies.

The estimated cost of a mud walls iron-roof house without labour is between **UGX 1,000,000 (270 USD) and UGX 1,500,000 (USD 400).**

Permanent brick houses are frequently encountered in the urbanised areas between Buliisa T.C. and Wanseko T.C. They usually belong to rich owners such as business men or politicians.

Including manpower (builders, carpenters and masons), these houses can cost from **UGX 10 million (USD 2 700) to 50 million (USD 13 000)**.

Public infrastructure

Education

Literacy rates in Buliisa and Nwoya districts are low. School enrolment has increased following the recent passing of the Universal Primary Education (UPE) Policy, but the dropout rate remains high, especially for girls. The increase in enrolment has exerted pressure on the already over-stretched school infrastructure (classrooms, desks, pit latrines and teachers' accommodation).

Generally, **women** have low levels of education; there is a high illiteracy rate among women (estimated at 44%). It is estimated that over a third of the population over the age of six, primarily women, have never attended school.

Although there are **54 government, community and private primary schools** in Buliisa district, most pupils do not join primary education until the age of 7,8, or 9 and the vast majority of pupils who begin never complete their primary education. There are only **5 secondary schools** in the district.

There are 44 government-aided primary schools, 3 private primary schools and 23 community primary schools in the District. In the study area (Got Apwoyo), children go to school either in **Got Apwoyo Primary School** (10 km away from the village) or in Pakwatch. Due to to the distance, many children do not attend schools regularly. There are three secondary schools

In **Buliisa District**, there are no Business, Technical and Vocational Education and Training (BTVET) institutions at present, but NGOs such as Living Earth Uganda are implementing programs supporting the development and delivery of vocational training. There are also no universities, the closest ones being located in Gulu and Masindi. Very few students reach that level of education in Buliisa and Nwoya districts

Several NGOs are involved in the support to the educational sector in the study area: UNICEF, World Vision, Soft Power Education, Link Community Development, Build Africa. They build classrooms, staff houses, pit latrines and provide trainings to teachers to improve their educational skills. TEPU and TUOP also support the sector through a scholarship programme for the former and a funding to the Link School Improvement Project for the latter.

Water and sanitation

Water and sanitation infrastructure are scarce and unequally distributed throughout the study area due to uncoordinated interventions of various actors to build such infrastructure.

A large range of water sources are used by local communities:

- **Unprotected springs, swamps, Lake Albert, streams and rivers.**
- **Hand-dug wells** usually dug out during the dry season.
- **Public tap water spots**, only available in major trading centres such as Wanseko, Masaka or Ngwedo
- **Hand-pumped community boreholes**. They are the most common source of water for local communities. Regular pump breakdowns and the fact that many boreholes tend to dry up during the prolonged dry season force many women to walk long distances and queue for long hours to fetch water whose quality is often degraded, according to local communities.

The poor sanitation conditions in Buliisa and Nwoya districts contribute to high health risks, especially cholera and water-borne diseases. The worst sanitation conditions are found at Lake Albert shores (*e.g.* around landing sites).

Several programs are implemented by international NGOs and bilateral donors to tackle sanitation issues.

Transportation

There is currently **no tarmacked road** in Buliisa district. UNRA plans to upgrade the Hoima – Butiaba – Wanseko road to tarmac in the coming years, a project that is currently at the procurement phase.

The District has about 160 km of **trunk roads,** 85 km of **feeder roads** and 130 km of **Community Access Roads.** It is connected with Nebbi Districts, across the River Nile, through the ferry.

The Karuma-Pakwach-Nebbi-Aura road runs through **Nwoya District** and gives access to DRC.

Despite renovation efforts by the Uganda National Roads Authority (UNRA), the whole road network can become hardly practicable during the rainy seasons due to potholes and water-logged spots.

Local communities use walking, bycicles and boda-boda to commute from one place to another.

Energy

There is no access to the national electricity network in the study area. In major trading centres such as Buliisa Town Council, Wanseko Town Council or Ngwedo Town Centre, generators fuelled with kerosene allow electrical appliances to work. Kerosene is also used to fuel portable and fixed grinding machines.

Numerous shops in trading centres are also equipped with **solar panels** used to load mobile phones, supply radio to listen to music or provide light at night.

Most of the households rely on firewood as a mean for cooking. Women use either a fireplace located inside the kitchen hut or outside. In the evening, lighting is provided through the use of paraffin lamps.

Communication

Cellphone use speads in the study area, with **58% of the respondents** to the SHBS Household Survey reporting they use one. The telecommunication providers include MTN (U) Ltd, Airtell, Uganda Telecom Ltd and Africell.

Information can also be exchanged at various **socialization places**, which includes trading centres, markets, woship places, football games or community events.

Health

Common diseases burden

According to the routine HMIS system, the **top diseases diagnosed** in 2013/2014 in Buliisa were malaria (47%), non-pneumonia-cough (33.7%), intestinal worms (6.7%), acute diarrhoea (4.8%), Sexually Transmitted Infections (2.9%), skin infections (2.8%), eye infections (2.1%), gastrointestinal disorders (1.9%), pneumonia (1.4%) and ear, nose and throat Infections (1.2%). Overall, this profile of leading causes of morbidity is broadly similar and consistent with those seen in other districts in northern and western Uganda.

The disease epidemiology in Nwoya is generally similar to Buliisa however, according to HMIS statistics, a notable difference is in the malaria burden. Although malaria is a major cause of morbidity in Nwoya with on average 17% of health centre visits being due to malaria in Buliisa this was 47%. Sexually Transmitted Infections appear to be less prevalent in Nwoya accounting for only 1% of health facility visits while skin conditions appear more prevalent accounting for 5% of facility visits.

Villages bordering Lake Albert and the White Nile also experience a high burden of **neglected tropical diseases**, such as schistosomiasis and onchocerciasis. The **burdens of HIV and HIV-related conditions** are also high, although not captured as such within the HMIS system.

Road Traffic Accidents (RTA) were not listed among the common causes of health facility visits in Buliisa except at Biiso HC III, which is close to a main road (Buliisa – Hoima highway), and Packwach HC IV, commonly as a result of accidents involving animals in Murchison Falls Game Reserve. There is no active surveillance system to track cases of non-accidental injuries and there were mixed responses about how common these are in Buliisa.

Infrastructure assessment

Like other essential services health provision in Uganda is decentralized. Health centres levels I to IV cover geographical areas from villages to sub-counties, district/general hospitals, regional referral hospitals and national referral hospitals.

Health service delivery is **decentralised at the district level**. The District Health Management Team (DHMT), led by a District Health Officer (DHO), is mandated to implement health policies and programs, and plan for and oversee service delivery including curative, prevention and disease control services.

Each district has a designated **regional referral hospital** which provides specialised health services not offered at district level.

- The Regional Referral Hospital which serves Buliisa is Hoima regional referral hospital in neighbouring Hoima district and about 80 Km from the Centre of Buliisa.
- The district hospital, Buliisa Hospital located in Buliisa sub-county was constructed by Tullow and handed over the Ministry of Health in March 2014. It is however operating at minimal capacity as it is yet to be equipped and staffed.
- There are ten health centres in Buliisa district - one HC IV, two HC IIIs and seven HC IIs, two of which are PNFPs.

In addition to these officially designated health facilities, it is not uncommon for Buliisa residents to attend other health facilities in neighbouring districts, largely because of better access as well as better as better capacity for service delivery compared to facilities within Buliisa.

With the exception of Buliisa Hospital, lack of space was reported as a major challenge for all health facilities.

All facilities with the exception of Bugoigo HC II, Kihungya HC II and Avogera HC III cited understaffing as a major constraint to service delivery. Acute and chronic staffing shortages are a challenge at the national level for Ugandan health sector, resulting from a number of interconnected factors ranging from low remunerations, lack of training or shortage of staff housing.

All facilities reported routinely:

- Providing recommended vaccination services for children 0-1 year old, family planning services and basic antenatal care
- Diagnosing and treating uncomplicated malaria and URTIs, but only HC IIIs HC IVs and hospitals are able to manage pneumonia.
- Conduct HIV testing at all facilities and at HC IIs, which are not mandated to provide PMTCT and comprehensive HIV care services: patients found to be HIV-infected are appropriately referred to facilities which provide comprehensive HIV/AIDS care.

There is a severe lack of capacity to manage schistosomiasis, NCDs, surgical conditions and blood transfusion within the study area and almost no capacity to manage cancers. Notably, none of the health facilities in Buliisa can conduct surgeries, blood transfusions or deal with mass casualty incidents while Hoima RRH is the only unit with capacity to deal with serious burns.

In terms of medicines, stock situations varied widely:

- Almost all facilities had the basic medicines and critical tracers including paracetamol, Oral Rehydration Salts (ORS), deworming medicines and measles vaccine.
- Likewise almost all facilities had in stock the first line medicines for treating uncomplicated malaria. In contrast only 50% had injectable artesunate, the recommended first-line for complicated/severe malaria.
- Only 40% of health facilities had in stock injectable oxytocin, a life-saving medicine for the control of bleeding in women after delivery

Individual practice, particularly that of spiritualists and to some extent herbalists varies considerably depending on the ethnic origin of both the practitioner and the patient and their belief systems. Alur communities thus seem to have more traditional practitioners, especially herbalists, than Bagungu.

Land and natural resources

Tenure

Customary tenure systems, covering mostly **unregistered** land assets managed individually or communally, are the predominant form of tenure.

- **Communal** tenure: applied by the **Bagungu** ethnic group in central and western Buliisa District.
- **Individual** tenure: applied by the **Alur** in eastern Buliisa District and the **Acholi** Got Apwoyo area (Nwoya District).

Individual and communal customary tenures are recognised by the law. Customary land holders can formalize their land rights through the establishment of **certificates of customary ownership** (CCO) or of **freehold** titles.

However, most of the community members holding customary land under individual or communal tenure **do not hold CCO, neither do they hold freehold titles.** Only a few cases of clan cooperation to title communal land were observed.

Explanatory factors are a lack of knowledge and financial resources among community members and weak governance from local land institutions, often unable to manage the procedure leading to the delivery of the CCO due to broader governance issues.

Land is largely acquired through traditional inheritance mechanisms, a process that favours **male domination** over land assets: land is usually transmitted from father to sons, excluding women from land ownership. Women are dependent on their male relatives (first their father, then their husband when they get married) to access land and are very exposed to landlessness upon their husband's demise.

In addition to inheritance, land can be now more frequently purchased or rented as contemporary tenures make their way into traditional land management.

In Buliisa District, purchase prices range from UGX 600,000 to 1,000,000 per acre (US$ 162 to 271). Land is more expensive in Ngwedo and Buliisa sub-counties because demand is higher and land availability lower. In Nwoya District, prices range from between UGX 350,000 to 600,000 per acre (US$ 95 to 162).

Freehold and leasehold tenures are not frequently encountered in rural areas. They are more common in urban and semi-rural areas. In Nwoya district, large parts of fertile land have been seen as vacant by private investors after populations were displaced in IDP camps. These investors acquired large swath of these land to develop large-scale agricultural farms.

Oil and gas presence, coupled with and other socioeconomic factors (population growth, migrations, etc.) have activated **land valuation and speculation processes** that directly affect local communities' customary rights and materialise through:

- Land grabbing, especially by an important businessman in Buliisa District, Increase in land titling applications despite the current moratorium.
- Conflicts among family members or ethnic groups for access to and preservation of land assets.

Speculation and land conflicts are fuelled by a weak national land governance framework and a poor regulation of land by local authorities.

Local communities solve most of the land-related conflicts (and other conflicts) using a three-stage approach, from local community-based institutions (clan elders and LC I) up to higher levels of authorities (LC III, courts of Law).

Current solutions to tackle land issues (and especially land grabbing), such as the moratorium on the issuance of land titles, are legally weak, poorly implemented and have a short-term validity. Long-term solutions, consisting for instance in conducting systematic land demarcation or developing land physical planning to better control future changes in land uses that will be brought by oil and gas development, are currently prepared.

NGO increasingly intervene in the land sector, assisting local communities in **securing their land rights** to avoid land grabbing.

Land use

A large part of land in Buliisa and Nwoya districts is dedicated to accommodate **environmentally protected areas** that were established to preserve a valuable biodiversity.

These areas have different statutes (forest reserves, wildlife reserves, national parks or Ramsar sites) which condition different rights and duties. For instance, some sites are not accessible without authorization (such as the Ramsar Site or the MFNP). Resource collection in these areas is strictly forbidden unless arranged by the law. Some sites are dedicated to tourism such as the MFNP and Budongo Forest Reserve.

In Buliisa district, land is mainly used for crop farming and cattle grazing, with development of peri-urban areas in the surroundings of Buliisa T.C. and Wanseko T.C. (see Figure 4 for the exact location of these areas).

In Nwoya, although 90% of the total land area is fertile, **less than 10% is utilized yearly. Land use is dedicated to crop farming.**

Natural resources

Local communities actively exploit forestry products, plants (papyrus, elephant grass) and minerals (lake shells, vegetal earth, sand) in the study area to meet specific household needs (construction, cooking fuel, production of handicrafts, furniture or medication). Exploiting natural resources also enables households to generate incomes and to alleviate poverty.

Natural resources are subject to **increased pressure leading to their rarefaction**, especially **wood** and Lake Albert's **fish population**.

Local communities resort to collecting resources from environmentally protected areas (collecting wood in MFNP, fishing in the Victoria Nile River, etc.), threatening the environment and causing conflicts with UWA.

The **rangeland**, used to graze cattle, is also overexploited because of the increasing size of cattle herds.

The role of oil and gas activities played on this trend cannot be clearly established: contrarily to land resources which are needed to implant sites, natural resources are not part of oil and gas operators supply chain. Oil and gas operations thus indirectly contribute to natural resources depletion, through in-migrations and induced economic development.

District local governments, a number of NGOs and UWA support natural resources regulation and preservation.

Livelihood strategies

Most of the households in the study area live on natural resources based livelihood.

- **Crop farming** in areas where land is the most fertile, especially eastern Ngwedo Sub-county, known as the "food basket" of Buliisa District (see Figure 4 for the location of this area);
- **Livestock rearing**, on grazing land along the Lake shores and in villages such as Kibambura, Kasenyi and Waiga (see Figure 4);
- **Fishing** in the Lake Albert and rivers such as Zolia, Sambyie and Waiga rivers and related activities (fish processing and trade);
- **Natural resources** exploitation (*e.g.* charcoal and papyrus).

Other economic activities include:

- **Trade and services** (*e.g. boda-boda* transportation, bank, shops, restaurants, etc.), mostly concentrated in more urbanised areas such as Buliisa Town Council, Ngwedo Town Centre and Wanseko;
- **Tourism**, especially lodges at the border of Murchison Falls National Park (villages such as Mubako and Paara).

Many households rely on **more than one livelihood strategy** for food security and income generation: it is common for families that own cattle below the escarpment (Kigwera Sub-county and parts of Buliisa Sub-county) to also small plots of agricultural land above the escarpment (Ngwedo Sub-county), as well as fishing boats along the lakeshore.

This high level of livelihood diversification has been developed by local communities as a **coping mechanism** for dealing with stresses, shocks and trends (such as climate change) that may affect their livelihoods.

The diversity of livelihood sources gives way to **seasonal migrations** of populations within Buliisa district: during the cultivating season (see Table 1 below), communities from Kigwera sub-county, especially women, settle in eastern Buliisa district to take care of their crops. In the fishing season (see Table 1 below), men commute to the lake shore on a daily basis, or occasionally spend several nights in one of the landing sites. These migrations, represented by blue arrows on 0, strongly shape the social life and organisation of communities in the study area.

Table 1_ Calendar of activities (crop farming, cattle grazing, fishing)

Type of activity	J	F	M	A	M	J	J	A	S	O	N	D
Crop farming		Land clearing, ploughing and planting				Harvest	Land clearing, ploughing and planting				Harvest	
Fishing	Low fishing		Fair	Best Fishing season		Fair	Low season Fishing			Best season Fishing		
Cattle grazing	Higher mobility		Grazing mobility		short			Grazing mobility		short	Higher mobility	

Figure 4 Land uses in Buliisa District (study area)

Livelihood strategies are strongly related to land uses and are largely influenced by:

- **Geographic location** and access to natural resources (*e.g.* proximity to the Lake);
- **Soil and water conditions**: eastern part of Ngwedo Sub-county has relatively **fertile soils** with good potential for growing different perennial crops;
- **Ethnic group**: the two dominant ethnic groups in the study area, namely Alur and Bagungu, have different land use systems and livelihood strategies.
- **Seasonality**: there are marked seasonal variations in livelihood activities (fishing, use of natural resources and agriculture) and noticeable patterns of vulnerability due to seasonal factors. Local communities have different responses and coping strategies to deal with these factors of vulnerability.

Buliisa district

The study area can be divided into **four major agro-ecological zones**:

- Lake Albert shores ;
- River banks, especially Waiga River, which are part of wetland ecosystems;
- "Food basket" in eastern Buliisa District (most part of Ngwedo Sub-county and the north-eastern part of Buliisa Sub-county);
- Grazing land in central Buliisa (covering large parts of Kigwera, Ngwedo and Buliisa sub-counties).

These zones can be grouped into three major livelihood zones, the river banks being used for natural resources collection (papyrus) by inhabitants of the three other main livelihood zones.

The Lake Albert shores

Local communities in this part of the study area rely mainly on **fisheries** (fishing activities for men and processing activities for women), in combination with crop farming (seasonal migration to Ngwedo Sub-county), livestock rearing and other income-generating activities such as sand mining and shell collecting.

Fishing and fish processing are the main income-generating activities and sources of food security along the Lake shores. Those who own the means of production (boats and fishing gear), the better-off (mainly Bagungu), employ migrants and native fishermen who provide labour in crew and are paid in-kind (fish catches). The bulk of the fish that is caught is sold on local markets and to intermediaries from Kampala (and other places as far as Sudan), while some of the catch is consumed by households.

Sand mining areas (for construction purposes) have been identified in this area (in Wanseko, Kigwera South West and Kisansya West at the Lakeshores, and in the swamps and valleys around Ngwedo Town Centre and Kijangi), especially where the road allows for an easy access for trucks.

Smale scales sea shell collecting (especially by women) is another important income-generating activites: shells are sold to the animal food industry.

Grazing land and livestock rearing

"Central Buliisa District" or the grazing land between the Lake shores and Ngwedo "food basket" area, below the escarpment, is almost exclusively dedicated to livestock rearing: sheep, goats and mainly cattle. Due to their ability to survive on poor forage and limited water, local short-horn zebus are generally the preferred breed.

Cattle is sold on local markets but mainly serve as a saving and coping mechanism, used to pay for exceptional expenditures.

Most of the Bagungu livestock owners hire *balaalo* herdsmen which are usually paid in-kind (milk) and sometimes with a salary.

Most of the Bagungu households (85% according to the SHBS Household Survey) practice crop farming and fishing as complementary activities:

- Some have of them have planted crops around the homestead, in fenced gardens to prevent cattle to encroach it. This practice has been observed but is very marginal.
- Most of the households prefer to cultivate crops in the farmland area (Ngwedo Sub-county) where they own or rent plot of lands, or for the poorest, provide casual labour. Women (mainly) temporary migrate during the rainy season to cultivate their gardens. They rely on crop farming for food security and incomes that will be used for household needs or invested in cattle.

Local community members also practice **fishing** on Lake Albert as a complementary source of income.

The "food basket" in Ngwedo Sub-county

The soil in the north-eastern part of the study area (most of Ngwedo sub-county and north-eastern of Buliisa Sub-county) is relatively fertile. **Rain-fed agriculture** is the main activity practiced by Alur residents and seasonal Bagungu migrants: cassava and maize are the main crops cultivated, both as food and cash crops. Cotton is also grown.

Farmers who have enough land (more than 5 - 7 acres dedicated to food crops, for a household of 8 to 10 members) for their own needs usually rent small plots to other farmers from neighbouring villages or other parts of Buliisa District.

Local inhabitants usually have different **trees** around the compound, including mangos, citrus, bananas and pawpaw for fruit consumption, but also acacia and lira trees for sale and construction. In the **garden**, near the house, women grow pumpkins, sweet potatoes, sorghum, tomatoes, egg plants and beans.

Most of the households (80% according to the SHBS Household Survey) also own **small livestock** (chicken, ducks, sheep, goats and more rarely pigs) that they keep tethered around the homestead.

Fishing is not regularly practiced due to the long distance to the Lake Albert. However, local communities can temporarily migrate to the Lake shores to practice fishing from one of the landing sites, especially during the dry season when agricultural activities are low.

The main sources of food for most households are their own crops and livestock. They also supplement these food sources through purchase of fish from Lake Albert.

Nwoya District (study area, Got Apwoyo)

Prior to the protracted conflict, local communities relied on **livestock grazing and crop farming** as their major sources of livelihoods. After they returned to their home villages in 2007, they were exposed to the presence of numerous wild animals coming from MFNP which regularly attacked their livestock and devastated their crops. To adapt to these impediments, local communities change their livelihood strategies from subsistence agriculture to **income generating activities**.

They abandoned traditional activities such as cattle rearing (today, only small animals are kept close to the compounds) and cultivation of fruit trees (because they attract elephants). They started to cultivate other crops such as sesame – that is not eaten by elephants – and to collect and sell

grass for thatches and produce charcoal. Fishing activity in the River Nile, although prohibited, has also increased.

Tourism

Tourism is a developing sector in Uganda compared to regional neighbouring countries. MFNP is now a major tourism destination in Uganda, with an increasing number of visitors and on-going development of carrying capacities.

However, the tourism sector as it is currently developed in or around MFNP has limited benefits to the local communities, due to private investors organizational arrangements (Kampala-based), lack of local content (most of the employees and supplies come from Kampala), limited competences and qualifications of local communities to work for lodges and hotels or to develop their own tourism infrastructure. Few community groups are properly structured and involved in tourism activities. They generally lack **financial and business management skills** to effectively run tourism-related enterprises.

The revenue-sharing mechanisms put in place between villages bordering the park and the Uganda Wildlife authorities contribute in a small way to development of local communities.

Communities also face challenges regarding **human-wildlife conflict**. Local residents are concerned about wildlife destroying their crops and their inability to protect their livelihoods and their own safety and security.

These conflicts and the limited contribution of revenue-sharing mechanisms to development of local communities bordering protected areas fuel community dissatisfaction over these areas.

There are major concerns among the stakeholders within the tourism sector who include investors, authorities and conservation bodies regarding the future on the tourism sectors once oil and gas development and production get underway. There is however recognition that the two can coexist if various interventions are put in place to ensure continuity and growth of the tourism sector.

4. MAJOR SENSITIVITIES AND MONITORING INDICATORS

Each workstream report has underlined a number of sensitivities in the social and economic context of the study area. The main sensitivities are presented in the table below.

Table 2_ Social sensitivities

Key thematic	Brief description of sensitive elements	Monitoring indicators
Local governance	▪ Elections period to be held in 2016 (possible unrest in the country). ▪ Poor performance of local governments attributed to internal and external factors. ▪ Accusation (towards elected leaders) of embezzlement, corruption or land speculation. ▪ Gender disparities and exclusion of women from political processes and decision-making. ▪ Superposition of traditional and modern governance. ▪ Traditional or cultural leaders claiming a share of oil revenues. ▪ Bagungu groups claiming a cultural distinctiveness and demanding secession from Bunyoro-Kitara Kindgom. ▪ Very sensitive issue of village boundaries: most disputes or tensions between villages related to boundary demarcation issues. ▪ Inadequacy of existing maps showing the administrative boundaries and mismatching information provided by different sources.	▪ Changes in district budget (resources and expenses)

Key thematic	Brief description of sensitive elements	Monitoring indicators
Demography, migration, ethnicity, vulnerable populations	▪ Buliisa District's population nearly doubled in the past two decades and continues to rise steadily. ▪ Demographic pressure due to natural growth and in-migration from DRC and Nebbi district, Uganda ▪ Demographic pressure fueling urbanization of Lake Albert shores (Buliisa Town Council, Wanseko and Masaka) and competition for land and natural resources access. ▪ Vulnerable groups identified: Balaalo herdsmen, separated/divorced women and widows, uneducated persons, landless persons, isolated older people, people with disabilities. ▪ Harmonious cohabitation between ethnic groups but cases of violent clashes between Balaalo, Bagungu and Alur, Acholi and Jonam groups in the past. ▪ Resent among ethnic groups over access to land and natural resources could renew conflicts (potentially violent).	▪ Changes in population size, distribution and composition in affected villages ▪ In- and out-migration flows ▪ Inter-ethnic relations: frequency and intensity of disputes
Housing and living conditions	▪ Traditional grass-thatch and mud houses dominant in study area. ▪ Increasing number of iron-roofed houses and even permanent brick houses.	▪ Living conditions of local communities/households (with particular attention to vulnerable groups): physical indicators such as housing conditions, access to water (e.g. distance to nearest borehole), access to health services (distance to nearest health centre) ▪ Standard-of-living indicators

Key thematic	Brief description of sensitive elements	Monitoring indicators
Culture, social organisation	▪ Bagungu, Alur and Acholi cultures essentially oral and strongly intertwined with their livelihood sources. ▪ Potential changes in livelihood sources to affect their culture and cohesion as an ethnic group. ▪ New efforts made by Bagungu to preserve their cultural identity through local associations. ▪ High unemployment rates and limited opportunities for youth. Feeling of exclusion from land ownership and community decision making processes, pessimistic vision of their future. ▪ Gendered roles and heavy burden on women. ▪ Weaker community support in Bagungu groups ▪ Social disorders on the rise in Buliisa district, seemingly less important in Nwoya. ▪ Alcoholism, domestic violence (fuelled by alcoholism) and commercial sex the main social ills. ▪ Commercial sex present in the study area, especially in villages and towns along the Lake shores or more populated trading centres. ▪ Fish landing sites well known commercial sex and HIV transmission “hotspots”.	▪ Changes in gender division of labour (workload) ▪ Trends in marriages/divorces ▪ Trends in domestic violence (it is very difficult to monitor domestic violence, but the number of cases reported to the police can be used as a proxy indicator although it does not fully) ▪ Changes in access to and control of resources ▪ Changes in women empowerment (e.g. active women groups, participation in decision-making processes, etc.) ▪ Trends in commercial sex (also difficult to assess but trends can always be “observed” and NGOs working with (former) commercial sex workers can help to monitor these trends)
Public infrastructure	▪ 90 % of the population in Buliisa district below poverty line. ▪ Inadequacy and insufficiency of public basic service delivery and infrastructure development. ▪ Limited access to water and poor water quality. ▪ Low literacy rates. ▪ Poor transportation network vulnerable to rain. ▪ No access to national electricity grid, reliance on firewood. ▪ Lack of budget and staff at district level to implement infrastructure improvement.	▪ Pressure on existing basic infrastructure (ratio schools/population, health centres/population, number of functioning boreholes/population, etc.)

Key thematic	Brief description of sensitive elements	Monitoring indicators
Health	▪ High burden of malaria and prevalence of water-related diseases ▪ Inadequate disease surveillance and investigation with a distinct lack of up-to-date or accurate information on HIV, malaria, TB and NCD prevalence and incidence. ▪ Non-quantified increase in sexually transmitted infections and specifically HIV in study area. ▪ Limited care capacities for certain health burdens and to respond to mass casualty incidents.	▪ Malaria indicators ▪ HIV/STD indicators ▪ Non Communicable Diseases indicators ▪ Quality of care and services (e.g proportion of health facilities with adequate staffing by cadre type)
Safety and security	▪ Main offences: petty thefts (especially livestock), petty crimes, land disputes, domestic violence ▪ Child labour at landing sites ▪ Poor awareness on road safety among local communities ▪ Tribal bias of police forces reported by Alur community members ▪ Limited access to formal judicial system for poor and vulnerable households	▪ Number and types of offences ▪ Number of Road Traffic Accidents registered by local hospitals
Land	▪ In Buliisa, limited land availability due to presence of protected areas surrounding the district. ▪ Land pressure fuelled by demographic growth and migrations. ▪ Perception of land as valuable asset due to development of oil and gas operations (among other factors). ▪ New conflict sources caused by arrival of external investors buying land in anticipation of oil shares, compensations or for speculation motives. ▪ Fear of land grabbing and resettlement widespread among local communities. ▪ Competition between families, neighbours and ethnic groups to access and preserve land assets. ▪ Land at the centre of major past conflicts between ethnic groups and still a subject of dispute between Bagungu and Alur.	▪ Changes in prices of land asset (purchase and rental) ▪ Frequency, intensity and number of boundary conflicts at various levels (household/individual, clan, village, parish, sub-county, district) ▪ Claims as regard to changes in administrative units (sub-county and district boundaries) ▪ Changes in settlement patterns: physical indicators such as density of buildings in urban, peri-urban and rural areas, extension of urban areas, etc. ▪ Land prices and transaction trends (origin of buyers, prices trends, number of land transactions, etc.)

Key thematic	Brief description of sensitive elements	Monitoring indicators
Livelihood strategies	▪ Multiple sources of livelihood (fishing, cattle grazing, crop farming, natural resources exploitation). ▪ Reliance on one major source combined with others to complement revenues. ▪ Combinations of these different sources depend on ethnic group belonging and place of residence. ▪ Livelihood combination a key element of resilience to economic shocks and food insecurity: if one activity fails (for instance harvest failure in crop farming), use of another (such as fishing).	*Changes in livelihood strategies* ▪ Average surface of farming land per household ▪ Number of livestock head per household ▪ Livelihood diversification (fishing/business/agriculture/ casual labour) ▪ Fish catch (need additional baseline indicators) ▪ Increase in small businesses (the exact number today is unknown but it is possible to monitor trends) *Changes in household incomes* ▪ Expenditure can be used a proxy indicator (usually more reliable than income data because people are less reluctant to talk about expenditures that they are when they talk about their incomes) ▪ Ownership of productive and consumption assets are other possible proxy indicators (land, small business, means of transportation, radios, mobile phone, etc.)
Crop farming	▪ Climate change causing prolonged dry spells and pests and diseases such as cassava mosaic can lead to crop failure and undermine food security for vulnerable households. ▪ Lack of access to inputs, to mechanized tools such as tractors and lack of capital to hire labour greatly reduce agricultural productivity. ▪ Crop destruction by cattle or by wild animals (wild pigs, baboons, monkeys) coming from the MFNP force local communities to better protect their crops. ▪ Low and fluctuating prices of products penalize household incomes.	▪ Price trends (crops, basic amenities, building material, natural resources sold on local markets, etc.) ▪ Average surface of farming land per household

Key thematic	Brief description of sensitive elements	Monitoring indicators
Fishing	▪ Overfishing jeopardizes the sustainability of fish stocks and the livelihood system of local inhabitants (both for food security and income). ▪ Fishermen exposed to physical risks and regular fatal accidents are reported. ▪ Increasing tensions between Congolese and native fishermen perceived as a serious risk to their safety. ▪ Exposure to water-borne diseases and malaria, poor sanitary conditions, high prevalence rate of HIV/Aids, especially at the landing sites, and risk taking behaviours including alcohol abuse, also constitute serious vulnerability factors for the households' wellbeing.	▪ Annual fish catch rate ▪ Changes in income generated by fishing activities
Livestock rearing	▪ Reduction of grazing land observed due to urbanisation process along the lake shore, extension of crop farming areas and presence of oil and gas activities. ▪ Increase in cattle ownership and cattle herd size (due to demographic pressure and increased cattle value) put a strong pressure on grazing land with a degradation of this land. ▪ Communal land management challenged by competition for resources, leading to potential future changes in traditional cattle grazing (from free range to fenced grazing). ▪ Strong dependency of Balaalo herdsmen on the traditional free range scheme and in-kind payment. Change on this scheme could lead to their unemployment and fuel their vulnerability.	▪ Number of cattle heads in the district (and at the household level) ▪ Price of livestock products (cattle, meat, milk) ▪ Availability and quality of pasture ▪ Access to water sources ▪ Contribution of livestock to household livelihoods (cash income, in-kind benefits and food security) ▪ Livelihood and status of vulnerable groups, especially the Balaalo

Key thematic	Brief description of sensitive elements	Monitoring indicators
Natural resources	▪ Prolonged dry seasons and recurrence of long droughts prevent natural resources to grow and regenerate. ▪ Overexploitation of wood causes soil erosion and progressive land degradation that could affect other sector. ▪ Other natural resources subject to increased pressure leading to their rarefaction. ▪ Important reliance of women on natural resources exploitation as a source of income: resource rarefaction could affect them heavier than men. ▪ Collection of resources from environmentally protected areas, threatening the environment and causing conflicts with UWA. ▪ Demographic changes as well as changes in livelihood patterns will continue to exert strong pressures on natural resources.	▪ Price trends (crops, basic amenities, building material, natural resources sold on local markets, etc.) ▪ Access to natural resources and availability
Tourism	▪ Growing sector (number of visitors to the national parks steadily increases) but sensitive to external factors (e.g. health issues, economic crisis, terrorism, etc.). ▪ Sector disruption as a result of oil and gas activities (in MFNP particularly). ▪ Lack of integration and management of tourism planning and management at the local (district) level. ▪ Low contribution of tourism, both directly (employment and generation of incomes for local communities) and indirectly (through revenue-sharing mechanisms and indirect benefits such as local content) to economic and social development of local communities. ▪ Human-wildlife conflicts and prohibition of resource collection from protected areas fuel local communities' discontent.	▪ Early warning indicators (e.g., decline in numbers of tourists who intend to return) ▪ Measures of the current state of the industry (e.g. occupancy rate)

5. MONITORING TOOLS

In order to monitor the proposed indicators presented in Table 2 and to update comprehensively the baseline data information, TEPU and TUOP can use several tools at a different frequency.

Some tools are proposed in the Table 3 below, as well as a recommended frequency to update the baseline data. The frequency for monitoring of indicators can be adapted to the project intensity: if the project intensity is low, indicators can be monitored less regularly than if project intensity is very high (*i.e.* when the project requires an important mobilisation of human resources and material on the field, its intensity can be regarded as high).

Table 3_ Example of tools to monitor baseline indicators

Tool	Purpose	Frequency
Key informant interviews	▪ Monitor various indicators ▪ Update on demographic figures through contacts at UBOS ▪ Assess migrations trends through interviews with Directorate of Citizenship & Immigration Control Office located in Butiaba ▪ Assess security issues and conflict potential with RDC, police officers ▪ Asses public infrastructure conditions and plans for future investments with District officers ▪ Assess land trends with District Land Board ▪ Assess health issues with District health officer	Yearly
Price assessments	▪ Monitor inflation through regular updates on a list of material and immaterial items (commodities, land purchase or rental, etc.) ▪ Use Infotrade tool[4], market surveys and interviews with key informants (land institutions)	Depends on the project intensity (can be bi-annual if operations are intense)
Media search	▪ Monitor certain trends (conflicts, social issues, etc.) and project perception in media	Weekly
Project library creation and update	▪ Get latest district budgets and framework plans, ACODE reports, other publications from NGOs, universities, on study area to constitute a library	Monthly
Household surveys	▪ Monitor trends at the household level: changes in living conditions, incomes and expenses, access to public infrastructure ▪ Also help monitor project perception	Every 3 years
Satellite imagery analysis	▪ Follow-up changes in land uses: reduction of rangeland, extension of crop farming, urbanisation, reduction of wetlands, etc.	Every 2 years

[4] http://www.infotradeuganda.com/

6. RECOMMENDATIONS FOR FURTHER INVESTIGATIONS

Additional baseline indicators and dedicated investigations are required to properly monitor the Project future impacts. Issues that might require **further investigations** are listed below:

- Household income assessment (individual household survey) and food security assessment;
- Condition of fish stocks in Lake Albert;
- Balaalo communities, their culture, customs, living conditions, livelihood sources and vulnerabilities;
- Women's role in livestock production systems.

Some of them can be developed in the environmental and social impact assessment studies, as well as the resettlement action plan studies. Others might need dedicated social investigations.

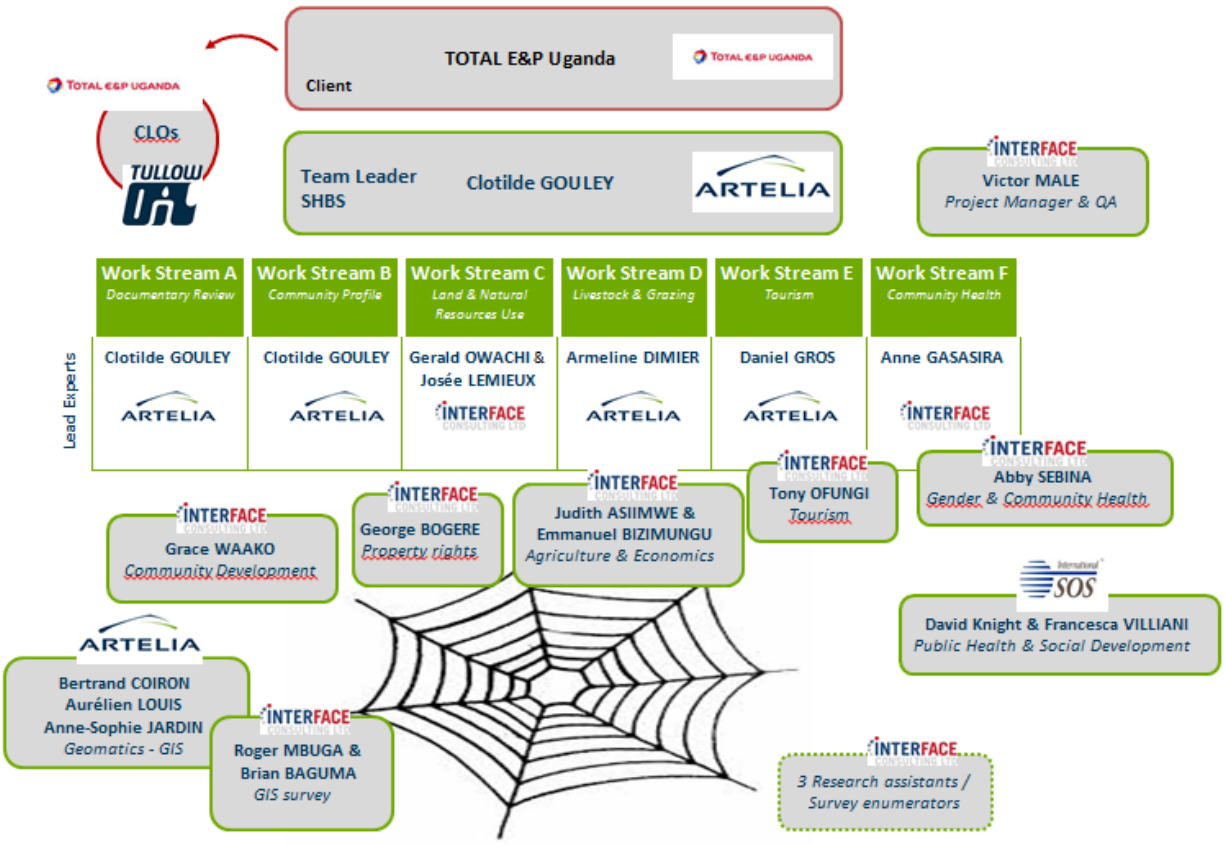
APPENDIX 1 List of villages in SHBS study area

#	Village / Town	Parish	Sub-county / Town Council	District
EA1 (Total)				
1	Ajigo	Muvule	Ngwedo	Buliisa
2	Avogera	Avogera	Ngwedo	Buliisa
3	Kamandindi	Avogera	Ngwedo	Buliisa
4	Karatum	Mubako	Ngwedo	Buliisa
5	Katanga	Wanseko	Kigwera	Buliisa
6	Katodio	Ndandamire	Kigwera	Buliisa
7	Kichoke	Ndandamire	Kigwera	Buliisa
8	Kilyango	Nile	Ngwedo	Buliisa
9	Kirama	Kirama	Kigwera	Buliisa
10	Kisomere	Nile	Ngwedo	Buliisa
11	Mubako	Mubako	Ngwedo	Buliisa
12	Muvule Nunda	Avogera	Ngwedo	Buliisa
13	Ndandamire	Ndandamire	Kigwera	Buliisa
14	Pajengo (Got Apwoyo)	Latoro	Purongo	Nwoya
15	Paraa	Mubako	Ngwedo	Buliisa
16	Wanseko Town Council	Wanseko	Kigwera	Buliisa
EA2 (TUOP)				
1	Beroya	Kakoora	Buliisa	Buliisa
2	Bikongolo	Kisansya	Kigwera	Buliisa
3	Bugana-Kataleba	Bugana	Buliisa	Buliisa
4	Bugana-Kichoke	Bugana	Buliisa	Buliisa
5	Buliisa Town Council			Buliisa
6	Gotlyech	Nyamitete	Buliisa	Buliisa
7	Kakoora	Kakoora	Buliisa	Buliisa
8	Kibambura	Ngwedo	Ngwedo	Buliisa
9	Kigoya	Kigoya	Buliisa	Buliisa
10	Kigwera North East	Kirama	Kigwera	Buliisa
11	Kigwera North West	Kigwera	Kigwera	Buliisa
12	Kigwera South East	Kigwera	Kiwgera	Buliisa
13	Kigwera South West	Kigwera	Kigwera	Buliisa
14	Kijangi	Kigoya	Buliisa	Buliisa
15	Kijumbya	Kakoora	Buliisa	Buliisa
16	Kisansya East	Kisansya	Kigwera	Buliisa
17	Kisansya West	Kisansya	Kigwera	Buliisa
18	Pandiga	Nyamitete	Buliisa	Buliisa
19	Uribo	Nyamitete	Buliisa	Buliisa
20	Waiga	Bugana	Buliisa	Buliisa
EA1 / EA2				
1	Kasinyi	Nile	Ngwedo	Buliisa
2	Kiyere	Kirama	Kigwera	Buliisa
3	Masaka	Wanseko	Kigwera	Buliisa
4	Muvule I	Muvule	Ngwedo	Buliisa
5	Ngwedo Farm	Muvule	Ngwedo	Buliisa
6	Ngwedo Town Centre	Ngwedo	Ngwedo	Buliisa
7	Uduk I	Muvule	Ngwedo	Buliisa
8	Uduk II	Ngwedo	Ngwedo	Buliisa

APPENDIX 2 Team composition

Overview

The team was composed of 14 key experts (Artelia, Interface Consulting and International SOS) who pooled their expertise in an **interdisciplinary and collaborative working approach**. Three research assistants (of which one was a young man from the study area) assisted in data collection, mainly to administer the household questionnaires (see figure below).



Key experts

Clotilde GOULEY – Team Leader (Artelia)

Social Impact Assessment and Social Baseline Studies in Extractive Industries

Lead Expert for Work Stream A & B: Documentary Review & Community Profile

Clotilde Gouley holds a Master's Degree in International Conflict Analysis from the University of Kent at Canterbury, United Kingdom, and a BA in Political Science from Lille Institute of Political Studies. She specializes in corporate social responsibility, social impact assessment, conflict analysis, community relations and stakeholder engagement. Clotilde Gouley has an extensive experience with the energy sector in Africa and worldwide: she has carried out several social impact assessment studies and provided guidance to private companies for their community investment programs, community relationships and consultation processes. She has recently coordinated social and human rights impact studies for TOTAL E&P, including the Social Screening for Buliisa Project facilities (2013).

APPENDIX 3 List of activities conducted per village

Table 4_ List of activities conducted in each village

Activities / Villages	Community Feedback	Community Mapping	KII (LC1)	Other KII	FGD Women	FGD Youth	FGD Crop farming	FGD Livestock	FGD Fishing	FGD Trading / Business	FGD Mixed Livelihood	Household Survey
Ajigo	■		■		■	■	■					2
Avogera		■	■			■	■					2
Beroya		■	■		■	■	■					7
Bikongoro		■	■		■	■					■	2
Bugana-Kataleba		■	■		■		■	■				6
Bugana-Kichoke		■	■		■		■	■				8
Buliisa Town Council				■								
Gotlyech		■	■		■						■	10
Kakoora		■	■		■		■					5
Kamandindi		■	■	■	■	■	■					5
Karatum	■		■		■		■					2
Kasinyi	■		■		■						■	4
Katanga	■		■		■				■			3
Katodio	■				■				■			2
Kibambura	■		■		■			■				3
Kichoke		■	■		■			■	■			2
Kigwera North East	■		■		■	■	■		■			7
Kigwera North West	■		■		■		■					5
Kigwera South West			■		■						■	6
Kigwera South East		■	■						■		■	7
Kigoya		■	■						■		■	6
Kijangi		■	■	■	■	■	■	■				5
Kijumbya		■	■		■	■	■					4
Kilyango	■		■			■	■					2
Kirama	■		■		■	■	■	■	■			3
Kisansya East	■		■		■				■			4
Kisansya West		■	■		■						■	4
Kisomere		■	■		■		■					4
Kiyere		■	■		■	■		■	■	■		5
Masaka		■			■						■	5
Mubako	■		■		■						■	2
Muvule I		■	■		■	■	■					2
Muvule Nunda		■	■		■		■					4
Ndandamire		■	■		■		■					3
Ngwedo Farm		■	■		■	■	■					4
Ngwedo Trading Center		■	■			■	■			■		2
Pajengo (Got Apwoyo)		■			■						■	7
Pandiga		■	■		■	■	■		■			2
Paraa				■								
Uduk I	■		■		■	■	■					3
Uduk II	■		■		■						■	3
Uribo		■	■		■	■	■					4
Waiga		■	■		■						■	7
Wanseko Trading Center		■			■				■	■		
	14	27	38	4	37	17	23	7	11	3	12	173

APPENDIX 4 List of interviews with Key Informants

Semi-structured interviews with District stakeholders

The list of stakeholders met and the issues covered during the interviews are presented in the table below.

Stakeholder	Date of meeting	Issues covered
District Education Officer Buliisa District	10/02/2015	▪ Current conditions and challenges : lack of infrastructure (class-rooms, latrines, staff accommodation, etc.), lack of qualified staff, lack of education material, school drop-out ▪ Improvement plans ▪ Levels of salary for school teachers
Community Development Officer District Planner	10/02/2015	▪ Organisational capacity of local communities ▪ Creation of CBOs in the framework of NAADS and NUSAF2 ▪ Opportunities and challenges
Physical Planner Buliisa District	10/02/2015	▪ Roles and responsibilities of the District Physical Planner ▪ Physical development plan in preparation for the whole Albertine Graben region. No physical planning for Buliisa district, mainly due to the lack of funds. ▪ Challenges in terms of land use and tenure systems (e.g. no titles, lack of proper decentralisation, weaknesses of institutions to manage land, land scarcity, pressure on land resources due to oil and gas development, increasing individualisation of land ownership, etc.) ▪ Government Moratorium on Land since 2010
Statistician Buliisa District	10/02/2015	▪ Description of the 2014 census process ▪ Provision of demographic data available (only at the parish level)
Community Development Officer Nwoya District	12/02/2015	▪ Status of Got Apwoyo (village or sub-village) ▪ Land issues (return of IDPs, ownership conflicts, outsiders buying large areas of land, conflict escalation because of oil and gas activities, etc.) ▪ Availability and quality of social services (feeling of exclusion) ▪ Potential for economic development (tourism, agricultural development, etc.) ▪ Recommendations to oil and gas companies (community engagement, community social investment, control over sub-contractors and the way they treat labourers, etc.)
Buliisa District Senior Veterinary Officer	14/04/2015	▪ Responsibilities of the veterinary ▪ Livestock types in Buliisa ▪ Grazing system and livestock management practices (differences between Ngwedo and Kigwera, hired labour, production, etc.) ▪ Buliisa Cattle Farmers Cooperative (creation, benefits, challenges) ▪ NAADS and government-supported programs ▪ Infrastructure (slaughter places, markets, etc.) ▪ Most common diseases, treatment and control ▪ Value chain and livestock marketing ▪ Livestock, culture and tradition (dowry, etc.)

Stakeholder	Date of meeting	Issues covered
District Production Officer	14/04/2015	▪ Role and responsibilities ▪ Key initiatives being implemented to improve production and productivity in the different key sectors (livestock, crop farming, bee keeping and fisheries) ▪ Challenges and opportunities ▪ Interaction with the oil sector (concerns and expectations)
Operation Wealth Creation Coordinator Buliisa	14/04/2015	▪ Redesign of NAADS program and deployment of Uganda People's Defence Force (UPDF) officers to replace NAADS officers ▪ Activities ▪ Challenges
Buliisa District Revenue Officer	15/04/2015	▪ Sources of District revenues (tendering and not tendering) ▪ Challenges to collect taxes (including with oil companies for the hotel and local service taxes) ▪ UWA and sharing benefits scheme (gates revenue collection) ▪ Allocation of revenues and use of funds ▪ Challenges: limited sources of revenue
Buliisa District Land Board Chairperson	15/04/2015	▪ Composition and role of Buliisa District Land Board (BDLB) ▪ Land tenure systems in Buliisa (customary, communal, individual land holding, land owned by the District, leasehold and forestry area) ▪ Land acquisition, land titling and application process ▪ Changes in land prices over the past 10 years ▪ Moratorium (not recognized by the District) ▪ Compensation rates ▪ Land disputes: reported cases and conflict resolution mechanisms ▪ NGOs involved in land issues (sensitization on land rights)
Buliisa District Police Commander (DPC) Buliisa Deputy District Internal Security Officer (DISO)	15/04/2015	▪ Police staff (about 10 persons in each Police station) ▪ Coordination with local leaders, including LC1s ▪ Coordination with Congolese counterpart (regular meetings) ▪ Coordination with UWA ▪ Main cases reported (land disputes, cattle theft and domestic violence) ▪ Roles of community crime preventers ▪ Influx of migrants to Buliisa: actions implemented ▪ Interaction with oil companies (Tullow/Total): District Security meetings
Buliisa Senior Fisheries Officer	15/04/2015	▪ Mandate, staffing and activities (sustainable use of fisheries resources, regulation, monitoring and control, etc.) ▪ Coordination with other institutions (Ministry, BMUs, etc.) ▪ Achievements and challenges
Police Officer in charge of Child and family Protection (Buliisa)	16/04/2015	▪ Role and responsibilities ▪ Material means and staff ▪ Cases most reported (domestic violence, child labour, child neglect) ▪ Compensations and domestic violence: reported cases and risks ▪ Key challenges at landing sites (STIs, lack of sanitation, child labour) ▪ Training and skills on human rights ▪ Achievements and challenges

Stakeholder	Date of meeting	Issues covered
LC3 vice-chairperson Purongo sub-county, Nwoya District	17/04/2015	▪ Role of traditional institutions in conflict resolution, especially for land disputes

Semi-structured interviews with other key informants at district level

Complementary interviews were conducted with various locally-based representatives from national institutions (e.g. Uganda Wildlife Authority - UWA), local organisations (e.g. Beach Management Units – BMUs) and NGOs. All the interviews are presented in the table below.

Stakeholder	Date of meeting	Issues covered
Chairperson - Buliisa District NGO Forum	10/02/2015	▪ Role mission and activities of Buliisa District NGO Forum; Membership (43 NGOs/CBOs) ▪ Funding opportunities and challenges ▪ Strength and weaknesses of local civil society: (e.g. gap in environmental research - rely on external expertise) ▪ Land issues in Buliisa: trends and challenges, narratives of conflicts and court cases, differences between Ngwedo (individualised land) and Kigwera (communally owned land), role of Uganda Land Alliance (assistance) ▪ Relationships with oil companies: (1) Tullow: legacies of past/ongoing experiences with compensations (focus on gender issues); (2) Total: scholarship program; (3) interactions with CLOs ▪ Social illness in Buliisa: commercial sex and HIV, alcoholism, domestic violence
Project Officer Buliisa Initiative for Rural Development Organization (BIRUDO)	10/02/2015	▪ Creation of BIRUDO (history and background) ▪ Role and mission ▪ Main activities: livelihood, education, health and land rights ▪ Main challenges and opportunities
Chairperson Beach Management Unit (BMU) - Kalolo	10/02/2015	▪ Governance system of BMU ▪ Role and mission of BMU (fisheries management, law enforcement, sensitisation) ▪ Main issues and concerns (illegal fishing, corruption, lack of coordination between the different authorities, need for harmonisation with DRC, etc.)
Secretary Beach Management Unit (BMU) - Wanseko	11/02/2015	▪ Governance system of BMU ▪ Role and mission of BMU (fisheries management, law enforcement, sensitisation on HIV/AIDs) ▪ Registering process and cost ▪ Figures about fishing activities (registered boats, cost of material, fish prices, etc.) ▪ Main issues and concerns (illegal fishing, increasing population at landing sites, limited funds for BMUs, escalating levels of HIV/AIDs at landing sites, encroachment by DRC fishermen, lack of sanitation at landing sites) ▪ Concerns about oil activities (no compensation for fishermen who lost their nets, water pollution, etc.)

Stakeholder	Date of meeting	Issues covered
Rangers Uganda Wildlife Authority (UWA)	16/02/2015	▪ Relationship between UWA and local communities ▪ Benefits sharing of Park revenues ▪ Resource use in Murchison Falls National Park (MFNP): exceptional permission, (e.g. funerals) for community members to collect firewood and cut grass in MFNP, under UWA's escort. ▪ Challenges: human-animal conflicts: challenges, illegal fishing; poaching, livestock grazing on the boundaries of MFNP ▪ Concerns about oil activities (impacts on landscape, negative impacts on tourism, increased in road traffic and disturbances such as noise and dust, etc.).
Business owner Mobile Money Shop, Ngwedo Trading Centre	14/04/2015	▪ Socio-economic profile of business owner ▪ Socio-economic profile of employee ▪ Socio-economic profile of customers ▪ Skills and training ▪ Investment costs and operating expenses ▪ Return on investment ▪ Description and prices of services ▪ Challenges and opportunities
Field officers, Office Attendant and Accountant Kakindo Orphan Care (NGO)	14/04/2015	▪ History of the NGO and institutional structure (funds, membership, staffing and governance) ▪ Current activities: care of orphans and vulnerable children, community sensitization programs about HIV/AIDS, land and environmental issues ▪ Main achievements and challenges
Members of the executive committee Kalolo Beach Management Unit (BMU)	14/04/2015	▪ Governance system of BMU (membership, sources of revenue, etc.) ▪ Role and mission of BMU (fisheries management, law enforcement, sensitisation on HIV/AIDs) ▪ Registering process and cost ▪ Poor conditions of social services and infrastructure at landing sites ▪ Challenges (illegal fishing, poor coordination with other institutions, lack of support, lack of skilled law enforcers, etc.).
Chairperson Buliisa Livestock Farmers Cooperative	15/04/2015	▪ History of the cooperative ▪ Management of the cooperative (membership, dividend sharing, etc.) ▪ Mission and activities ▪ Conflicting interests and tensions within the cooperative ▪ Opportunities and challenges
Business Owners Bright Flowers Modern Restaurant (former commercial sex workers), Buliisa TC	16/04/2015	▪ Origin of the initiative and creation of the restaurant ▪ Socio-economic profile of former commercial sex workers (background, reasons for becoming sex worker, etc.) ▪ HIV and commercial sex trends in Buliisa (main spots, profile of customers, etc.) ▪ NGOs active in sensitization about STIs prevention and commercial sex in Buliisa ▪ Involvement of former sex workers into sensitization programs ▪ Achievements and challenges
Rwot Kweri Anaka (Nwoya District)	17/04/2015	▪ Origin of the Rwot Kweri ▪ Role of the Rwot Kweri: grass-root conflict resolution mechanism ▪ Land governance, land tenure and land acquisition process in Nwoya ▪ Land grabbing issues ▪ Conflict trends

Stakeholder	Date of meeting	Issues covered
Health Facility In-charges of Health facilities around Buliisa (Kigwera HC II, Avogera HC II, Bugoigo HC II, Kihungya HC II, Biiso HC III, Buliisa HC IV and Buliisa Hospital)	14/04/2015 to 16/04/2015	▪ Health Human Resource availability: general doctors, clinical officers, nurses, midwives, laboratory personnel ▪ Infrastructure and equipment ▪ Communication and referral system ▪ Clinical services availability ▪ Laboratory capacity ▪ Medicines availability ▪ Disease burden ▪ Challenges of service delivery
Packwach HC IV Facility Head and Head of Medical Services, Jonam Health sub-District	16/04/2015	▪ Health Human Resource availability: doctors (specialized and general), clinical officers, Nurses, midwives and paramedical staff, laboratory and pharmacy personnel ▪ Infrastructure and equipment ▪ Communication and referral system ▪ Specialised clinical and surgical capacity ▪ Specialised Laboratory and imaging capacity ▪ Medicines availability ▪ Disease epidemiology and common problems seen ▪ Challenges of service delivery

Semi-structured interviews with national stakeholders

Whenever possible, interviews were also conducted with national authorities from specific ministries to collect additional information on government policies and programs, current challenges and opportunities.

The list of these interviews is presented in the table below.

Stakeholder	Date of meeting	Issues covered
Coordinator NAADS	24/02/2015	▪ NAADS operations and programs ▪ NAADS linkages with other agricultural institutions ▪ Challenges of the program and reforms undertaken ▪ Relationship with oil and gas sector
Assistant Commissioner Animal Nutrition MAAIF	04/06/2015	▪ Livestock health issues ▪ Promotion of agricultural enterprises ▪ Potential for sector development
Assistant Commissioner Land use MAAIF	04/06/2015	▪ Soil and water conservation programs ▪ Collaboration with other ministries for these programs ▪ Government strategies addressing climate change ▪ Plans of the department ▪ Land conflict management plan ▪
Senior Pasture Agronomist MAAIF	04/06/2015	▪ Marketing of livestock products ▪ Information on livestock prices ▪ Challenges of livestock owners ▪ Strategies addressing climate change ▪ Livestock regulations strengths and weaknesses
Commissioner for Fisheries MAAIF	04/06/2015	▪ Fish policies ▪ Concerns in fishing activity and health issues ▪ Projects to improve health condition among fishermen communities in Lake Albert ▪ Effects of climate change and overexploitation on fish resource ▪ Control over illegal fishing ▪ Fish farming projects ▪

Stakeholder	Date of meeting	Issues covered
Assistant Commissioner Physical Planning Commissioner Land Administration MLHUD	12/05/2015	▪ Governance over land and roles of institutions in Buliisa ▪ Coordination of MLHUD with other government institutions involved in land management ▪ Challenges in national land policy implementation in Study area ▪ Land moratorium ▪ Land tenures in Study area ▪ Systematic Land Demarcation project in Study area ▪ Challenges in land tenure systems ▪ Impact of oil and gas sector on land in Study area ▪ Gender and access to land ▪ Conflict resolution for land issues ▪ Physical planning

Q.2 Social and Health Baseline Study – Summary of Fieldwork Survey Activities

Community	Local council level	Social Screening - Artelia (2013)	SHBS - Artelia (2015)	ESIA Scoping Engagement - AECOM (2015)	FGD engagement for SHBS - AECOM (2016)	RAP Screening - Intersocial /Newplan (2015)	RAP1 Priority Areas - Atacama/Synergy/Nomad (2017)	Impact Assessment feedback - AECOM (2018)
Buliisa District	LCV							
Ngwedo Sub county	LCIII							
Avogera Parish	LCII							
Avogera Village	LCI							
Kamandindi Village	LCI							
Muvule Nunda Village	LCI							
Ngwedo Parish	LCII							
Kibambura Village	LCI							
Ngwedo TC	LCI							
Uduk I	LCI							
Mubako Parish	LCII							
Karatum Village	LCI							
Mubako Village	LCI							
Paraa Village	LCI							
Mvule Parish	LCII							
Ajigo Village	LCI							
Muvule I Village	LCI							
Nwgedo Farm								
Uduk II	LCI							
Nile Parish	LCII							
Kasenyi Village	LCI							
Kilyango Village	LCI							
Kisomere Village	LCI							
Kigwera Sub county	LCIII							
Kigwera Parish	LCII							
Kigwera NW	LCI							
Kigwera SE	LCI							
Kigwera SW	LCI							
Kirama Parish	LCII							
Kigwera NE	LCI							
Kirama	LCI							
Kiyere	LCI							
Kisansya Parish	LCII							
Bikongoro Village	LCI							
Kisansya E Village	LCI							
Kisanysa W Village	LCI							
Ndandimire Parish	LCII							
Katodio Village	LCI							

Community	Local council level	Social Screening - Artelia (2013)	SHBS - Artelia (2015)	ESIA Scoping Engagement - AECOM (2015)	FGD engagement for SHBS - AECOM (2016)	RAP Screening - Intersocial /Newplan (2015)	RAP1 Priority Areas - Atacama/Synergy/Nomad (2017)	Impact Assessment feedback - AECOM (2018)
Ndandamire Village	LCI							
Kichoke Village	LCI							
Wanseko Parish	LCII							
Katanga Village	LCI							
Masaka Village	LCI							
Wanseko TC				Cancell -ed				
Buliisa Sub county	LCIII							
Gotlyech	LCI							
Uribo	LCI							
Kakoora Parish	LCII							
Beroya	LCI							
Kakoora	LCI							
Kijumbya	LCI							
Bugana Parish	LCII							
Bugana-Kataleba	LCI							
Bugana-Kichoke	LCI							
Waiga	LCI							
Kigoya Parish	LCII							
Kigoya	LCI							
Kijangi	LCI							
Buliisa Town Council								
Central Ward	LCII							
Civic Cell	LCI							
Kizongi Cell	LCI							
Northern Ward	LCII							
Kakindo	LCI							
Kisimo Cell	LCI							
Western Ward	LCII							
Kityanga	LCI							
Kitahura	LCI							
Nwoya District	LCV							
Purongo Sub county	LCIII							
Pabit East Parish	LCII							
Pabit East	LCI							
Pabit West Parish	LCII							
Pabit Lagaji Parish	LCII							
Pawotomero Parish	LCII							
Patira Parish	LCII							
Got Awpoyo Sub County	LCIII							

Community	Local council level	Social Screening - Artelia (2013)	SHBS - Artelia (2015)	ESIA Scoping Engagement - AECOM (2015)	FGD engagement for SHBS - AECOM (2016)	RAP Screening - Intersocial /Newplan (2015)	RAP1 Priority Areas - Atacama/Synergy/Nomad (2017)	Impact Assessment feedback - AECOM (2018)
Latoro Parish	LCII							
Pajengo village								
Paminalongo v								
Te Ogot Village								
Nebbi District	LCV							
Pakwach District	LCV							
Pakwach Town Council								
Hoima District	LCV				1			1
Hoima Municipality					1			
Buseruka Parish	LCII							
Nyamasoga vllage	LCI							
Masindi District	LCV				1			1
Masindi Municipality					1			

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TILENGA PROJECT ESIA - APPENDIX R: Archeology and Cultural Heritage

May 2018

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Table of Contents

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Annex A

ANNEX A- STAKEHOLDER CONSULTATION (ARCHAEOLOGY & CULTURAL HERITAGE)

A.1 Introduction

The archaeology and cultural heritage baseline research involved close collaboration with the social and socio-economic survey teams. The archaeology and cultural heritage team accompanied the socio-economic team from the 24th November to 3rd December 2017 to collect information on cultural heritage.

Besides those meetings the archaeology and cultural heritage team consulted stakeholders alone. Those consulted were either individuals or institutional representatives. The stakeholders were from academic institutions from the two leading public universities in Uganda, Ministry of Gender, Labour and Social Development, Department of Museums and Monuments, The Uganda Museum, Non-Governmental Organisations represented by Cross Cultural Foundation, UNATCOM which is Uganda's UNESCO office situated at Uganda's Ministry of Education building.

A.2 Objectives of Stakeholder Consultation

The specific objectives for each institution/stakeholder consulted were as follows:

Department of Museums and Monuments

- Factual information on all known cultural heritage sites (archaeology, palaeontology, intangible heritage) within the project area.
- Discussion of research objectives and key research agendas in this area – e.g. stone tool typologies, palaeoclimate, pottery chronology, development of iron technology.
- Discussion of anticipated mitigation measures – archaeological watching brief and excavation, application of dating techniques and sample processing for environmental evidence.
- Discussion of anticipated control measures – cultural heritage management plan (schedule of mitigation fieldwork), cultural heritage ground disturbance procedure, chance find procedure and construction staff heritage awareness training.
- Discussion of potential opportunities for eventual publication, dissemination, public engagement and display as part of mitigation measures.

Uganda National Museum

- Factual information on all known cultural heritage sites (archaeology, palaeontology, intangible heritage) and ethnography within the project area.
- Information on any finds/archives held by the museum related to the project area.
- Discussion of research objectives and key research agendas in this area – e.g. stone tool typologies, palaeoclimate, pottery chronology, development of iron technology.
- Deposition and archiving of anticipated finds arising from mitigation stage archaeological watching brief and excavation – box costs, space available.
- Discussion of potential opportunities for eventual publication, dissemination, public engagement and display as part of mitigation measures.

National Environmental Management Authority

- Factual information on all known cultural heritage sites (archaeology, palaeontology, intangible heritage) within the project area, particularly MFNP.
- Information on systems currently used to record, report and protect cultural heritage sites (archaeology, palaeontology, intangible heritage – sacred sites, graves, rituals) within national parks, in particular MFNP.
- Discussion regarding access arrangements for descendants of former MFNP inhabitants to sacred sites and graves within MFNP, and access to perform traditional religious activities.

Ministry of Gender, Labour and Social Development

- Factual information on cultural aspects of the project area, including ethnography, intangible heritage, traditional social structures, officially-recognised minority peoples.
- Discussion of potential mitigation measures for the good management and mitigation of potential socio-cultural change associated with oilfield development, in-migration, ethnic and land issues.

Ministry of Education & Sports

- Factual information on intangible heritage aspects of the project area, including ongoing local programs of cultural education & revitalization – e.g. music & dance, languages, cultural festivals.
- Factual information on heritage elements within primary and secondary school curricula.

NGO - The Cross-Cultural Foundation of Uganda – CCFU

- Factual information on intangible heritage aspects of the project area, including ongoing local programs of cultural education & revitalization – e.g. music & dance, languages, cultural festivals.
- Details of local organizations/funding bodies involved in promoting cultural heritage revitalization, education, and practice and outreach activities.

Academics/universities/experts

- Discussion of research objectives and key research agendas in this area – e.g. stone tool typologies, palaeoclimate, pottery chronology, development of iron technology.
- Discussion of anticipated mitigation measures – archaeological watching brief and excavation, application of dating techniques and sample processing for environmental evidence.
- Discussion of potential opportunities for eventual publication, dissemination, public engagement and display as part of mitigation measures.

A.3 Stakeholder Consultation

i) Bunyoro Inter Religious Council (BIRC)

This meeting was held on 22 November 2016 together with members of the social team. Regarding cultural heritage, this meeting suggested that cultural values and practices are being eroded because of modern technology and changes, for example:

- *Ekyoto* (fire place): evening social gatherings among the Banyoro where elders sat and instructed children, is no longer practiced because of technology (watching television) and because children are away in boarding schools
- *Enguli* (local brew): Granary/garden for every homestead to store millet, cassava, beans is no longer practiced because of population pressure meaning there is not enough land for gardens. In the past in case of famine the food stored in the enguli is what people would eat. People have now stopped growing millet because they prefer to grow rice which can be harvested every 3 months and has a higher selling price. But this brings a risk of food insecurity. Overall diets and traditional foods are changing.
- Marriage instruction: in the past aunts instructed their nieces for three months on marriage but this is no longer practiced. This has contributed to domestic violence and divorce.
- Cultural education: in the past people were taught cultural values and practical skills but now they are just trained in theory.

The Banyoro have several cultural shrines. Some of these include:

- Mparo Royal Tombs
- Kaduk Cultural shrine
- Royal Palace (Karuziika)
- Bugoma Cultural Centre

The pomp and enthusiasm associated with cultural practices has gone down. Banyoro no longer celebrate the cultural events with much pomp and enthusiasm as was the case before. E.g. there used to be big cultural galas (Mpango) celebrating their traditional dances and music but now they just have musicals. In the past counties and sub counties they used to come and compete at Mpangos but this no longer happens. They still have some but they have been diluted. Clans do still have cultural sports galas and occasional cultural exhibitions and they also host cultural radio talk shows.

Challenges of Conserving Cultural Heritage

Religious and cultural teachings / norms are sometimes in conflict with the rule of law.

“Biggest challenge in Uganda is politicization”.

The Local Council (LC) system has died – people that were elected 30 years ago are still there – linked to problems of corruption and challenges with land titling as LC1s are the ones who validate

land transactions not even minding about the cultural heritage within the land.

ii) Meeting with Elders of Kirama Village

This meeting was held on 24th November 2016 at X: 0324038 and Y: 0241224 coordinates. The meeting was attended by five elders but who were very constructive.

The five elders unanimously gave a list of items they considered form part of their heritage such as swamps like; Matwe, Kanyuri, Taagi, Kalyamukwanzi. These are water catchment areas and sources of natural springs/wells. More emphasis was put on thickets that provide raw materials for construction like poles and natural fibres. The old wells are mainly in swampy areas especially in the rainy season. The Kanyuri swamp has for long possessed stories of strange people dressed in white appearing at different hours of the day. That is the reason why people are barred from visiting the stream at 7 am, noon, and late evenings.

The Kabalwa area has a tamarine tree that is culturally used to bless the community with rain in case of drought. The elders in the region go to that big tamarine tree and cover the hole that is there with a bark cloth then the rains come. This source of water is important to their livelihood as well as animals[1]. He further noted that there is a forested area within Kirama where people are not allowed to fetch firewood that if someone attempted to pick wood he / she would return the wood but that was so much in the 1970s. This area is still respected but currently not much emphasis is put on such heritage.

The Hoohwe area has a number of big trees around like tamarine and muteete that people use them for worshiping. They further all agreed on the presence of shrines in the region. The shrines are of two categories: those that are clan owned (not for business) and those put up by individuals to make money. They gave the example of the Bakindwa clan shrine at Bukidwa where there are a number of trees that people don't tamper with like tamarine, mukwakwa, ndendemule and musinga-bakazi[2].

iii) Kizongi Village Mapping

This meeting was held on 25th November 2016 at X: 0323721 and Y: 0234448.

Summary

The meeting was well attended and after separation we got 58 males both youth and elderly. The women also were in big numbers but had their own section. Major concern was on land wrangles, trees since to them all are medicinal, credited oil and gas sector of the support extended to them but unemployment to local people is still a big challenge

Minutes

On the issue of recent developments, the members were happy for the roads, hospital however, short of the happiness they got land wrangle increasing day after day that many cases are not resolved yet and those worked on there is unfair judgement especially if the case is between the rich and poor. From their own words, they said that all the oil pads are in one man's land. The elders are influential in decision-making since the youth do not own such resources.

The channel of communication is from top to bottom that their leaders whenever they receive information on something they tell them to converge in their meeting points for discussion.

Settlement and migration, they maintain that the original inhabitants were the Bagungu but other groups came in later they by buying land but mainly from willing sellers although in some instances a few can be forced to give in the land. The area of Kizongi is evenly settled and grazing land was communal though now some buyers have fenced off their land to avoid land related issues.

On the element of livelihood, the people mentioned fishing, animal rearing with cattle, goat, and sheep in particular though piggery and poultry is also on a small scale. They further noted crop farming as a major economic activity. The challenges brought out on economic activity are reduced land, poor fishing that the lake is now unproductive, water shortage.

In terms of cultural heritage the members maintained that all trees are medicinal and from analysis almost everything is too important to them, this was witnessed from the list that was given with its uses but the team was able to pick out key features since the rest cover the whole area and these

[1] Bikooba Ntaro Christopher one of the elders aged 68yrs.
[2] Elder Byenkya Julius aged 50 yrs.

included the only church in the village (SDA), schools, two cultural (Mpuluma) sites, water dip, grinding mills, swamps, water ponds, playground, livestock market, seasonal rivers as well as some medicinal trees like mukwakwa, tamarin etc.

The “Mpuluma” cultural sites are so secretive that only responsible clan members perform rituals there on behalf of the rest of the society. In case of any element of mishandling any part of the cultural site the visible signs can be seen by the society like shifting of the Mpuluma to a different location, the flooding of the seasonal River Sambiye to cover the whole area. He the responsible clan member has to come up to perform some rituals to appease the gods. The notable times have been in the 1970s when President Amini Daada removed kingship and of recent in the 1990s when a member cut a tree in Basiimo Mpuluma at it flooded again. The minor cases related to Mpuluma when you get firewood from the place you return it yourself and even mosquitoes can cover your homestead till you do the right thing.

The selected group of people including the head of Basiimo cultural site led the researchers to ground truthing and we were in position to visit all the important places they mentioned in the meeting.

Coordinates of different features

Item (Feature)	X- coordinate	Y-Coordinate	Elevation (m)
Borehole	322976	234859	626
Mugisa Memorial Primary sch	322749	234656	625
Divine Secondary school	323821	234388	630
Basiimo Cultural site	324142	234895	629
Babezuwa Cultural site	325208	234950	634
Cattle dip	321208	234571	620
Grainding mill	323913	234547	630
Play ground	323249	234464	625
Grinding mill (group)			
Katala shell market	321088	234615	618
Medicinal tree (Mizoloobi)	321665	234445	618
S.D.A Church	322901	234432	625
Medicinal tree (Mukwakwa)	321209	234571	621
Sand mininig site	325268	234937	635
Livestock market	?	?	

iv) Meeting with the Acholi Cultural Leaders

This was held on 30th November 2016. The prime minister of the Acholi Kingdom was the key informant about the culture of Acholi. This person is the paramount chief and political head of the Kingdom. The cultural leader is currently known as Lawirwodi.

- To the prime minister clearly stated that the kingdom is endowed with a lot of cultural heritage though 90% of the Acholi people and especially the young generation is not aware of their heritage due to political upheavals from the 1980s.
- The Acholi split out from the main stream thereby getting clan names with “Pa” e.g. Palayira, Palamogi etc. and the point of splitting of Acholi and Alur is within MFNP.
- The creation of the MFNP has led to migrations to distant places as far as Lira
- A lot of features from mountains, rivers, rocks, trees to mention but a few have much significance to their lives.
- They have caves like Gugure Hills that are also used for protection where the Acholi used to hide during the war with the British. But today these are used as shrines for the gods.

Myths and Legends

- There are many and each clan has its own responsibilities
- Praising of culture is done through “Mwoch” (Each clan has its own praise “Mwoch”)
- These are well presented to the new generation through songs and dances attesting identity.
- They have rituals and rites that go to all Acholi as each was to use the resources present to live a better life.

- Their hierarchy starts with God up to the individual.

Cultural Geography

- As noted above they have key aspects that are very important to all Acholi that is land, water, animals, forests, mountains, trees. This created a divine bonding of all the people.
- All the land in Acholi is for everybody that means it is communally owned. Land is held in trust for the past, present and future generation.
- The Murchison falls National Park belongs to the Acholi so they need is intrinsic rights over the park as their property.
- Pan-kele meaning people settled near the place of food which is MFNP.

Places of Memory

- For the Acholi this comes from their history and this is reflected in music, dance and folk songs e.g. Gwech Nyanderere (Reflecting moments of femine),
- Clan naming like “Pa Nyadi, Pa Yira” Pa stands for identification of different clans from others.
- They have a distinctive relationship in the social construction of their society
- In the social hierarchy God is the most high followed by the ancestors who mediate between God and the living then the King (Kae), priests, Kaka (clan Leaders), Dogolo (extended families), Oti (nuclear family) and lastly individual respetively.
- The parallel base for the kingdom formed by the environment is in terms of land, water, animals, forests, mountains and trees. These provide the bondage that links them to God.
- Tumpadwa is a naturally protected site; it’s a place of security and prayer for basic human rights
- Lantanya hills where Lagoro was buried has a lot of mythical powers of the Acholi that happen in the hills. It was noted that, one can get lost if anything wrong was done to the spirits.

Conflict and Traumatic Heritage

- Traditionally they tabled all grievances in the kingdom at a round table and the culprit would compensate for the crime committed.
- If one was denying an offence then they would call the gods and that person would end up revealing the truth.
- Sites where people were murdered, or buried carried a lot of significance. People should not use them as this would be a sign of disrespect to the rights of the dead.
- In the case of relocation of cultural sites such as burials, cultural ceremonies would be carried out in order to shift the spirit of the dead to the free world.
- They could ask the gods to bring misfortune
- They had places for calling the gods to intervene.
- Around Lake Albert is where the Acholi split from the Alur (Refer to the story of Gipiri and Labongo). This area contains abila (shrines) for different gods.
- Carrying out any activities that disrupt natural cultural heritage could cause misfortunes to the community or the individual involved.

Traditional Craftsmanship

- They use the environment to extract raw materials for the many crafts they have in society. The raw materials are mainly from the Shea butter tree and papyrus to mention but a few.

Practices Concerning Nature

- To the Acholi culture all land is for the Acholi and kept in trust. But today people have become individualistic by acquiring land on a mailo land, customary, free hold and leasehold basis that may due to the effect of globalisation.
- There are traditional medicinal trees that you can’t cut e.g. Shea butter that is good for jelly making.
- Mahogany (tido) tree serves as a home of the gods where even rituals are conducted.
- Medicinal trees are usually very big trees which necessitates the protection around bigger trees.

Sacred Sites

- Sacred rocks are home of shrines (abila) like Anagira where the road was diverted to respect its historic importance.
- The true gods are embedded in the true intrinsic values of the Acholi culture.
- Issues of dishonouring cultural rights have led to gender based violence, conflicts and murders.

Perception of the People on Oil and Gas Sector in their Region

- The oil and gas sector has distanced people from their true values as many may be displaced thereby adopting new cultures
- Substandard practices are likely to infiltrate the society that may suppress standard and actual practices. Much as NGOs have taken on parental responsibilities for them to make money, women are running to pastors and other church leaders to solve domestic violence.

Migrations within Acholi Land

The principal migration was for the Acholi, Madi and Langi who came with the Karamojong. However in the other areas the Langi, Madi, Jonam (Alur), Okuti-Kiramajong, Lango-Sudan have also migrated in the project area.

New migrations are from the other Ugandan ethnicities especially the like Balalo, Bahima and Baganda who have moved mainly due to business. This has had a negative impact of language being adulterated.

v) Meeting with Elders in Packwach

This meeting was held on 2nd December 2016. The meeting made the following observations on cultural heritage.

- Wadilai is the place where Emin Pasha the first explorer died and was buried there and the place today has his monument.
- Kuba site close to Kuba lodge was where the first missionaries met chief Kuba.
- Wangilei (next to the bridge) is regarded as the home of Gipiir and Labong. This is where also the two brothers (Gipiir and Labongo) separated from after a misunderstanding over a spear and a bead. The story is that:
- Gipiir took his brother's spear and went hunting unfortunately, when he speared an elephant, it took off with the spear. Labong then demanded for his spear badly that the brother had to go back to hunt both the spear and an elephant fortunately, he recovered his brother's spear. In the struggle to recover the spear, Gipiir picked the beads which he came back home with.
- As Gipiir was sorting his beads, Labongo's daughter swallowed one accidentally, on recounting one bead was missing and the only person present was the nephew. In an eye for an eye, Gipiir demanded for his bead now, all was done to recover the bead and life of the nephew to the extent that she was given two days to ease herself but the bead didn't come out yet the demand was higher.
- So, Labong painfully paid by giving in the daughter who was bisected into two to recover the bead. Gipiir got his bead and Labong took his corpse hence the end of their relationship as brothers!
- They promised no relationship from that day "My people follow me" said Gipiir and they crossed the Nile River to the West and an X mark was put never to return to that land. Gipiir went to West Nile while another group (Labong's) moved East wards expanding as far as Kenya.
- One of Labong's chiefs in the group got sick and suffered from an incurable wound (*Adora* – an Alur word**)** while in Tororo on their way to Kenya he could not move any further. So he stayed there with his people marking the origin of the current Japadhola of Tororo.
- Jakolo is a cultural site for the Wangelei people
- Ahibye is a cultural site where sacrifices are done for rainfall, hunting etc. The functions are done when there is need.

vi) Meeting with the Bunyoro Cultural Leaders

Consultation was undertaken with Mr Yolamu Nsamba, a cultural historian and the Omukama's principal private secretary and the Bunyoro Kingdom's Minister of Culture and Education, Hajji Bruhan Kyokuhaire, on 6th December 2016 at the Bunyoro Kitara Kingdom Offices, Hoima. Both provided extensive information regarding traditional systems of leadership, history, sacred and cultural natural sites.

Summary

- The meeting was open and the attendees expressed their appreciation at being included in the consultation as part of the baseline study. They were very willing to share information on Bunyoro cultural heritage. The discussion covered cultural heritage and cultural sites across the Bunyoro region as well as specifically within the project footprint.
- The Kingdom requested a copy of the final ESIA report.

General Comments

- We appreciate this consultation as in the past sometimes we weren't considered for consultations or were only engaged when things had 'backfired'.

- During the exploration phase in Hoima (Kaiso Tonya area), Tullow built an oil well where an old king had been buried over 500 years ago. The name of the old king is Waraga, which is also the name for a type of fish (the fish was named after the king because he is the one that first started eating that type of fish) so Tullow just thought that the area was named after a type of fish, they didn't realise it was named after a king. They need to make sure the Bunyoro Kingdom is properly consulted to avoid situations like this happening again in future.

Bunyoro History

- Bunyoro Kitara Kingdom is one of the ancient kingdoms of Uganda
- The kingdom suffered a lot during colonial times. They resisted imperialism and were therefore punished and lost a lot of land. They feel that there are still ongoing impacts from colonialism, which manifest themselves in land, culture and livelihoods.

Cultural Sites

- The Kingdom noted that they have a map of oil wells in the Bunyoro area and can show where their cultural sites are on this map. They emphasised that "*when projects start they have to ensure that cultural sites are not tampered with*." They noted that they have sites within the park that they do not want to be destroyed and said that they had been undertaking an exercise with an archaeologist at the museum to document the locations of their cultural sites.
- Bukerenge (southeast of Kibiro) – mass grave/burial area from around 1900, "*many Bunyoro died (over 1.5 million) and almost all are buried there*". Those buried there were reportedly killed by colonial officers and that was one of the reasons the kingdom sued the Queen of England.
- Busingye (south of Hoima) – means 'where the king can sit'.
- Kibiro hot springs/salt mines – every year the king goes there to perform rituals to maintain hot water (Kabiga in local language).
- Buliisa to Mugini escarpment – place where the king sat and the place is still used as a ritual site.
- Landing Sites: Around the lake there were several places that people did rituals if fish were not being caught. A person from the clan is attached to every landing site and the fishermen give gifts to these people to reward them for good catches. The people that looked after landing sites were called Abaramansi. Landing sites have been there since time immemorial and at each site there are always cultural rituals performed by a member of the clan therefore every landing site is regarded as a cultural site. When someone new comes to the lake they first report at a landing site and the clan representatives will advise them on certain things e.g. how to dress. The rituals are performed for a good catch and to protect their life and property. In the past there were certain rules around what you could / couldn't do around the lake, including:
    - Women were not supposed to go into the lake to fish in the past and they were not supposed to undress in front of the lake or take cooking pots etc to the lake.
    - Fishermen were not supposed to fish before it was 'deep dark'
    - You couldn't put light in the lake except for fire at the landing site
- Landing sites in Buliisa are: Wanseko, Kigwera, Kisansya, Katala, Karakaba, Kagolwa, Bgeygo, Niamakuta, Wanakuba, Butiaba, Waki, Amur
- Kikese – a place where people came together to make spears for hunting and protective gear for defence. They are working with UWA to try and degazette the place and take it back for the Bunyoro Kingdom. The Office of the Prime Minister is trying to engage UWA and NFA.
- Rippon Falls Dam – there is a stone carved seat here and whoever takes the Bunyoro throne is taken there for inauguration.
- Bukemi-Bugungu Hunting Area – now a game reserve though it was partly restituted when the kingdom was recognised and returned to Bunyoro. The hunting area boundary went up to the lake shore
- Kikongo escarpment – ancient battlefield.
- Wusingiro (neighbouring Budongo Forest) – battlefield.
- Bugungu Fort – place where soldiers gathered from when going into battle.
- Rivers have many spirit attached to them: Nile River, Sambiye River, Waiga River, Wysoke River.
- The Park was named after their King Kibaale and has lots of cultural sites within it. There is a monument at Murchison Falls. Totems are also preserved in the park. The Kingdom has a lot of interest in the park and does not want it to be destroyed.

Traditional Names

- Traditionally places in Bunyoro were named according to ranks of chiefs of the kingdom. Some of the names were:
    - Omunyabara – traditional name for Buliisa Sub County
    - Amugwera – Biiso Sub County

Intangible Cultural Heritage

- Most people that knew the Kingdom's traditional songs have died but there is a team from the royal family that is trying to maintain them

Traditional Foods

- Most traditional crops are phasing out e.g. millet, yams, local beans, Ndemesa (like groundnuts), sorghum, cassava, cow peas.
- 'Sauce' was traditionally fish.
- All families used to have granaries but during battles with colonial forces they started to use underground food banks for storing food because the whites used to burn their granary stores.

Traditional Land & Natural Use

- In the past the kingdom offered land to people and decided on land uses e.g. hunting, cultivation, grazing.
- They had hunts twice a month.
- People mainly collected water from the lake (nowadays this is a problem because the population is expanding).
- Grasses around the lake were used to make mats (different to papyrus) – they were very soft and very good. It is still done a bit. This was a source of livelihood for some people and the mats were also brought as thanks to the King.
- There is a type of black walking stick made from short hard trees that is used by police now-a-days, which in the past was used as fighting sticks. The same tree is a source of herbal medicine.
- Amuramura – used to demarcate land and as part of dowry.

Traditional Medicine

- They have many medicinal plants – over 300 are known. Some of them include:
    - Mikoge – for cough, malaria, stomach ache
    - Aloe Vera – called Nkokoyarutanga, which means to protect and it is used when one wants to protect their child or a grown-up. Aloe vera brings all others herbs together and can be used for multiple purposes.
    - Amuramura – used for healing epilepsy and for cleansing and mediating. People are washed with the leaves of allumuramura by a healing man as part of a ritual to get a good harvest.
    - Amuko – treats syphilis
    - Amutoma – bark of a tree used to make cloth and the plant is also used to treat tonsillitis
    - Tree used to treat small pox and smoking its leaves would divert enemies from a site.

Ethnicity & Language

- There are many different ethnic groups in Buliisa that come from Uganda and beyond e.g. Lugbara, Kabeya, Bakego, Congolese, Rwandese, Balaalo (pastoralists).
- Historically the lake belonged entirely to the Bunyoro and the Kingdom stretched up to Congo – the colonialists divided it in two.
- People come for 3 reasons: hunting, grazing and fishing.
- When different tribes came the language started to change e.g. Lugungu.
- Currently in Bunyoro there are several tribes – in Buliisa the majority tribe is Bugungu and language is Lugungu – but the language is mixed up with Alur and Lugbara.
- The Bunyoro have maintained Bunyoro traditional beliefs despite incoming people.
- As long as people pledge allegiance to the king and accept Bunyoro culture there are no problems.
- The Alur and Bugungu wanted to teach their own languages in school – the Bunyoro Kitara Kingdom went to resolve this and said that the language to be taught in school is Bunyoro and Lugungu.

Traditional Leadership & Arbitration Systems

- Clan leaders had a core responsibility to maintain culture and traditions and up to now have also been the first line is resolving conflicts in communities using an informal system of arbitration that aims to maintain peace.
- With the constitution the clan leaders' role in arbitrating has remained especially on civil matters – often the formal courts refer issues back to clan leaders and Bunyoro Kitara Kingdom ministers.
- Arbitration normally starts with the family referring a case to the clan head, who then brings in the chief and the parish and subcounty chiefs if necessary. People only go to court if / after clan leaders have failed.
- Before colonisation the kingdom had its own law courts and collected its own revenue

- In the past they used fines as punishment (cowry shells or animals) and arbitration was not documented.

Vulnerable Groups

- Vulnerable groups include smaller tribes.
- Those living along the lake shore are more insecure e.g. Bakobia, Butiaba, Banyantonya, Bakibiro – vulnerability stems from their dependence on fishing, hunting and mining salt. Soil is not good for cultivation, productivity of the lake is going down and access to the park is restricted.
- "Some newcomers and coming and trying to suppress locals" e.g. Balaalo and Congolese.

vii) Meetings with the Ministry of Gender Labour and Social Development

On the 1st February 2017 a meeting was held at the MGLSD and the issues raised were as follows;

- Issues of indigenous resource knowledge need to be considered e.g. traditional medicine. If people are moved, where will they get their herbs? How will they ensure that traditional knowledge is captured e.g. that old stories are recorded?
- There is need to consider community resources, tangible and intangible cultural heritage – all issues have value and we must be careful not to undermine a community's relation with the gods at certain sites (e.g. certain trees)
- The Ministry of Trade and Antiquities should be consulted on matters of physical cultural heritage but in terms of issues of practice the Directorate of Social Protection is the relevant stakeholder.

A further meeting was held on 4th April 2017 at the Ministry of Gender Labour and Social Development (MGLSD) offices in Kampala. It was attended by the following:

- 1. Ajom Cecilia, Principal Cultural Officer
- 2. Naumo Juliana, Commissioner for culture and family affairs
- 4. Dr. Kyazike Elizabeth Archaeologist and cultural heritage expert

The discussion with the MGLSD started with giving a brief on the factual information about the cultural aspects in the project area such as; ethnography, intangible, traditional social structures and officially recognized minority. The Ministry of Tourism, Trade and Antiquities (MTWA) handles the tangible heritage while the Ministry of Gender, Labour and Social Development (MGLSD) handles the intangible heritage. Therefore this has created a conflict in terms of executing roles that needs to be streamlined[3].

What are some of the cultural heritage properties valued in Buliisa and Nwoya districts?

- These include wells, mountains, forests, swamps.
- The water sources e.g. wells where they bathe e.g. the hot springs, beliefs and values about how things should be done.
- How people interact in terms of hierarchy e.g. the leadership system.
- Food habits and processes they follow e.g. age set system like for one to attend the meetings must be in a particular age system. Once this is missed out it may lead to disenfranchising people from their culture.

What are the likely impacts of the project on cultural heritage?

People in this area leave in clans so they may be scattered by the oil activities and if they get out of their cultural spaces it may affect their livelihoods.

People's identity could be lost through intermarriages that may lead to loss of language.

- The project may lead to social impact on people's norms and values. Thus MGLSD hopes that respect of people's norms and values will be prioritised.
- The project is likely to disorganise people's cohesion.

How can such impacts on cultural heritage be mitigated?

- There is need to have as much interaction as possible with the community.

[3] This is according to the Principal Cultural officer Ministry of Gender, Labour and Social Development who thinks the roles of the MTWA and MGLSD should be properly streamlined or if need be the tangible and intangible heritage should be merged and put under one ministry.

- In order to identify cultural issues there is need to engage the community. The community in the project area should be engaged at all levels such as planning and implementation among others.
- The contractors and all workers should avoid sexual relationships with girls in the area and then force them to abort as it was experienced with contractors on one of the roads in Uganda.
- In case of any formal employment the local people should be given priority because they can assist in identifying cultural heritage in the project area.
- The traditional institutions such as clan leaders, clan heads and chiefs are the custodians of people's norms, values and practices. These should be the people to be consulted on cultural heritage other than the political leaders like the Local council chair persons.
- In view of the above the entry point during stakeholder engagement should always be consultation of clan leaders and elders instead of the top cultural leaders like the kings or prime ministers of either Acholi or Bunyoro communities. This is because the latter are usually political appointees or retired civil servants who may not be very knowledgeable on cultural issues.
- There is need to note that, retired civil servants have taken up most of the posts of the traditional leaders and yet they are not very conversant with the cultural heritage issues like the clan leaders. Hence the best choice should be the clan leaders than cultural leaders of the institutions. This is because the clan leaders are the custodians of the day to day cultural issues
- There is need to write a standalone social cultural report.
- The MGLSD has a profile of all the traditional leaders in Uganda, an exercise it does every year. This implies that they have information on the cultural leaders of the project area as well.
- There is need to undertake stake holder verification in order to avoid politicians who take advantage of the situation for financial gain than cultural heritage protection.
- The MGLSD raised a pertinent question that since the people in Buliisa practice community land ownership, then in case of relocation and eventual compensation especially from their places of worship whom do you compensate?
- Stakeholder selection is very key by getting people who value their culture. Using people like Local council chairpersons is very dangerous because in most cases they have vested interests.
- There is need to find out the number of clans in the project area. There after a meeting of all the clan leaders should be convened when all clans are together. It is better to have them all together to avoid controversies or contradictions and in case of any they would iron it out there and then.

Which projects does the MGLSD have in the project area?

The MGLSD intends to undertake a project aimed at profiling minorities such as the Banyaindi. But they are still lobbying the World Bank for funding because this is a new project they have in plan.

Potential mitigation measures for the good management and mitigation of potential socio-cultural change associated with oil field development

- There is need to have a dialogue with the community to find out a solution to any matters that may arise.
- The ministry appealed for fairness, inclusion, participation and respect for the people's cultures.
- The consultant should also read the Report on Indigenous communities done by the Equal opportunities Commission in Bugoloobi.
- The cultural resources of the community e.g. cultural space, site for venerating the gods, gardens for herbs for treatment should be left accessible.
- There's need to set up cultural villages in the area
- Work in the oil industry is very stressful in time and the management style so there is need for cultural activities that can relieve them of stress and this can also make the oil workers more productive.
- The project should consider the cultural benefits of community performances in the evenings such that the community can get some money and yet it can also re-enact the people's cultural values through songs, dance and drama and language usage.
- The oil companies should budget well for cultural heritage resettlement to avoid scenarios like on the Tororo-Apuyo road that has stagnated because of lack of understanding of cultural heritage at baseline data collection where they did not budget for cultural rituals like the resettlement of bees.

viii) Meetings with Department of Museums and Monuments and Uganda Museum

Two meetings were held. The first meeting begun with an explanation by Ms. Sarah Musaliizi of the difference between the Department of Museums and Monuments (DoMM) and the Uganda Museum. She said that, the DoMM is bigger than the Uganda Museum but the department is being housed by the Uganda Museum yet it should have been at the Ministry of Tourism Wild and Antiquities (MTWA) headquarters.

The Department of Museums and monuments has a dual function as depicted from its two sections as stated below:

1. The monuments section which in charge of all the sites including the Uganda museum. The Uganda Museum is therefore a monument and cultural heritage site.
2. The Museum section that exhibits cultural materials for public viewing among other things.

Following the above explanation at the initial meeting of 7th March 2017 another meeting was rescheduled for 9th March 2017 at 10:00 am with officials representing the various sections at the Uganda museum.

One key point that Sarah raised in the first meeting was the need to share the coordinates of any data collected to enable the museum to update its data base as it is in the process of making a digital map showing all the cultural heritage sites in Uganda.

The second meeting was held on 9th March 2017 and those who attended this meeting were as follows:

- Ms. Sarah Musaliizi, Palaeontologist
- Mr. Charles Okeny Kinyera, Archaeologist
- Mr. Abiti Nelson, Anthropologist
- Dr. Elizabeth Kyazike, Archaeology and Heritage consultant

The agenda of the second meeting was as follows:

1. Prayer
2. Communication from the chair (Sarah Musaliizi)
3. Brief about the project from Dr. Elizabeth Kyazike
4. Discussion of the key questions raised by O'Brien and reactions

Min 1: Prayer

The prayer was led by Mr Nelson Abiti.

Min 2: Communication from the chair

The chair noted that she was happy that they were meeting with an expert in heritage and archaeology who understood their language. The chair thus wished all Environmental Impact Assessments (EIA) would employ qualified archaeologists and cultural heritage people. This was on the basis of other projects where sometimes they send people who don't know much about archaeology and heritage to make the consultations.

Min 3: Brief by the Dr. Elizabeth Kyazike

She briefed members that this is work for Total/Tullow who contracted ESIA team, including the archaeology and cultural heritage expert. The presenter mentioned that the work concerns mainly Buliisa district and it is focusing on the well pads that lie mainly within the Buliisa community areas and MFNP.

Min 4: Tackling of key questions as follows:

Discussion of all the known cultural heritage issues (archaeology, palaeontology, intangible heritage in the project area.

- The first question raised by the officials was that, was the scoping done to identify the known sites since Buliisa is a very important area in terms of cultural heritage?
- There is need to review existing literature to identify the known sites in the project area. It should be noted as shown in the literature review section of this report.
- Towards Tangi gate there is a slave market that could be investigated in the literature or even physically.
- Why is emphasis on the well pads and yet the well pads have access roads and pipeline routes that serve the well pads?
- Members confirmed that MFNP has intangible heritage though some sites are seemingly abandoned e.g. the places of worship especially among the Acholi who refer too much to MFNP.
- Paleontological sites such as Kaiso and Nkondo[4].
- I was also provided with a map of Uganda with some of the known sites and the following were identified within and close to the project area: Kibiro salt gardens, Lugard's camping cave, Nkondo, Kaiso fossil sites, Katasiiha fort, Kabarega tomb and Baranwa fort.
- They recommended a look at the physical sites first and then go to the field to identify more sites. This should involve as much as possible the community who are more knowledgeable on the intangible heritage.
- The area around Pakuba airstrip was mentioned as one where they have ever picked some stone tools.

[4] For more information refer to the Uganda Museum publication, *A glance at palaeontology in Uganda*, 2006 Page:5

- Kibiro has components of archaeology and ethnography and is on the tentative list of world heritage sites since 1997.

Topics suggested for research by the DoMM's in the project area:

- Focus should be on dating the archaeological sites.
- For anthropology the focus should be on investigating the practice of salt mining and the archaeological landscape and the continuity of the salt practice.
- Intangible heritage should be documented to avoid cases of those who deny the existence of a living heritage.
- Palaeoenvironmental studies should be undertaken that will incorporate issues of palaeoclimate e.g. study the dynamics of the Obweruka Lake.
- Studying of pottery making and salt making in the area.

Information on the archives:

- The museum has an archive and data base e.g. for palaeontology in form of fossil bones of elephants, crocodiles dated 4.5mya and fossils of fruits, seeds, fish etc.[5].
- There is evidence to show that the western rift was a fresh water area with a lot of extinct animals.

Deposition and archiving of anticipated findings:

- All collected samples have to be deposited at the Uganda Museum because space is available.
- Before storage at the Museum all materials should be properly labelled indicating the date, site name, site number, village, provenience, depth and the findings (artefact type).
- Deposition boxes have to be made by the survey company for depositing materials at the Museum whose size and quantity will depend on the materials collected.
- The cost of the boxes can only be determined at the time of deposition basing on the current exchange rate in consultation with the Department of Museums and Monuments but the boxes should be conservation friendly.

Discussion of anticipated mitigation measures:

- Training the game rangers and all Uganda wildlife officials in the basics of archaeology and cultural heritage.
- Training of all workers who will participate in the project development phase such that they can implement the chance findings procedure.
- Utilisation of the palaeontology watching brief developed by the Uganda Museum.
- The oil exploration companies should set up a community museum in Buliisa that can house or show case materials within the entire Albertine rift. This does not mean that, the museum does not have enough space but it is better for them to be viewed within the vicinity and this can also assist in the dissemination of the findings as people can come to know about themselves.
- For the intangible heritage there is need to consult people who attach value to the heritage and documentation of this intangible heritage is a key aspect.
- Some of the intangible cultural heritage places should be maintained close to the project areas because as it was done in Moyo. For instance if it is a place of worship people could continue worshipping though with some regulations.
- In case of relocation proper rituals should be performed in consultation with the community cultural leaders.
- Burials should be treated with utmost care in line with the regulations and cultural practices of the affected communities.
- Test pit excavations should be carried out in areas found to be affected by the project during the baseline data collection.
- The chance finds procedure should be used as a last resort and in only areas that are not accessible.
- There is need to share with the museum coordinates of sites identified during baseline data collection after writing the reports to enable DoMM to update their databases.

ix) Meeting with Cross Cultural Foundation of Uganda

Cross Cultural Foundation is Non-Governmental Organisation established in 2005 on the premise that culture is not sufficiently taken into account in development work and as a result many development initiatives are not sustained because they tend to depend in external thinking and resources. CCFU is

[5] For details refer to the petrified fossil bone in the Uganda Museum, 2006 page 7.

an accredited NGO to the UNESCO intergovernmental Committee for safe guarding of intangible cultural heritage and also a member of the International National Trust Organisation (INTO) since 2012[6]. It is basing on this history of CCFU that it was regarded as one of the key stakeholders to be consulted. The meeting was held on 10th March 2017 and the following people were in attendance.

- Mr. Nsibambi Frederick, Heritage programmes Manager
- Mr. Aliguma Alabyona A., Heritage Programs Officer
- Dr. Kyazike Elizabeth, Local Archaeology Consultant

Matters that arose

Conservation of heritage requires the inhabitants to be vigilant who can also ask the oil companies to help in conserving their heritage. This is because acknowledgement of heritage ownership is very important.

CCFU has worked in Acholi and Bunyoro kingdoms on matters of cultural heritage and they have a project with the Acholi, Alur and Banyoro. There are two issues CCFU is addressing in the above project and these are:

- The need for heritage conservation
- What form of aid or support do communities require from an NGO like CCFU?

In accomplishing the above they have made consultations in Gulu, Masindi, Nwoya and Buliisa districts. Therefore they recommended the Nwoya CD as a potential resource in case there is need for more information for the project.

From CCFU's consultations with the communities, they pointed out that there biggest fear is that most of their heritage that will be affected is in Murchison Falls National Park (MFNP). MFNP area was gazetted by government but giving it away to the oil companies will be a betrayal to the local people.

Thus the communities suggested a tripartite agreement between government, the cultural institutions and the oil companies in order to decide on does and don'ts during oil exploration activities.

On the issue of the support from the NGOs they suggested that the NGO (CCFU) should assist them come up with guidelines for oil companies' interaction and preservation of cultural heritage in the project areas[7].

A meeting to draft the guidelines was held in 2016 in Gulu though attempts to involve the oil companies were futile. During the deliberations it was observed that oil companies usually prefer to deal with individuals than institutions which is detrimental to heritage conservation as it was in Nwoya. At the time of the interview the draft was but could only be shared at a later time.

What really are the cultural heritage concerns of the people in the National Park?

- The CCFU officials said that the people claim there are burial sites in the park especially for the Acholi chiefs and kings.
- The Bagungu have cultural attachments with the park especially with wild life and sacred trees among the many. Some of the animals are their totems. They cite the oil activities in Bugungu wild life reserve which were carried out at night involving a lot of light throughout the night that could not allow some animals to mate and many had to migrate which led to loss of touch with their totems.
- The Prime Minister Ker Kwaro of Acholi mentioned to CCFU five pillars of Acholi culture in MFNP though they could recall only three that include: the forest, wild life and the land.
- For the Acholi community oil exploration activities may lead to the alteration of their cultural heritage through disorganising especially wild life. This is also because the oil activities limit access to cultural heritage sites.
- The Acholi claim to have traditional guidelines for cultural heritage protection.
- Change in diet from their principal diet called ndwa which is a mixture of cassava flour and fish to new foods like spaghetti, rice and loss of confidence in themselves due to foreign influence.
- Limited cultural space for practicing cultural festivals such as those for celebrating a big fish catch, welcoming the new moon and birth of twins. These have been affected not only by the oil activities but also by the influx of foreign religions where some people now claim they are saved[8].
- There is a wreck in Lake Albert that should be archaeologically investigated (underwater archaeology).
- The Bagungu have marriage, naming practices and dances. The latter include; Kaligwa and Kigwere dances and hunting and victory dances that should be protected.

[6] www.crossculturalfoundation.or.ug
[7] These guidelines were published this year 2017.
[8] A saved person in the Ugandan context is one who follows the Pentecostal churches and thus shuns traditional religions that are part of cultural heritage.

- There are different rituals for twins, fishing and for chocking (removing a fish bone stuck in one's throat.
- Promotion of the Bagungu traditional dressing for women unfortunately the one for men was not mentioned.

How can burials in MFNP be identified yet even within the communities most burials are not clearly marked?

CCFU suggested that, in case of identification of burials one should look for marks such as trees and mounds among others.

Activities of CCFU to promote cultural heritage

- CCFU has worked in Buliisa for the last 3-4 years mainly on heritage education programs that encompasses 6 schools. The schools have cultural heritage clubs and there is a local coordination office at Bugungu Heritage and Information Centre.
- The Bugungu Heritage Information Centre also acts as a museum since it has a few collections thus any attempt to start a museum in the area will not be from scratch. In the centre they have collections that include: materials related to the life and identity of the Bagungu e.g. fishing gear such as nets, musical instruments, and artefacts depicting Bagungu culture.
- The school clubs are involved in different activities such as learning to trace their family trees so that one can talk about many generations back in ancestry.
- Inculcating the importance of heritage through encouraging them to use the local outfit.
- Promotion of the Lugungu language which is vulnerable due to the long-time domination of the Banyoro and infiltration of other ethnicities especially the Alur.
- In Buliisa there is a Bible translation Association that started with the Bible and now has gone ahead to translate even books for primary school level based in Biso.
- The Bunyoro Kitara Kingdom wanted to set up a museum in front of their palace and were promised support by one of the oil companies however, CCFU did not have clear evidence on this.
- Kakindo women's group in Buliisa also has links with heritage conservation.

What have the oil companies done in order to support heritage conservation?

- The communities claim they have been given blue band (blind folding) in the form of supporting tournaments and scholarships.
- CCFU however, does agree with it they believe if scholarships are given then the community could utilise them and have people who come back to help preserve the heritage only if the courses sponsored included cultural heritage related courses.

CCFU's cultural heritage concerns

- CCFU is concerned about what will happen to cultural heritage in Buliisa where people seem not to care about heritage preservation, they have the, I don't care attitude yet their heritage is very vulnerable. There is a tendency of feeling inferior which has made many to adopt foreign local and international languages and also thinking of the oil money in the case of compensation than heritage thus some deny the existence of heritage.
- We should be careful as the Bagungu may fail to put up with the new developments and migrate to other areas such as Congo.
- CCFU is ready to share contacts of people from Buliisa who may have cultural heritage information e.g. Mr. Mugasa Blasio one of the elders and a former prime minister of Bunyoro who is very knowledgeable and concerned about heritage conservation.
- Funding bodies and other organisations in the area include: National Association of Professional Environmentalists (NAPE), Kaiso Tonya Museum, Bunyoro Community museum Associates, Bunyoro Kitara Kingdom. They recommended contacting NAPE for an interview due to their wealth of experience and work in the area.

How cultural heritage information can be published and disseminated to the public

- A dissemination event could be organised in Buliisa
- Publications of the findings should be bilingual to allow the heritage owners to understand what is written especially in Lugungu and the translation could be done by the Lugungu Bible Translation Association.
- Utilisation of the cultural heritage custodians such as elders and cultural leaders to disseminate the information.

x) The Uganda National Commission for UNESCO (UNATCOM)

This meeting was held on 18th April 2017 with Mr Daniel Kaweesi, Intangible Heritage Cultural Programme Specialist, Programme Officer, Cultural Section, UNATCOM.

The interview emphasised the significance of living cultural heritage. It noted the importance of intangible heritage specific to each ethnic group, and the dependency on ecosystems such as medicinal plants.

Highlighted attachment to burial places and that traditional ceremonies for grave relocation differ between ethnic groups.

Uganda ratified the UNESCO Convention for the Safeguarding of Intangible Heritage in 2009.

Ritual areas may be secret and sensitive, and must be respected. Appropriate consent and rituals may be required. Impacts should be avoided where possible. Relocation may involve negotiated compensation and rededication ceremonies.

Buliisa's intangible heritage should be inventoried. Preservation in situ of archaeological remains, by avoiding impacts, is key.

xi) Consultation with Academic Institutions

The plan was to consult academicians from three departments of Makerere University. These were Departments of Languages, Anthropology and History, Archaeology and Heritage studies Department. However when due to the strikes and busy schedules in Makerere it was not possible to identify them and that is why an option was found from Kyambogo University. Thus an interview was held with Mr. Kintu John who is a Lecturer at the Department of Languages And Communication (Kyambogo University) And a PhD Student of the Department of Languages And African Studies (Makerere University). From the interview with Kintu John the following points are worth noting.

On the issue of the heritage potential of the Project area Mr. Kintu made the following comments:

- The Albertine region, the Lake itself is a heritage source for generating income for the people in terms of finishing.
- Some of the cultural issues like empako or petty names may not be affected by the project.
- Heritage assets like the Kibiro salt mining gardens and hot springs may be adversely affected.

The second question concerned suggesting a research agenda for academics

The areas that he suggested to be investigated included:

- The impact of oil on the lives of the people (Banyoro).
- Investigation of the different dialects spoken by the Banyoro. This is based on the thinking that; the Lungungu language though it is regarded as a dialect of Lunyoro language they seem to differ which suggests that they may be many dialects within Lunyoro. This therefore necessitates an investigation to ascertain if Lugungu is a language itself or just a dialect of Lunyoro language. Another basis for recommending investigation into the different dialets of Lunyoro was due to the fact that, despite the informant being a Munyoro he claims to understand Luganda well compared to Lugungu which raises a question mark as to whether Lugungu is part of Lunyoro or not.
- According to Mr. Kintu it is in line with this debate of whether Lugungu is an independent language or a dialect of Lunyoro that the Bagungu have gone ahead to try to translate the Bible in the Lugungu language. Thus the need to investigate the factors behind the Bagungu's strive for identity within Bunyoro Kingdom.

Finally was an investigation on the mitigation measures to curb the impact of the oil projects on cultural heritage assets

Mr. Kintu came up with the following mitigation measures.

- The lake should be protected and the oil spills or wastes should not be deposited in the lake.
- Sites like Kibiro should be gazette and protected.
- The Bagungu literature should be developed especially the language by teaching it in schools, publishing books in Lugungu language otherwise it will perish. The development of the language will also entail developing the Lugungu grammar and dictionary among others.
- Cultural norms should be protected. Though he does not suggest how this should be done properly.
- The oil companies should assist the researchers in this area with publication opportunities. Through this the focus should be on writing of Lugungu language materials such as a dictionary and grammar with the aim of producing educational materials.
- Adult literacy programs should be launched to enable the Bagungu acquire basic skills.

Annex B

Annex B- FINDS CATALOGUE, DEC 2016 & JUNE-JULY 2017 (ARCHAEOLOGY AND CULTURAL HERITAGE)

Appendix 17-C -
Finds Catalogue, Dec

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Archaeology Finds Catalogue, Tilenga Project Wellpad Areas to July 2017

Wellpad	AECOM He	Field GR	Date	Material	Description	Quantity	Temper	Surface Finish	Decoration	Rim?	Lithic Type	Raw Material	Period
JBR-07 & J	ACH-02-06	130a	27/06/2017	Ceramic	Chobi ware shoulder fragment. Body much thicker than shoulder area.	1	Grog with infrequent quartz.	Slip	Yes. Band of tfinger nail impressio		N/A	N/A	MIA
JBR-07 & J	ACH-02-06	130b	27/06/2017	Ceramic	Body sherd	1	Laterite and grog.	Slip	No		N/A	N/A	
JBR10	ACH-02-07	2	27/06/2017	Ceramic	Abraded body sherd	1	Grog and sand	Too abraded to say	No		N/A	N/A	
JBR10	ACH-02-07	19	27/06/2017	Ceramic	Two adjoining sherds of a decorated vessel. Interior abraded possibly as a result of grain preparation.	2	Sand and infrequent quartz	Slip (black)	Roulette		N/A	N/A	LIA
JBR10	ACH-02-07	8	27/06/2017	Ceramic	Rim sherd of Chobi Ware with decoration. Thick and very flag rim.	1	Grog and sand	Slip	At least two bands of t	Yes	N/A	N/A	MIA
JBR10	ACH-02-07	20	27/06/2017	Possible Lith	Raw material not local to area.	1	N/A	N/A	N/A		Possible core	Granite	
JBR10	ACH-02-08	36	27/06/2017	Ceramic	three sherds of differents fabrics	3	Grog and sand	Burnished			N/A	N/A	
JBR10	ACH-02-08	38	27/06/2017	Lithic	Abraded core of quartz.		N/A	N/A	N/A		Core	Quartz	LSA?
JBR10	ACH-02-08	33	27/06/2017	Ceramic	One neck sherd of decorated pottery. Coil manufacture.		Grog and sand		Band of horizontal roulette		N/A	N/A	LIA
JBR10	ACH-02-09	46	27/06/2017	Lithic	One quartz multi platform core	1	N/A	N/A	N/A		Core	Quartz	LSA
JBR-02	ACH-02-00	65	27/06/2017	Ceramic	One abraded decorated sherd.	1	Sand	Too abraded to say	Possible adraded rouletting.		N/A	N/A	LIA
JBR-02	ACH-02-00	67	27/06/2017	Lithic	Five pieces of quartz. Three with cortex. Raw material appears to be river cobbles.	5	N/A	N/A	N/A		Two flakes and three cores	Quartz	LSA
JBR-02	ACH-02-00	70	27/06/2017	Lithic	Two multi-platform cores, one quartz and one unknown material (pumice?)	2	N/A	N/A	N/A		cores	Quartz and unnown	LSA
JBR-02	ACH-02-00	70	27/06/2017	Ceramic	Three pottery sherds (two adjoining), including one rim. All abraded. Possibly from a constricted open bowl.	3	Grog with infrequent quartz.	Too abraded to say	Too abraded to say	Yes (1)	N/A	N/A	
JBR-02	ACH-02-00	71	27/06/2017	Lithic	Quartz core with lots of cortex surviving. River pebble.	1	N/A	N/A	N/A		Core	Quartz	LSA
NSO-03	ACH-01-15	535a	08/12/2016	Ceramic	Possible crucible or linked to salt production.	1		None	Impression of vegetati	No	N/A	N/A	Unknown
NSO-03	ACH-01-15	535b	08/12/2016	Ceramic	Thick rounded bases fragment. Orange fragment.	1	Sand and grog.	Not clear			N/A	N/A	Unknown
NSO-03	ACH-01-15	535c	08/12/2016	Ceramic	Three body sherd of LIA pottery	4			Roulette		N/A	N/A	LIA
NSO-03	ACH-01-15	535d	08/12/2016	Ceramic	One rim sherd of LIA pottery	1		Slip	None	Yes	N/A	N/A	LIA
NSO-06	ACH-02-58	471	03/07/2017	Ceramic	Fiver sherds of decorated pottery. One rim, with an out-turned rim.	5			Roulette	Yes (1)	N/A	N/A	LIA
NGR-04	ACH-02-16	295	30/06/2017	Ceramic	Rim sherd.	1	Sand and grog.			Yes			LIA
NSO-04	ACH-02-48	551	04/07/2017	Lithic	Possible flake. Quartz.	1	N/A	N/A	N/A	N/A	Flake	Quartz	LSA
KW-01	ACH-01-17	466	08/12/2016	Ceramic	Small decorated body sherd.	1	Sand		Roulette		N/A	N/A	LIA
NGR-07	ACH-01-15	496	08/12/2016	Ceramic	Two decorated body sherd. Some evidence of burning. Possibly cups.	2	Sand and grog.		Roulette	Yes (2)	N/A	N/A	LIA
Bridge Barg	ACH-02-34	161	28/06/2017	Lithic	Pyramidal core.	1	N/A	N/A	N/A	N/A	Core	Quartz	LSA
NGR-04	ACH-02-16	281	30/06/2017	Lithic	Core.	1	N/A	N/A	N/A	N/A	Core	Quartz	LSA
Bridge Barg	ACH-02-34	163	28/06/2017	Lithic	Adjacent double platform core.	1	N/A	N/A	N/A	N/A	Core	Quartz	LSA
NSO-04	ACH-02-47	523	04/07/2017	Lithic	Four lithics. Three debitage and one flake.	4	N/A	N/A	N/A	N/A	Flake (1)	Quartz	LSA
NSO-04	ACH-02-47	523	04/07/2017	Ceramic	One rim sherd. Coiling method of production.	1	Sand	Slip	N/A		N/A	N/A	LIA
GNA-04	ACH-02-33	485	04/07/2017	Ceramic	One sherd of pottery. Possible bowl.	1	Sand and grog.		Roulette		N/A	N/A	LIA
NSO-04	ACH-02-45	212	02/07/2017	Ceramic	Two sherds. Rim slightly out-turning.	2	Sand and grog.		Roulette	Yes (1)	N/A	N/A	LIA
NSO-06	ACH-02-56	473	03/07/2017	Ceramic	Large rim sherd.	1	Sand and mica.	Burnished	None	Yes (1)	N/A	N/A	Unknown
GNA-04	ACH-02-32	469	28/06/2017	Ceramic	Decorated body sherd. Horizontal roulette.	1	Sand and grog.		Horizontal roulette		N/A	N/A	LIA
GNA-04	ACH-02-32	468a	28/06/2017	Ceramic	One decorated body sherd.	1	Sand and grog.		Roulette		N/A	N/A	LIA
GNA-04	ACH-02-32	468b	28/06/2017	Ceramic	Decorated body sherd. Possible Chobi Ware.	1	Sand and grog.		Mamillated		N/A	N/A	MIA
NGR-04	ACH-02-86	462	30/06/2017	Lithic	Two lithic in quartz. One a possible single platform core scraper. The other a flake.	2	N/A	N/A	N/A	N/A	Flake and core	Quartz	LSA
NGR-02	ACH-02-11	950	29/06/2017	Ceramic	One decorated body sherd. Possible Chobi Ware.	1	Sand and grog.		Mamillated		N/A	N/A	MIA
NGR-02	ACH-02-11	949	29/06/2017	Lithic	One quartz flake fragment	1					Fake	Quartz	LSA
NSO-04	ACH-02-42	170	02/07/2017	Ceramic	Two rims. One with possible decoration.	2	Sand and grog.	Slip	Roulette	Yes (2)	N/A	N/A	LIA
GNA-04	ACH-02-33	482	28/06/2017	Ceramic	One rim sherd. Out-turning, with a band of roulette decoration.	1	Sand		Roulette	Yes	N/A	N/A	LIA
Bridge Barg	ACH-02-10	147	28/06/2017	Lithic	Two lithics in quartz. Lots of cortex surviving. Single platform core and a flake	2	N/A	N/A	N/A	N/A	Single platform core and a fla	Quartz	LSA
NGR-04	ACH-02-16	289	30/06/2017	Lithic	Half a fishing weight. Possible metamorphic rock.	1	N/A	N/A	N/A	N/A	Half a fishing weight	?	Modern
NGR-04	ACH-02-16	289	30/06/2017	Ceramic	Pottery.	1			None	No	N/A	N/A	Modern
GNA-04	ACH-02-29	186	28/06/2017	Ceramic	One rim sherd with decoration.	1	Sand and mica.	Burninshed interior	Roulette	Yes	N/A	N/A	LIA
GNA-04	ACH-02-33	480	28/06/2017	Ceramic	One rim sherd with fine decoration. Rim out-turning. Possibly a bowl.	1	Sand and mica.		Roulette (fine)	Yes	N/A	N/A	LIA
NSO-06	ACH-02-49	361	03/07/2017	Ceramic	One large sherd with crude roulette decoration. Possible base sherd.	1	Sand	Burninshed interior	Roulette	No	N/A	N/A	Modern
NSO-06	ACH-02-52	385	03/07/2017	Ceramic	Decorated body sherd. Possible Chobi Ware.	1	Sand and mica.		Mamillated	No			MIA
NSO-06	ACH-02-53	395	03/07/2017	Ceramic	Abraded pottery with roulette decoration.	1	Sand and mica.		Roulette	No	N/A	N/A	LIA
NGR-07	ACH-02-24	405	01/07/2017	Lithic	One large quartz core. Multi-platform.	1	N/A	N/A	N/A	N/A	Multi-platform core.	Quartz	LSA
NSO-02	ACH-02-36	271	02/07/2017	Ceramic	Two body sherds. One very small and one very abraded.	2	Sand and grog		Roulette	No	N/A	N/A	LIA
NSO-04	ACH-02-42	161	02/07/2017	Ceramic	One undecorated body sherd.	1		Burnished	None	No	N/A	N/A	Modern
NSO-02	ACH-02-35	266	02/07/2017	Ceramic	Large rim sherd with decoration. Possible Chobi Ware. Rim not turning.	1	Grog		Mamillated	Yes	N/A	N/A	MIA
JBR-02	ACH-02-02	93	27/06/2017	Ceramic	Five sherd of pottery. One rim. Decorated but abraded.	5	Sand and grog		Too abraded to say	Yes (1)	N/A	N/A	LIA
NSO-06	ACH-02-51	373	03/07/2017	Ceramic	Three pottery sherds. All body sherds, two of which are decorated, and one abraded.	3	Sand and mica.		Roulette (1) and cross	No	N/A	N/A	LIA/Modern
NSO-06	ACH-02-50	367	03/07/2017	Ceramic	Four pottery sherds (one broken). One decroated rim, and the remaining three undecorated and abraded.	4	Sand and mica.	Slip and burnished	Mamillated (1)	Yes (1)	N/A	N/A	MIA/LIA
NSO-06	ACH-02-51	354	03/07/2017	Ceramic	Four large body sherds. Two decorated (and adjoining pieces of the same vessel).	4	Sand with quartz	Slip and burnished	Roulette (2)	No	N/A	N/A	Modern
GNA-04	ACH-02-28	176	28/06/2017	Ceramic	One sherd of abraded pottery.	1	Sand	Possible slip	Too abraded to say	No	N/A	N/A	LIA
GNA-04	ACH-02-28	176	28/06/2017	Lithic	Possible rubbing stone/stone for burnishing floors.	1	N/A	N/A	N/A	N/A	N/A	N/A	Modern
JBR-07 & J	ACH-02-05	129	27/06/2017	Lithic	Core in quartz.	1	N/A	N/A	N/A	N/A	Core	Quartz	LSA
JBR-07 & J	ACH-02-05	129	27/06/2017	Ceramic	Two decorated body sherds. One quite abraded with wavy line decoration. The other with impressed decoration.	2	Sand (1) Grog (1)			None	N/A	N/A	Kansyore/EIA
NSO-03	ACH-02-40	331	01/07/2017	Ceramic	Two pottery sherds. One rim and one decorated body sherd. Rim sherd - rim thinning towards the top.	2	Grog (rim) sand (body)		Roulette (1)	Yes (1)	N/A	N/A	LIA
GNA-04	ACH-01-09	268	08/12/2016	Ceramic	Two decorated body sherds of the same vessel	2	Grog	Burnished interior	Roulette	No	N/A	N/A	LIA
KW-02	ACH-01-04	429	08/12/2016	Ceramic	Large rim sherd with decoration. Possible open mouthed bowl. Rim out-turning (everted rim).	1	Sand ang grog		Roulette	Yes	N/A	N/A	LIA
NSO-02	ACH-02-35	244	02/07/2017	Ceramic	Three sherds of decorated pottery. Two rims.	3	Sand	Slip and possible burnishe	Roulette	Yes (2)	N/A	N/A	LIA
JBR-07 & J	ACH-02-05	452	27/06/2017	Ceramic	Two sherds of pottery. One decorated, and one may have been decorated but is abraded.	2	Sand	Slip	Roulette	No	N/A	N/A	Modern
KGG-06	ACH-02-77	409	03/07/2017	Ceramic	Two pottery sherds, one out-turning rim, and one body sherd.	2	Sand ang grog	Slip	Roulette	Yes (1)	N/A	N/A	LIA
NSO-06	ACH-02-55	455	03/07/2017	Ceramic	Ten sherds of pottery, six plain and the remaining decorated.	10	Sand	All seem to be burnished a	Roulette (1), grass/org	Yes (1)	N/A	N/A	LIA/Modern
KGG-06	ACH-02-76	309	03/07/2017	Ceramic	One body sherd with a large/deep groove.	1	Sand	Burnished and slip	Deep groove.	No	N/A	N/A	EIA
JBR-02	ACH-02-02	98	27/06/2017	Ceramic	One body sherd with roulette decoration	1	Sand	Burnished	Roulette	No	N/A	N/A	LIA/Modern

NSO-06	ACH-02-51	374	03/07/2017	Ceramic	Two large body sherds, both decorated and from the same vessel.	2	Sand and mica.	Burnished	Roulette	No	N/A	N/A	Modern
JBR-02	ACH-02-02	88	27/06/2017	Ceramic	One upper shoulder to rim sherd of mamillated pottery. Chobi Ware	1	Sand and grog.		Mamillated	Yes	N/A	N/A	MIA
NSO-04	ACH-02-43	190	02/07/2017	Ceramic	One decorated pottery sherd.	1	Sand and grog.		Roulette	No	N/A	N/A	EIA
KGG-06	ACH-02-77	320	03/07/2017	Ceramic	Two abraded body sherds. Undecorated.	2	Sand and latalite	Too abraded to say	None	No	N/A	N/A	Unknown
GNA-03	ACH-01-06	387	08/12/2016	Ceramic	Two pottery sherds, one a rim. Rim very fine.	2	Sand	Burnished	None	Yes (1)	N/A	N/A	Unknown
JBR-02	ACH-02-03	109	27/06/2017	Lithic	Two quartz lithics. Two flake fragments.	2	N/A	N/A	N/A	N/A	Flakes	Quartz	LSA
JBR-02	ACH-02-02	87	27/06/2017	Lithic	Convex side scraper and five fragments.	6	N/A	N/A	N/A	N/A	scraper and debatage	Quartz	LSA
JBR-02	ACH-02-02	87	27/06/2017	Ceramic	Large rim, square in profile.	1	Sand and grog.		None	Yes (1)	N/A	N/A	MIA
NSO-04	ACH-02-45	208	02/07/2017	Ceramic	Two rim sherds. One fine (and bevelled) and one very large/chunky.	2	Sand	Slip and burnished	Roulette	Yes (2)	N/A	N/A	ELIA
NSO-06	ACH-02-51	375	03/07/2017	Lithic	Possible multi-platform core.	1	N/A	N/A	N/A	N/A	Core	Quartz	LSA
JBR-02	ACH-02-03	111	27/06/2017	Lithic	One quartz flake. Platform is crushed, so bipolar.	1	N/A	N/A	N/A	N/A	Flake	Quartz	LSA
NGR-04	ACH-02-20	122	30/06/2017	Ceramic	One body sherd with roulette decoration.	1	Sand	Too abraded to say	Roulette	No	N/A	N/A	LIA
JBR-02	ACH-02-02	88	27/06/2017	Ceramic	One body sherd. Abraded, but traces of linear decoration surviving. Coarse fabric.	1	Sand and grog.	Slip	Linear marks (but abraded)		N/A	N/A	LIA
NGR-04	ACH-02-15	272	30/06/2017	Lithics	One stone fishing weight and one burnishing stone.	2	N/A	N/A	N/A	N/A	Weight and burnishing stone.	?	Modern
KGG-01	ACH-02-59	563	05/07/2017	Ceramic	One body sherd with small mamilations. However modern with soot still clinging to pottery.	1	Sand		Mamillations	No	N/A	N/A	Modern
NGR-04	ACH-02-15	269	30/06/2017	Ceramic	One body sherd. Undecorated.	1		Slipped and burnished	None	No	N/A	N/A	Modern
GNA-04	ACH-02-29	194	28/06/2017	Ceramic	Three pottery sherds, one with roulette decoration.	3	Sand and grog.	Slip (on undecorated sherd	Roulette	No	N/A	N/A	Unknown
KGG-05 & M	ACH-02-75	583	06/07/2017	Ceramic	One body sherd, undecorated.	1	Sand and mica.	Burnished	None	No	N/A	N/A	Unknown
KGG-03	ACH-02-67	548	04/07/2017	Lithic	One possible quartz core, single platform.	1	N/A	N/A	N/A	N/A	Core	Quartz	LSA
KGG-09	ACH-02-83	667	05/07/2017	Ceramic	Two body sherds, both with roulette decoration, and both from same vessel.	2		Burnished	Roulette	No	N/A	N/A	Modern
KGG-09	ACH-02-83	675	05/07/2017	Ceramic	One large squared rim sherd.	1	Sand and grog.		No	Yes	N/A	N/A	EIA
KGG-01	ACH-02-60	582	05/07/2017	Lithic	One quartz core.	1	N/A	N/A	N/A	N/A	Core (discqoid)	Quartz	LSA
KGG-01	ACH-02-58	553	05/07/2017	Ceramic	One decorated body sherd.	1	Sand, grog and Mica.	Slip and burnished	Roulette	No	N/A	N/A	LIA
KGG-01	ACH-02-60	588	05/07/2017	Ceramic	One decorated body sherd.	1	Sand and mica.	Slip and burnished	Roulette	No	N/A	N/A	LIA
KGG-01	ACH-02-59	569	05/07/2017	Ceramic	Two pottery sherds. One rim and one decorated body sherd. Both from same vessel.	2	Sand and grog.	Highly burnished	Roulette	Yes (1)	N/A	N/A	Modern
KGG-04	ACH-02-69	54=521	JUN-JUL 201	Ceramic	One decorated pottery sherd, body.	1	Sand, grog and Mica.	Slip and burnished	Roulette	No	N/A	N/A	Modern
KGG-04	ACH-02-69	519	JUN-JUL 201	Ceramic	Two body sherd, one decorated.	2	Sand, grog and Mica.	Slip and burnished	Roulette (1)	No	N/A	N/A	Modern
KGG-04	ACH-02-69	522	JUN-JUL 201	Ceramic	One rim sherd.	1	Sand and mica.	Slip and burnished	No	Yes	N/A	N/A	Unknown
KGG-01	ACH-02-60	588	05/07/2017	Ceramic	One decorated body sherd.	1	Sand, grog and Mica.	Burnished	Roulette	No	N/A	N/A	LIA
KGG-01	ACH-02-60	579	05/07/2017	Ceramic	One large loop handle from lid of cooking vessel.	1	Sand, grog and Mica.	Burnished	No	No	N/A	N/A	Modern
KGG-05	ACH-02-72	693	06/07/2017	Ceramic	Three pottery sherds, one with mamiliated decoration, one with cross hatching, one plain.	3	Sand, grog and Mica.	Slip	Cross hatching and Ma	No	N/A	N/A	Modern
GNA-04	ACH-02-86	180	28/06/2017	Lithic	One quartz core fragment.	1	N/A	N/A	N/A	N/A	Core fragment	Quartz	LSA
KGG-09	ACH-02-81	624	05/07/2017	Ceramic	One decorated body sherd. Very thin.	1	Sand	Slip	Roulette	No	N/A	N/A	LIA
KGG-05	ACH-02-70	654	05/07/2017	Ceramic	Two body sherds, one decorated.	2	Sand	Slip	Mamillation	No	N/A	N/A	MIA
KGG-09	ACH-02-82	655	06/07/2017	Ceramic	Two small sherds. One plain.	2	Sand and grog.	Burnished	Roulette (1)	Yes (1)	N/A	N/A	LIA
KGG-09	ACH-02-82	663	06/07/2017	Ceramic	Two abraded body sherds.	2	Sand and grog.	Too abraded to say	too abraded to say	No	N/A	N/A	Unknown
KGG-01	ACH-02-59	564	05/07/2017	Ceramic	One decorated body sherd	1	Sand and grog.	Slip	Roulette	No	N/A	N/A	LIA
KGG-05	ACH-02-70	652	06/07/2017	Ceramic	Two adjoining body sherds. Possible rim, but abraded.	2	Sand	Possibly burnished but abr	None	Possible	N/A	N/A	Unknown
KGG-05	ACH-02-72	687	06/07/2017	Ceramic	Five large sherds of decorated pottery from the same vessel.	5	Sand, grog and Mica.	Slip and burnished	Roulette	No	N/A	N/A	Modern
KGG-05	ACH-02-72	703	06/07/2017	Ceramic	Four pottery sherds, all decorated and one also a rim.	4	Sand and grog.	Too abraded to say	Roulette (3) and herrin	Yes (1)	N/A	N/A	EIA and LIA
KGG-05	ACH-02-74	732	06/07/2017	Ceramic	Decorated rim sherd. Rim out-turned.	1	Sand, grog and Mica.	Burnished	Roulette	Yes	N/A	N/A	Modern
KGG-05	ACH-02-71	676	06/07/2017	Ceramic	One decorated rim sherd. Very thin.	1	Sand	Burnished (but abraded).	Roulette	Yes	N/A	N/A	ELIA
KGG-05	ACH-02-73	716	06/07/2017	Ceramic	Nine decorated pottery sherds. Varying patterns. One very neat carved roulette and one possible Neolithic.	9	Sand and grog.		Mixed		N/A	N/A	Neo to LIA
JBR-10	ACH-02-09	407	27/06/2017	Ceramic	Undecorated pottery sherd.	1	Sand, grog and Mica.	Slip and burnished	None	No	N/A	N/A	Unknown
NSO-04	ACH-02-47	523	04/07/2017	Ceramic	Undecorated pottery sherd.	1	Sand and mica.	Too abraded to say	None	No	N/A	N/A	Unknown
JBR-07 & J	ACH-02-05	452	27/06/2017	Ceramic	Rim sherd, abraded.	1	Sand, grog and Mica.	Too abraded to say	Possible abraded roul	Yes	N/A	N/A	Unknown
KGG-06	ACH-02-78	429	03/07/2017	Lithics	Two flake fragments.	2	N/A	N/A	N/A	N/A	Flake fragments	Quartz	LSA
JBR-02	ACH-02-03	106	27/06/2017	Ceramic	One fragment of decorated pottery.	1	Sand and mica.	Slip and burnished	Roulette	No	N/A	N/A	LIA
NGR-03	ACH-02-14	252	30/06/2017	Ceramic	Two fragments, one decorated.	2	Sand and grog.	Burnished	Roulette (1)	No	N/A	N/A	LIA
NGR-04	ACH-02-18	94	30/06/2017	Ceramic	One small rim fragment of a highly decorated vessel.	1	Sand and grog.		Two types of decoratio	Yes	N/A	N/A	EIA
NSO-04	ACH-02-42	160	02/07/2017	Ceramic	One decorated pottery sherd.	1	Sand, grog and Mica.	Burnished inside.	Roulette	No	N/A	N/A	LIA
NGR-07	ACH-02-25	509	01/07/2017	Ceramic	One undecorated body sherd.	1	Sand and grog.	Burnished	None	No	N/A	N/A	Unknown
NSO-02	ACH-02-35	245	02/07/2017	Ceramic	One decorated pottery sherd.	1	Sand and mica.	Burnished	Cross hatching	No	N/A	N/A	EIA
KW-02 & N	ACH-01-05	418	08/12/2016	Ceramic	One undecorated body sherd.	1	Sand, grog and Mica.	Too abraded to say	Too abraded to say	No	N/A	N/A	Unknown
NSO-02	ACH-02-35	264	02/07/2017	Ceramic	One rim sherd. Out turning. Possible cup	1	Sand and mica.		Roulette	Yes	N/A	N/A	LIA
JBR-07 & J	ACH-02-06	131	02/06/2017	Ceramic	Two adjoining sherds from the rim of a vessel.	2	Sand and grog.	Abraded.	No	Yes	N/A	N/A	Unknown
GNA-04	ACH-01-07	254	08/12/2016	Ceramic	One rim sherd with decoration	1	Sand and grog.	No	Roulette	Yes	N/A	N/A	ELIA
KGG-01	ACH-02-60	577	05/07/2017	Ceramic	One decorated body sherd.	1	Sand and grog.	Abraded.	Roulette	No	N/A	N/A	LIA
JBR-02	ACH-02-01	83	27/06/2017	Ceramic	One decorated body sherd.	1	Sand and mica.	Abraded.	Wavy lines	No	N/A	N/A	Neolithic
NGR-07	ACH-02-25	503	01/07/2017	Ceramic	One decorated body sherd.	1	Sand and grog.	Burnished	Roulette	No	N/A	N/A	Modern
CPF	ACH-01-14	316	08/12/2016	Ceramic	Decorated rim sherd. Rim out-turned. Very thin	1	Sand	Burnished (inside)	Roulette	Yes	N/A	N/A	LIA
JBR-02	ACH-02-03	101	27/06/2017	Ceramic	One decorated body sherd.	1	Sand and grog.	Abraded	Mamillations	No	N/A	N/A	MIA

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Annex C

Annex C – INVENTORY OF ARCHAEOLOGY, PALAEONTOLOGY AND CULTURAL HERITAGE SITES IDENTIFIED IN PROJECT AREA

Included in electronic version only.

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TILENGA PROJECT ESIA - APPENDIX S: Ecosystem Services

May 2018

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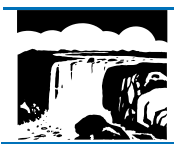
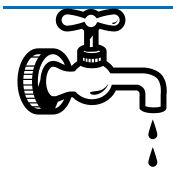
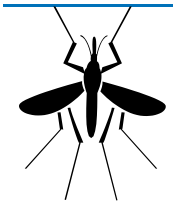
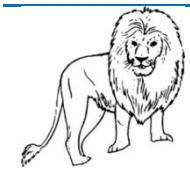
Table of Contents

Ecosystem services checklist

Ecosystem Service		Description	Example
	Crops	Cultivated plants or agricultural products harvested by people for human consumption.	Crops include food sources such as rice and maize as well as honey for drinks such as wine and beer.
	Livestock & fodder	Livestock are animals raised for domestic or commercial consumption or use while fodder is any foodstuff used to feed domesticated livestock.	Livestock includes goats and cows, while fodder is typically made up of hay, straw, silage, legumes etc.
	Capture fisheries	Aquatic organisms replenish naturally in both freshwater and marine environments. The capture of such organisms, particularly fish, provides an important protein source for billions of people worldwide.	Commonly eaten species include for example perch, and tilapia as well as many shellfish species.
	Aquaculture	Aquatic organisms grown in controlled conditions in both freshwater and marine environments.	Commonly harvested species include prawns, mussels, and salmon.
	Wild foods	Many societies gather wild sources of food which replenish naturally across a variety of different ecosystems.	Wild foods include plants, fungi, fruits, nuts, as well as animal, bird, insect, amphibian, and reptile species.
	Timber	A range of ecosystems produce trees which can be harvested to provide a variety of wood products.	Timber sourced from a variety of tree species is used in the construction of buildings and furniture.
	Energy	Ecosystems provide a variety of renewable energy sources, from harvestable biomass to hydropower. Fossil fuels are not considered to be ecosystem services as they aren't dependent upon the living component of existing ecosystems, so any benefits are not derived from ecosystems. Likewise solar radiation is not considered to be an ecosystem service.	Renewable energy sources provided by ecosystems such as woodfuel, biomass, hydropower etc.
	Biochemicals /medicine	Many medicines, biocides, food additives, ethnobotanical plants, and biological materials are derived from ecosystems.	Examples include latex, morphine, aspirin, quinine etc.
	Water	Freshwater is essential for human life and occurs naturally in a range of ecosystems.	Freshwater is found in lakes, rivers and underground aquifers.

Ecosystem Service		Description	Example
	Fibres and ornamental resources	A vast range of products are derived from plants and animals that are used as natural fibres in clothes or building materials or as ornamental resources.	This may include flowers, grass, papyrus, skins and shells.
	Genetic resources	This includes the genes and genetic information used for animal and plant breeding and biotechnology.	Natural variation in the genes of a variety of plant species has been used to develop genetically modified species which are more drought resilient, more productive etc.
	Local climate regulation	Ecosystems can influence the local climate through the level of evapotranspiration, surface albedo, temperature regulation etc. Particular groups of trees or other vegetation can also provide localised shading and temperature regulation.	Wetlands influence local and regional temperature, precipitation and other weather patterns
	Global climate regulation	Ecosystems play an important role in global climate regulation through sequestering, storing, and emitting greenhouse gases as well as contributing to the albedo effect.	Carbon is stored within biomass (includes crops, grass, forest) and in soils. The world's peatlands are thought to contain between 180 to 455 billion metric tons of sequestered carbon.
	Hazard regulation	Ecosystems play a role in maintaining the integrity of land surfaces; maintaining soil cover and low suspended sediment loads in fluvial systems; retaining and storing water; and dissipating energy from coastal processes.	Zones of vegetation such as wetlands can play an important role as a natural buffer to erosion while woodlands reduce surface water flows.
	Air quality regulation	Ecosystems contribute chemicals to the atmosphere as well as extracting them, influencing many aspects of air quality.	Trees absorb airborne pollutants such as ozone, nitrogen oxides, sulphur dioxides, carbon monoxide, carbon dioxide, and particulate matter. In urban areas particularly, trees can reduce pollution considerably.
	Water quality regulation	Ecosystems can be a source of impurities in fresh water but also can help to filter out and decompose organic wastes introduced into inland waters and coastal and marine ecosystems.	Woodlands can help protect streams from surface water runoff and create nutrient soaks that reduce the amount of pollutants and sediment reaching the water by trapping particles.

Ecosystem Service		Description	Example
	Pollination	The distribution, abundance, and effectiveness of natural pollinators such as bees are directly dependent on ecosystems.	Bees and other insects pollinate crops, several species of bats and birds pollinate flowers, vertebrates such as monkeys play a role pollinating and dispersing the seeds of various fruit trees.
	Disease and pest control	Changes in ecosystems can directly change the abundance of human pathogens such as cholera, destructive invasive species, and the prevalence of crop and livestock pests and diseases.	Temperature and water availability limit the abundance of disease vectors such as mosquitoes, while predators such as birds and spiders control agricultural pest numbers. Non-native species introduced to an area can disrupt this balance.
	Noise regulation	Noise can have both a negative and positive impact on human well-being depending on its magnitude and source (the sound of a waterfall for example may be considered positive whereas the sound of traffic may be negative). Ecosystems play an important role in noise regulation, both in terms of contributing and reducing noise.	Tree planting and soil bunds along roadsides can reduce the negative noise impacts of traffic, while birdsong contributes noise but is often considered to be welfare enhancing.
	Soil quality regulation	Soils capture and release carbon, nutrients and water, detoxify pollutants, purify water, and suppress soil-dwelling pests and pathogens. The capacity of soil for regulation is determined by the interaction of its chemical composition, physical integrity and the structure and activity of soil biodiversity. Different soil types have different inherent regulating capacities.	Certain soils are more suppressive of plant pathogens than others, while others provide better buffers against atmospheric pollutants e.g. peatland soils.
	Tourism & recreation values	People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.	There are numerous recreational activities derived from ecosystems such as angling, boating, bird spotting, game driving, white water rafting, eco-tourism, etc.
	Cultural & spiritual values	The diversity of ecosystems is one factor influencing the diversity of cultures and many religions attach spiritual and religious values to ecosystems or their components. Many societies also place a high value on the maintenance of historically important landscapes and	Inhabitants derive a strong cultural identity from fishing in the area and living on land inhabited by their ancestors. The surrounding environment is used for spiritual ceremonies, the burying of dead, construction

Ecosystem Service		Description	Example
		value the “sense of place” that is associated with recognised features of their environment.	of temples, and worship of spirits who inhabit the area.
	Scientific & knowledge values	Ecosystems influence the types of knowledge systems developed by different cultures. They can also influence global knowledge systems as a source of scientific knowledge and discovery.	Globally valuable knowledge can be derived from archaeological sites, sites rich in wildlife, cultural sites, fossils, etc.
	Wild species diversity	Biodiversity is a supporting service since it underpins a number of provisioning, regulatory, and cultural services such as wild foods, fisheries, pollination, tourism opportunities etc., However, a number of studies suggest that the diversity of wild species is itself a service regardless of whether it provides a supporting role in the provision of any other services, and that people are willing to pay to protect the existence of wild species even if they do not benefit from any of the ecosystem services they support.	In societies across the world, the diversity of wild species is considered to be important and valuable. Species which are at particular risk, such as chimpanzees and lions, can generate significant global concern and resources devoted to their conservation.

Summary of the Rationale for Inclusion or Exclusion of Each Ecosystem Service

Table: Scoping Exercise: Summary of the Rationale for Inclusion or Exclusion of Each Ecosystem Service

Ecosystem Service	Likely Relevance	Include in IA	Justification
Crop products	Moderate	Yes	Stakeholders highlighted that a variety of crop products are grown for subsistence, including cassava, cotton, sesame and maize, with any surplus sold in local markets and benefitting local consumers. Locally grown crops and fruits include aubergines, bananas, beans, mangoes, passion fruit, pineapples and tomatoes. Agricultural activities are concentrated in the east of the Study Area. Local people in the Study Area who are engaged in crop production have a high dependence on this ecosystem service. Over 45% of the population depend on crop production/subsistence farming as their main livelihood, with the majority comprising of small-scale farm holdings with fields ranging from $50m^2$ to $500m^2$. Land will be acquired, leased or secured by way of an easement as a result of the Project, some of which will be agricultural land that will be taken out of production for the long term. Project induced in-migration has the potential to increase the dependency on crop production for subsistence uses, resulting in intensification around the existing concentration of agricultural activities and expansion to additional areas.
Livestock and fodder/ pastoralism	Moderate	Yes	Livestock production is widespread in the Study Area, with cattle grazing primarily concentrated in the western part of the Study Area south of the Victoria Nile. The primary beneficiaries of livestock production are pastoralists and their families, as well as cattle owners who employ the services of pastoralists (particularly the Balaalo herdsmen). Livestock production is also an important economic activity at the household level, with a significant number (up to 80%) of local people owning livestock (mostly cattle, chickens and goats) for their personal consumption and as a savings mechanism, with 28% of households owning cattle. The RAP1 Social Baseline indicates that 55% of surveyed households own cattle. Engagement with stakeholders suggested that the rangelands used for cattle grazing by pastoralists are changing as a result of agricultural expansion, the individualisation of land ownership and growing population pressure, especially along the Lake Albert shoreline. Land speculation (driven in part by the increased interest in land due to the resettlement and compensation process for land needed for Project infrastructure) has the potential to threaten rangeland as people sell communal land to private investors. Therefore, the Project has the potential to exacerbate the general decline in these areas; a decline which increases in severity east to west toward Lake Albert. As highlighted by focus group discussions, there is an increasing level of competition around specific sites (Neyamitete, Kasinyi and Kigwera), particularly during the dry season (November to March). Several project activities will potentially impact livestock production and pastoralism. In particular, the clearing of vegetation and soil associated with the construction of Project infrastructure may have impacts and project activities could hinder the movement of herders and their animals along grazing paths. Furthermore, land expropriation may drive a transition from communal ownership to individual ownership.
Capture fisheries	Moderate	Yes	Capture fisheries provide an important ecosystem service around Lake Albert. Whilst fishing is restricted in the Victoria Nile, including the Murchison Falls-Albert Delta Ramsar site, it is undertaken by some groups. Focus group discussions with those engaged in fisheries highlighted that a variety of activities in the Study Area depend on production from these fisheries, including fishing, fishmongery, fish drying, and the leasing of fishing equipment and boat building. Capture fisheries are therefore arguably a 'keystone' ecosystem service, because many activities and livelihoods in the Study Area could not continue without its supply. Additionally, research from the National Fisheries Resources Research Institute (NaFIRRI) suggests that Lake Albert is currently overfished, indicated by changes in species compositions, reduced species diversity in the Lake, reduced sizes and increases in the effort needed to catch the same number or biomass of fish over the last four decades. Several Project activities will potentially have an impact on this ecosystem service, with the nature of the impacts varying depending on the activity. For example, project activities may lead to unplanned, discharges reaching Lake Albert or Albert Delta-Murchison Falls Ramsar site which can impact water quality and potentially increase fish mortality. Project induced in-migration has the potential to increase the dependency on fisheries.
Aquaculture	Negligible	No	Aquaculture activities are limited in the Study Area. As such it is considered unlikely that the Project will impact on aquaculture production or the benefits derived from this service.

Ecosystem Service	Likely Relevance	Include in IA	Justification
Wild foods and bushmeat	Moderate	Yes	Hunting for bushmeat takes different forms in the Study Area. This includes for basic needs (subsistence); generating income above and beyond basic needs (commercial); responses to perceived injustice (such as human-wildlife conflict); and cultural traditions. Commercial hunting for bushmeat is the most common form of hunting amongst households living in villages near MFPA. Stakeholder engagement suggested that with the exception of households headed by hunters, bushmeat is a less important source of protein than domestic livestock and fish for the households. Hunters are however heavily dependent on bushmeat as a source of both income and food. Most hunting is of smaller bodied species such as cane rates. A smaller subset of hunters hunt larger animals. Despite hunting for bushmeat being illegal under the Uganda Wildlife Act (UWA) (1996) and one of the key threats affecting the integrity of MFPA it takes place in the Study Area, with the meat used for sale or personal consumption. Hunting is a year-round activity (with increases in hunting activity taking place in the dry season) and has the potential to be lucrative. The resilience of bushmeat as an ecosystem service is undermined by its lack of availability, and the sensitivities of the species hunted. Many species of animal within the MFPA are threatened and therefore very sensitive to any changes in hunting patterns which might result from the project activities. For example, the presence of well pads may discourage hunters from pursuing game animals within the MFPA because they are more likely to be spotted by project employees. Project employees may also spot snares and traps and alert UWA officials to their presence. Induced population change from the Project has the potential to lead to an increase in subsistence and commercial hunting. Apiculture (beekeeping) is an important source of wild foods in the Study Area for some groups, especially in the east of the Study Area in the areas adjoining MFPA. During stakeholder engagement beneficiaries of this ecosystem service raised concerns that fumes and noises from additional vehicles associated with project activities would adversely affect their bees.
Timber and woody biomass	Moderate	Yes	Stakeholder engagement suggested that woody biomass is important both as a fuel and a building material throughout the Study Area. Local people collect firewood at a number of villages, which is used as a fuel in cooking stoves and in larger fish-smoking stoves. The other major use of woody biomass in the Study Area is as a raw material in charcoal production. Beneficiaries of this ecosystem service state that it is easy to find trees suitable for making charcoal, although they now had to travel further to find them than they had in the past as a result of their decreasing abundance. Declines in abundance were attributed to cutting down too many trees, associated with oil development. Local people are vulnerable to Project activities that cause a complete curtailment in the supply of timber and woody biomass. For example, impact to woody ecosystems, savannah, scrub and shrublands caused by the clearing of vegetation and soils is likely to reduce the supply of timber and woody biomass in adjacent areas, which has the potential to be exacerbated by an increase in clearing of vegetation from induced in-migration. In the longer term, increases in disposable incomes as a result of the employment opportunities offered by project activities are likely to encourage local people to buy alternative fuel sources, such as paraffin tadoobas, as they will be able to afford them. Charcoal production and firewood collection may therefore decline, however this depends on the extent to which population change induced by the project limits such collection.
Energy	Moderate	Yes	As timber and woody biomass above.
Biochemicals / natural medicines	Moderate	Yes	The use of the services of traditional medicine practitioners (healers) in the Study Area is widespread. Traditional medicine is used as a supplement and as an alternative to conventional medicine, and is often the first avenue pursued when people are unwell. Nevertheless, the clinical efficacy of these natural medicines is unclear. People rely upon and use natural medicines within the Study Area, with patients of healers treated by a range of natural products including grasses, leaves, tree bark, mushrooms and animal parts. Engagement with those involved in traditional medicine highlighted that healers specifically identify products from the neem tree (which are used in the treatment of malaria and stomach aches) the bark of mango trees (to treat coughs and poisoning) and other plants like 'amogi' (used for headaches). It also highlighted that the range of animal parts used in traditional medicine is also extensive, with healers using gorilla and elephant bone, rhino horn, hyena parts, and rabbit skins. These natural products are typically sourced from the local area, in addition to the Murchison Falls National Park or, further afield, the Albertine escarpment. Potential clearances of vegetation associated with the Project activities might impact upon the availability of certain natural products which are used by healers. Higher magnitude induced impacts may emerge as a result of improvements in employment opportunities and disposable incomes brought about by Project activities. For example, as the Study Areas become more prosperous, this could encourage people to seek treatment using conventional medicine rather traditional medicines. If this scenario takes place, it is likely that the number of people reliant on the practices of healers will decline, with an associated decline in demand for and harvesting of medicinal plants and animals. Furthermore, it may lead to changes in traditional ways of life.

Ecosystem Service	Likely Relevance	Include in IA	Justification
Water (for drinking and supply)	Moderate	Yes	Vegetation, wetlands, streams, and various aquatic organisms play a role in the interception, filtration, decomposition, and detoxification of pollutants and wastes. Regulation of water quality is important for the fishing industry, human consumption and in the provision of crops. The Project could impact the ability of freshwater ecosystems to regulate water quality through vegetation clearance and pollutant run-off during Project activities. Despite the lack of rain during the November-March dry season, freshwater is not scarce within the Study Area. However, access to freshwater is difficult because some rivers and streams (e.g. Sambiye, Waiga, Zolye) are seasonal and only flow during the rainy season. In other cases, the infrastructure for accessing water (e.g. for irrigation) is poorly developed. The majority of freshwater in the Study Area is groundwater (accessible via boreholes), which is the primary source of water for drinking and supply. As such, there is a high dependence on boreholes, with local people sensitive to impacts that will change groundwater availability and quality. Most people in the Study Area benefit from groundwater and surface water, with the Project itself also reliant on the water supply. As such, groundwater and surface water is both a Type 1 and Type 2 ecosystem service. In this context it should be noted that **water is the only Type 2 ecosystem service prioritised through the scoping exercise**. Although there is sufficient water for purposes other than consumption in the Study Area, a variety of project activities will require significant volumes. Water for Project activities will be sourced from aquifers via boreholes until such time as the Lake Albert Water Abstraction Facility is completed. This can have effects on local people who rely on groundwater. Additionally, Project induced in-migration can to exacerbate the issue of groundwater availability.
Fibres and ornamental resources	Moderate	Yes	Stakeholder engagement and field studies suggest that people in the Study Area utilise fibres and ornamental resources (including papyrus, shells, grass and woody biomass) for a range of uses. Papyrus is sold as material on its own, or made into mats for domestic purposes. Shell collecting is particularly prominent around the Lake Albert shoreline, sold as an ingredient in chicken feed or used in jewellery and other ornaments. Grass is harvested in bundles and used to sweep homes or thatch roof, with woody biomass used as a building material or the raw ingredient for charcoal production. There are few substitutes for many of these resources (e.g. papyrus), which is vulnerable due to its limited distribution to particular parts of the Study Area (e.g. the Albert Delta-Murchison Falls Ramsar site), and may decline as a result of Project activities, specifically construction and operations near the Lake Albert or Nile river. Although supply is abundant, (especially with regard to shells in Lake Albert), the sensitivity of local people to impacts on this ecosystem service might potentially increase due to project induced in-migration and future over-harvesting.
Genetic resources	Low	No	There is no evidence of any significant use of flora or fauna within or immediately surrounding the Study Area for the conservation or preservation of genetic resources, including the use of genes and genetic information for animal and plant breeding and biotechnology. It is possible that there may be as yet undiscovered genetic resources, and there is some scientific interest in the Study Area for exploitation of genetic resources or of any species unknown to science. However there are unlikely to be any significant loss of unique genetic resources lost by any Project activities.
Local climate regulation	Moderate	Yes	It is not possible to assess the extent of carbon sequestration and storage carried out by ecosystems within the Study Area. However, secondary data from the Ecosystem Services Review report for Tullow Uganda Operations Pty Ltd' (Ref- 19-18) suggests that natural and riverine forests across the Study Area are of high importance in providing local climate regulation services. Additionally, woodland, wetlands/swamp and open water (e.g. Lake Albert, River Nile) also have a significant climate regulation role. Project activities may have a significant effect on local climate regulation, either through the clearance of vegetation during earthworks, the release of polluting emissions from plant and vehicles, or the operation of power generation sets. Loss of vegetation may also cause changes in local climate regulation patterns.
Global climate regulation	Moderate	Yes	It was not possible to assess the extent of carbon sequestration and storage carried out by ecosystems within the Study Area. However, secondary data from the Ecosystem Services Review report for Tullow Uganda Operations Pty Ltd suggests that natural forests and riverine forests across the landscape are of high importance in providing global climate regulation services. Globally, people benefit from the carbon sequestration provided by ecosystems in the Study Area and wider landscape. Construction activities and increasing vehicle numbers will produce additional GHG emissions that contribute to the greenhouse effect and affect global climate regulation. Construction activities will also lead to the loss of vegetation with carbon sequestration and carbon storage potential.

Ecosystem Service	Likely Relevance	Include in IA	Justification
Air quality regulation	Low	Yes	Surveys in 2014 and 2016/2017 indicate that long-term concentrations of nitrogen oxide (NOx), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and hydrogen sulphide (H_2S) are below their respective air quality standards, which is consistent with the non-industrialised and non-urbanised characteristics of the Study Area. Ozone gas (O_3) does exceed its standard, but this again is consistent with a non-industrialised and non-urbanised area. Vegetation acts as a natural barrier or filter for airborne pollutants (e.g. sulphur or nitrogen) and dust plumes. Air quality regulation by local ecosystems would mitigate the impact of an increase in pollutants associated with Project activities. Impairments to air quality regulation services have the potential to arise from vegetation clearance works. Other Project activities will also cause the release of pollutants which may impair the provision of air quality regulation services. However given that air quality is of a good standard in the area, and the Project is unlikely to have significant impacts on the capacity of ecosystems to regulate air quality across a wide area, or in key centres of population, the relevance of the ecosystems service is low.
Hazard regulation	Moderate	Yes	Hazard regulation in the Study Area is provided by vegetation (primarily rolling woodland), Lake Albert and the Murchison Falls-Albert Delta Ramsar site. These features act as important sources of water during dry spells or droughts, and in the case of vegetation, reduces topsoil erosion and influences rainfall patterns. Climatic disasters have influenced migration patterns across Uganda, with floods and landslides leading to people's displacement. Furthermore, land fragmentation in the Albertine area has affected agricultural production and local people's long-term food security. Construction activities of permanent installations will require the clearance of vegetation that lies directly in the path of these activities, leading to the loss of hazard regulation services provided by this vegetation. Also, Project induced in-migration may lead to the loss of vegetation in areas susceptible to the impacts of climate change (including extreme weather events).
Pollination	Low	No	The clearance of vegetation and construction of new roads could potentially lead to habitat fragmentation at the local level which leads to a small loss of habitat which supports such pollinators such as bees and other insects. However, the limited extent of this loss in respect to the surrounding habitat means that the Project is unlikely to significantly impact the distribution or population of any important natural pollinators. As such, the impact on the provision and use of the service is expected to be low.
Disease and pest control	Negligible	No	There is no evidence to suggest that the ecosystems or any particular species within the vicinity of the Study Area play a significant role in pest control. Whilst there are habitats (e.g. standing water) which may influence the incidence and abundance of human pathogens, these are unlikely to be significantly affected by Project activities.
Noise regulation	Low	No	Vegetation of a certain density and quantity can play an important role in attenuating unwanted noise (e.g. traffic). Noise from construction traffic and the temporary generators together with vegetation clearance could impact on the ability of ecosystems to provide this service and thereby adversely affect nearby communities (***Chapter 7: Noise***). However, the noise regulating capacity of vegetation is dependent on its characteristics. To be effective, vegetation needs to be thick, tall forest at least 100 m high and set close to the source. The project activities are unlikely to impact the ability of ecosystems to regulate noise. As such, these impacts are considered within the tourism and recreational value ecosystem services.
Soil quality regulation	Low	No	Soil quality is important for landowners, workers, human health, flora, and fauna. Healthy soil also plays an important role in flood regulation through the capacity for water absorption. The Project could impact this service through potential contamination of the soils through accidental leaks and spills or disturbance causing mobilisation of existing contaminants, compaction and erosion. However, it should be noted that the capacity of soil for regulation is determined by the interaction of its chemical composition, physical integrity and the structure and activity of the soil. In this context there is no evidence to suggest that the soil types in the Study Area have increased inherent regulating capacities.

Ecosystem Service	Likely Relevance	Include in IA	Justification
Tourism and recreation values	Moderate	Yes	The tourism industry around the Murchison Falls National Park (MFNP) is sustained by the continued abundance of game animals in the area and the' sense of place' provided by landscape character. Tourists to the MFNP are drawn in by its 'untouched' nature and its wild animals (principally the "Big 5' – buffalo, elephant, leopard, lion and rhino, although rhino are absent within the National Park.). Consultation with tourist lodges and tourism operators suggested that tourists engage in a range of activities including birdwatching, game drives, visits to the bottom of Murchison Falls by boat or on foot, and fishing trips in the Nile Delta (the Albert-Nile). Although the continued abundance of wildlife populations and sense of place is vital for the prosperity and viability of tourist operators in MFNP, beneficiaries of this ecosystem service noted that they were also vulnerable to macro-economic, political and other factors. For example, engagement with tourism lodges highlighted that there was a view that visitor numbers in 2015 and early 2016 had been low due to a perception that Uganda would be politically unstable following presidential elections, and that it was at risk from the Ebola virus epidemic in West Africa. Stakeholder engagement suggested that construction and drilling activities within MFNP and adjacent areas is likely to have an impact on perceptions of the National Park's wildness and sense of place for tourists. The industrial nature of the project will also have the longer-term effect of reducing the National Park's reputation for remoteness and/or wildness, which is one of its primary attractions.
Cultural and spiritual values	Moderate	Yes	The cultural and spiritual importance of the Study Area's landscape, flora and fauna was evident in conversations with beneficiaries of this ecosystem service, including local villagers. Cultural and spiritual values are provided at specific sites within village boundaries, but are also important at the landscape level. For example, sites comprising of sacred trees or groves of trees, rocks, lakes, swamps and waterfalls are thought to have special qualities. The Ugandan wildlife also plays an important but intangible cultural role in the Study Area. For example, various clans amongst the Bagungu and Banyoro have totems – including wild animals – which they are not allowed to eat or to use. In addition, each village in the Study Area has an associated sacred site. Project activities may have an effect on the provision of cultural and spiritual values at a local level if they cause damage to or the removal of specific sites. Disturbance from noise, lights and the movement of people and vehicles from project activities may detract from the significance and value of these sites.
Scientific and knowledge values	Moderate	Yes	Secondary data suggests that there is a significant amount of scientific research in the Study Area. In addition to a research station at Budongo (Budongo Conservation Field Station), numerous scientific studies are undertaken in the area. For example, researchers at Michigan State University are engaged in giraffe and lion conservation research within MFNP and a team at McGill University is conducting qualitative research in the area examining the impacts of protected areas on local people. The majority of scientific research is focussed on understanding ecological changes, and is valuable for future conservation efforts. The beneficiaries of the scientific and knowledge values provided by the Study Area are varied. They include the researchers themselves and the academic communities to which they contribute; local people who are employed in research efforts and/or learn from the research themselves; and local people, tourists and conservation organisations who benefit from research findings that secure the biodiversity of the Study Area. In the context of the project, the changes that the Study Area will undergo are likely to be of anthropogenic, economic, historical and sociological interest. This will potentially result in a shift of research patterns and/or knowledge values, potentially supported by additional research activities stimulated through the project.
Wild species diversity	Moderate	Yes	The Study Area incorporates key protected areas, including the MFNP, Budongo Forest Reserve, Bugungu Wildlife Reserve, Bugoma and Karuma Game Reserve and the Murchison Falls-Albert Delta Ramsar site. The range of habitats within these protected landscapes (woodlands, swamps, delta, grasslands) are particularly diverse, supporting populations of four of the 'Big 5' (buffalo, elephant, leopard and lion) and a variety of additional mammals, fish and birds. Areas to the north of the Nile are noted to be particularly species rich. Wild species and diversity is arguably a 'keystone' ecosystem service, because many activities and livelihoods in the Study Area could not continue without its supply. The construction and operational phases of the Project could impact species through disturbance / fragmentation / loss of habitat/ barrier effects. Additionally, due to the lifetime of the project, and as a result of Project induced in-migration, project activities could cause ecological changes that significantly alter the structure and function of the protected areas including the Bugungu Wildlife Reserve and the Murchison Falls National Park.

TILENGA PROJECT ESIA - APPENDIX T: Environmental and Social Management Plan (ESMP) Mitigation Checklist

May 2018

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APPENDIX T - Tilenga Project - ESMP Mitigation Checklist

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	1	All fuels and hazardous materials will be stored within appropriate bunds and drip trays, providing appropriate containment, where practicable	X		Spill Prevention Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Contractors	Regular audits, as detailed in the ESMP	X			X	X	X			X	X	X					X
X	X	X	X	2	Chemicals and hazardous liquids will be supplied in dedicated tote tanks made of sufficiently robust construction to prevent leaks/spills. Dedicated procedures will be developed for fuel and hazardous material transfers and personnel will be trained to respond. Spill kits will be available at all storage locations	X		Spill Prevention Plan and Oil Spill Contingency Plan (OSCP)	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Contractors	Regular audits, as detailed in the ESMP	X			X	X	X			X	X	X					
X	X	X		3	Main refuelling facilities will be located within the Industrial Area, the camps and the Masindi Vehicle Check Point. Facilities will be located within bunded areas with appropriate capacity (110% tank containment). The refuelling pumps will be equipped with automatic shut off and there will be dedicated procedures and spill kits available. Bunds will be designed to minimise ingress of surface water, facilities roofed where practicable and any contaminated water collected will be trucked off site for disposal	X		Spill Prevention Plan and Oil Spill Contingency Plan (OSCP)	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Contractors	Regular audits, as detailed in the ESMP	X			X	X	X			X	X	X					
X	X	X		4	Flow meters will be integrated on all refuelling points to monitor usage. Sampling points will also be established to enable spot sampling of fuel composition	X		Physical Environment Monitoring Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X														

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		X		5	With the exception of the CPF which has a bespoke drainage arrangement~~,~~ drainage arrangements for the permanent facilities will be as follows: • Potentially contaminated areas (i.e. fuel and chemical storage areas) will be provided with local effluent collection (sumps, kerbing and bunding) whereby the potentially contaminated water will be collected and removed by road tanker to a licenced waste disposal facility; and • Uncontaminated areas which will drain naturally to the environment via Sustainable Drainage System (SuDS) comprising filter drains and soakaways. The SuDS design is subject to further detailed design. Sampling points will be established for all potentially contaminated areas to enable samples to be collected for analysis	X		Surface Run Off and Drainage Management Plan	Project Proponents' HSE team	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X			X	X	X		X	X	X	X					X
X	X	X	X	6	Lighting will be reduced to the minimum without impacting safety and security. Where feasible, the light will be directed inwards the facilities and will be of a warm / neutral colour so as to limit nuisance to the surrounding communities and to avoid attracting animals.	X		Landscape Management Plan, Biodiversity and Ecosystem Services Action Plan	Project Proponents, HSE team, and Project Proponents Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.	X						X			X	X	X				
		X		7	During normal Operations, power will be provided by the CPF; there will be no back-up generators other than black-start and emergency generators	X		Physical Environment Monitoring Plan, Noise and Vibration Management Plan	HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X	X													
		X		8	(Wellpads) There will be a 15 m wide buffer from the perimeter security structure, which will be cleared of vegetation. Within the MFNP, the structure will be designed to prevent the ingress of animals entering the well pads and will comprise a bund wall structure	X		Site Clearance Plan, Biodiversity and Ecosystem Services Action Plan	Project Proponents, HSE team, and Project Proponents' Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.	X			X		X				X						X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		X		9	Where practicable, equipment will be located under shelters to prevent the ingress of rainwater	X		Spill Prevention Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Contractors	Regular audits, as detailed in the ESMP	X															X
		X		10	Each well pad will include an emergency pit with capacity for up to 50 cubic metres (m^3) for use should there be an unplanned event i.e. blowout. The pit will be lined and covered to prevent rainwater ingress	X		Blow Out Contingency Plan (BOCP), Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	Project Proponent representative for Drilling Drilling Contractors HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X			X	X	X					X					X
		X		11	The pipelines will comprise carbon steel with adequate corrosion allowance built into material specifications (wall thickness) to prevent leaks	X		Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X			X	X	X			X	X	X					X
		X		12	An anticorrosion coating will be applied for external protection and a corrosion inhibitor will be injected for internal protection	X		Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X			X	X	X					X					X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X	X		13	The Production and Injection Network outside the Industrial Area will be buried at least 0.8m below the ground surface; markers will be used to denote the location (including the water abstraction pipeline in Lake Albert)	X		Emergency Preparedness and Response Plan (ERP)	HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X					X	X				X				X
		X		14	International Civil Aviation Organization (ICAO) lighting and marking are required for structures over 45 m and as such both the radio mast and the elevated flare will have appropriate warning lighting	X		Emergency Preparedness and Response Plan (ERP)	HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X						X									
		X		15	There will be no routine flaring during normal operations	X		Emergency Preparedness and Response Plan (ERP); and Physical Environmental Monitoring Plan	HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X	X				X					X				X
		X		16	A flow meter will be integrated into the flare design to monitor flow and a sample point will be integrated to monitor composition	X		Physical Environmental Monitoring Plan	Project Proponents HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X														X
		X		17	A Vapour Recovery Unit will be located at the CPF to process gases generated	X		Physical Environment Monitoring Plan	Project ProponentsHSE Representative from the Project Proponents'Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X														X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		X		18	The drainage arrangement of the CPF will be designed to segregate clean and potentially contaminated effluent streams. The drainage for the CPF will be segregated as follows: • Continuously Contaminated Drains will collect hazardous fluids from process and utility equipment. All effluent collected in the closed drainage system will be returned back to the oil treatment trains. There will be no discharge to environment from the closed drains system; • Potentially Contaminated Drains will collect rainfall, wash-water or fire water that falls on paved process and equipment areas that could contain contaminants such as hydrocarbons, metals and solids. Drip pans and kerbs will be provided below every process or utility system that may potentially leak or overflow. Any drips or leaks will be routed to the open drain system via a sump. Roofing will be provided where practicable to prevent surface water ingress. During normal operating conditions, rainwater from potentially contaminated areas will be directed to an the oil water separator prior to discharge to environment in accordance with applicable discharge standards as presented in Chapter 10: Surface Water. When the oil-water separator is full, it will overflow to an associated storm basin via an overflow diverter which will act as a buffer. When the level in the separator falls, the water collected in the storm basin will be sent by storm water pumps back to the overflow diverter and on to the separator. The storm water basin will be sized to withstand a 1 in 100 year event. An oil in water analysers will be installed on the discharge	X		Surface Run Off and Drainage Management Plan	Project Proponents' HSE team	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X			X	X	X			X	X	X	X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					point of the potentially contaminated drains to provide continuous monitoring of the discharge; and • Uncontaminated Drains will manage clean surface water from uncontaminated areas via suitably designed SuDS (network of filter drains and soakaways).																					
		X		19	A metering system will be integrated into the main power generation system package to enable the continuous monitoring of flow. Sampling points will also be established to enable sampling of fuel and exhaust gas	X		Physical Environment Monitoring Plan	Project Proponents HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X														
		X		20	For the CPF, equipment will be designed to achieve occupational noise level compliance of 85dBA at 1 metre (which is an industry accepted standard) where practicable	X		Noise and Vibration Management Plan	Project Proponents' HSE team, and the Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.	X		X									X		X		
		X		21	As part of the Water Abstraction System flow meter will be installed and sample point established for ongoing monitoring purposes	X		Physical Environment Monitoring Plan	Project Proponents' HSE team HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X					X											
		X		22	Once operational, there will be restricted access either side of the intake pipeline location in Lake Albert	X		HSE Management System	Project Proponents, HSE team	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year	X										X					
X	X	X		23	Drainage channels will be installed along the edges of the upgraded roads to prevent excessive runoff and cross drainage culverts will be installed, where appropriate. All drainage infrastructure will be designed taking into account the Uganda Ministry of Works and Transport - Road and Bridge	X		Surface Run Off and Drainage Management Plan	Project Proponents' HSE team	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X			X	X	X			X		X	X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					Works Design Manual for Drainage (January 2010) (Ref. 4.2)																					
X	X	~~X~~		24	The LARF will be implemented prior to the start of the Project and describes the legal and administrative framework, the land-use and land tenure of the Project Area, and provides guiding principles on valuation methodology, entitlements, resettlement action planning, and livelihood restoration	X		Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.	X											X	X			
X	X	X	X	25	A Stakeholder Engagement Plan is already in place; this will ensure the community are informed both prior to the commencement of work on site, during the works on a regular basis and after. A Grievance Mechanism will be established for the local community to raise compliant and concerns relating to Project activities (i.e. dust, noise etc.)	X		Stakeholder Engagement Plan, Grievance Management Procedure	Project Proponents' HSE team Project Contractors	An audit system will be setup to regularly check the logged grievances, Project Proponents' responses, and effectiveness and fairness of any actions or outcomes. The response time will also be monitored.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X			26	All site clearance activities will be undertaken in line with the Site Clearance Plan which will be developed by the Contractor(s) prior to commencing the Site Preparation and Enabling Works Phase to limit extent of vegetation clearance, wherever possible	X		Site Clearance Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.	X			X			X		X	X	X		X			
X	X			27	Surface water will be managed via temporary sustainable drainage systems (SuDS) to manage flood and contamination risk. The requirements for construction SuDS will be adapted depending on the nature of the activities utilising the principles as outlined in Chapter 23: Environmental and Social Management Plan	X		Surface Run Off and Drainage Management Plan	Project Proponents' HSE team	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X			X	X	X			X	X	X	X				
X				28	Diesel generator(s) will be located in the Industrial Area for the provision of power and small	X		Noise and Vibration	Project Proponents' HSE team, Project Contractors	A detailed monitoring programme will	X	X	X													

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					diesel generator packages will be used for all other work sites to provide power for small items of equipment such as pumps/compressors			Management Plan		be produced at pre-identified locations to an appropriate method.																
X	X			29	During site clearance, vegetation stripping will be undertaken using a phased approach to minimise sediment pollution from runoff	X		Site Clearance Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.	X			X		X			X	X	X					
X	X			30	Buffer zones will be established to protect watercourses and habitats	X		Surface Run Off and Drainage Management Plan, Biodiversity ad Ecosystem Services Action Plan	HSE Representative from the Project Proponents Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X					X			X	X	X					X
X	X		X	31	Barriers and fences will be used to isolate work areas	X		HSE Management System	HSE Representative from the Project Proponents Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year	X											X	X	X		X
X	X			32	Contaminated run off will be minimised by ensuring adequate storage facilities are in place for materials stockpiles, waste, fuels/chemicals/hazardous materials, vehicles/washing areas, parking facilities	X		Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Chemical Management Plan, Surface Run Off and Drainage Management Plan	HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X			X	X	X		X	X	X	X					X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X			33	Clean surface water will be diverted away from exposed soils with use of diversion drains and bunds	X		Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X			X		X			X	X	X					X
X	X			34	All dewatering from excavations or isolated work areas will be provided with appropriate level of treatment prior to discharge	X		Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X			X	X	X			X	X	X					
X	X		X	35	Implementation of a Dust Control Plan, which will include: o Measures to include the application of dust suppressants (including water), on potentially dust generating sources, including on site and off site roads used by Project vehicles and material stockpiles; o Water will be sprayed onto the roads and work sites to supress dust generation, where necessary. Water will be provided at the work sites and mobile water bowsers will be available to control dust generation, if required; o Activities likely to generate dust (e.g. drilling powders use and transfer) will be enclosed and dust catchers in place when practicable; o Trucks carrying potentially dusty material will be covered, to reduce fugitive dust emissions from the materials being transported; o Roads used by Project vehicles will be maintained, to the extent that this is possible, to reduce fugitive dust emissions associated with surface dust being disturbed by the passing of traffic; and o Concrete batching materials to be stored in sealed silos with the	X		Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition.	X	X							X	X	X	X		X		X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					batching area regularly watered down to supress dust emissions.																					
X				36	Trees stripped of their branches will either be stacked alongside the track, or transported to pre-determined locations within the working area for disposal or reuse	X		Waste Management Plan andSite Clearance Plan	Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X							X							
X	X			37	The topsoils will be removed to a required depth; material will be temporarily stored areas within designated areas	X		Site Clearance Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.	X			X			X		X		X						
X	X			38	It is planned to reuse removed soil onsite wherever possible. Through detailed design, the Project will ensure the generation of excess material is minimised as far as practicable and reused, wherever possible	X		Waste Management Plan	Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X				X	X		X					
X				39	For the upgraded roads, it will be necessary to cordon off the road (while retaining pedestrian access, where practicable) before widening the road	X		Physical Environment Monitoring Plan, HSE Management System	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X											X		X		X
X	X			40	All temporary land required associated with the construction of the roads will be restored following construction in line with the Site Restoration Plan as developed by the Contractor specifically for the roads	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation	X			X			X		X	X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										of adaptive management processes if required																
X				41	Additional water supply boreholes will be installed during the Site Preparation and Enabling Works Phase and will be drilled to target deep water aquifer zones using water and bentonite	X		Physical Environment Monitoring Plan	Project Proponents	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X				X				X	X						
X				42	All drill cuttings from borehole drilling activities will be collected and disposed of appropriately. Disposal methods will be pre-agreed with NEMA prior to commencement of activities	X		Waste Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X	X	X		X			X						
X				43	Flow meters will be installed on all boreholes to measure flow, water level and quality	X		Physical Environment Monitoring Plan	HSE Representative from the Project Proponents	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X				X						X						
X	X			44	Unused material will be reused within the Project footprint or used to restore the borrow pits as much as practicable	X		Waste Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X				X	X	X						
X	X			45	Regular audits of the borrow pits and quarries will be conducted at the aforementioned sources to ensure compliance with Ugandan law	X		Physical Environment Monitoring Plan	HSE Representative from the Project Proponents Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X											X					
X	X			46	All borrow pits and quarries used by Project Proponents will be re-habilitated following completions of extraction in line with the Site Restoration Plan as developed by the Contractor	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation	X			X			X		X	X						

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Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										completion criteria and implementation of adaptive management processes if required																
X	X	X	X	47	Working hours will be based on the normal work day in line with Ugandan law	X		HSE Management System and Labour Management Plan	Project Proponents Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year	X											X				
X				48	As per base case, there will be no routine night shift activities associated with the Site Preparation and Enabling Works Phase	X		Noise and Vibration Management Plan, Labour Management Plan	Project Proponents' RSES, and the Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.	X		X				X					X				
X	X			49	Buses will be provided to transport workers living in nearby villages	X		Road Safety and Transport Management Plan, Journey Management Plan, and Labour Management Plan	Project Proponents' RSES and HSE team Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X											X				
X	X	X	X	50	The Project Proponents are aware of the need to employ water efficiency measures throughout the lifetime of the Project; they will consider water reduction measures, where feasible	X		Water Management Plan	Project Proponents' representatives for different phases of work	Regular audits, as detailed in the ESMP	X				X	X					X				
X				51	The installation of boreholes across the Project Area is subject to the outcome of the Water Abstraction Feasibility Study currently being undertaken by the Project Proponents	X		Water Management Plan	Project Proponents' representatives for different phases of work	Regular audits, as detailed in the ESMP	X				X	X					X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			52	For power generation, centralised diesel generator package including back up facilities will be located at the Industrial Area Construction Support Base to service the construction and pre-commissioning activities within the Industrial Area. Dedicated generator packages of varying sizes will also be mobilised to provide the power requirements for the construction and pre-commissioning of at discrete locations including the Lake Water Abstraction System, well pads and pipeline installation sites. Separate independent packages will be mobilised with the drilling rig to service the power requirements for the drilling activities	X		Noise and Vibration Management Plan	Project Proponents' HSE team, and the Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.	X	X	X												
	X			53	With the exception of drilling and HDD construction activities there will be no permanent night time working in the MFNP	X		Noise and Vibration Management Plan	Project Proponents' RSES and HSE team, and the Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.	X		X				X			X					
	X			54	Pre-commissioning water (used for pipeline cleaning and hydrostatic tests) will be reused wherever practicable on multiple pipelines. The base case for management of hydrostatic test water is for the treated water to be left in situ until start up. Final disposal will be determined and selected depending on water quality and available discharge options. The base case for ESIA is that water left in the pipeline from hydrotesting will be disposed via the Produced Water Treatment Train and transferred back via the Production and Injection Network to the well pads for re-injection, subject to further technical assessment	X		Water Management Plan, Waste Management Plan	Project Proponents' representatives for different phases of work	Regular audits, as detailed in the ESMP	X				X	X		X			X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			55	Laydown areas at each of the well pad sites will be located within the footprint of the well pad; there will be no additional site clearance required outside the well pad footprint during the Construction and Pre-Commissioning Phase	X		Site Clearance Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.	X			X			X		X	X			X			
	X			56	All wells will be drilled using a Blow Out Preventer (BOP) system prior to entering hydrocarbons bearing reservoirs to prevent an uncontrolled release of hydrocarbons in the event that well control issues are experienced during drilling	X		Blow Out Contingency Plan (BOCP), Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	Project Proponent representative for Drilling Drilling Contractors HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X			X	X	X											X
	X	X		57	A down-hole safety valve (DHSV) will be fitted on all production wells crossing major fault lines	X		Blow Out Contingency Plan (BOCP), Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	Project Proponent representative for Drilling Drilling Contractors HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X			X	X												X
	X			58	Synthetic Based Muds will be transferred from the Liquid Mud Plant to the well pads via truck in dedicated sealed containers to reduce the risk of spillage during storage, handling and transportation operations	X		Blow Out Contingency Plan (BOCP), Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	Project Proponent representative for DrillingDrillingContractorsHSE Representative from the Project Proponents'Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be	X			X	X	X					X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										regularly checked.																
	X			59	Drilling muds will be reused, wherever possible	X		Waste Management Plan	Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X							X							
	X			60	A Wellbore Surveying Management Strategy will be implemented to address the main challenges related to wellbore positioning and collision avoidance aspects	X		Physical Environment Monitoring Plan	HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X			X											X
	X			61	• Mud Products will comply with Uganda's Health, Safety and Environment Regulations. Only Chemicals ranked E or D in the OCNS (Oil Chemical National Scheme classification) will be allowed to be used; • All products for completion and drilling fluids will be free of chlorides; the upper limit will be 2% by weight; • All Products entering in the mixing of drilling, completion and cementing will be free of aromatic Hydrocarbon, the upper limit is fixed at 300 parts per million (ppm); and • No asphalt, no gilsonite, nor equivalent so called "black" products will be permitted in the drilling fluids and cementing formulations.	X		Chemical Management Plan	Contractors, Project Proponents' representatives for different phases of works, HSE team	Regular audits, as detailed in the ESMP	X	X		X	X	X										
	X			62	Spent muds will be temporary stored in containers prior to removal by a vacuum truck, waste cuttings will collected via augers to the Roll-on Roll-off (Ro-Ro) skips (or equivalent) and transferred off the well pad for treatment and disposal	X		Waste Management Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X	X	X		X			X					

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	X			63	Disposal of drill cuttings will be in accordance with Ugandan Legislation and IFC Environmental Health and Safety (EHS)	X		Waste Management Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X	X	X		X			X					
	X	X		64	There will be no routine well testing after wells are completed	X		Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	HSE Representative from the Project Proponents Project Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.	X	X		X												
	X			65	Construction activities for the Production and Injection Network will be contained within the permanent RoW which will have a width of 30 m and is designed to accommodate the pipeline trench(s), stockpile areas, laydown, welding, and the movement of construction equipment alongside the trench(s)	X		Site Clearance Plan	Project Proponents' HSE team Project Contractors	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.	X		X	X	X	X	X		X	X		X	X	X		X
	X			66	During construction and hydrotesting activities, there will be access restrictions to the RoW for safety reasons. Once complete there will be no restrictions to the public using the area (refer to Section 4.10.8)	X		Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP	X											X		X			
	X			67	The length of open trenching at any given time will be minimised to approximately 1 km to allow wildlife and the local community safe passage	X		Biodiversity and Ecosystem Services Action Plan, Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP	X									X		X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			68	The use of animal crossing structures such as bridges, culverts, and over crossings, along pipeline and access road RoW will be installed where necessary. At special points such as crossings, deep excavations and tie-in bell holes, safety fences will be installed to prevent human or animal ingress	X		Biodiversity and Ecosystem Services Action Plan HSE Management System	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.	X										X		X				
	X			69	Ditch plugs will be installed on all trenches to prevent the pooling of water in the trenches	X		Physical Environment Monitoring Plan	Project Proponents' HSE team HSE Representative from the Project Proponents' Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X					X			X	X	X						
	X			70	Material from trenching activities will be stored within the pipeline RoW and used as backfill. Excess material will be reused on site where possible. Options for the reuse of uncontaminated excess subsoil material will be assessed during detailed engineering e.g. borrow pit restoration	X		Waste Management Plan	Project Proponents' HSE team Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X				X	X							
	X			71	When stringing pipeline in the MFNP, consideration will be given to minimising the amount of open trench time and where practicable maintaining pathways for wildlife to traverse	X		Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.	X										X						
	X			72	The pipe laying and backfill activity is to be conducted as soon as practicable after the trench excavation utilising standard pipe laying cranes and earthmoving equipment	X		Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.	X						X			X							
	X			73	The Production and Injection Network RoW will be restored in line with the Site Restoration Plan as developed by the Contractor specifically for the RoW	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive	X			X			X											

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										management processes if required																
	X			74	Prior to starting HDD activities a risk assessment will be undertaken to identify the necessary design of the HDD tunnels including appropriate tunnelling and slurry management practice to control groundwater ingress and minimise slurry loss from the tunnel into surrounding aquifers/surface waters	X		Spill Prevention Plan	Project Proponents' HSE team Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	X				X	X					X					X
	X			75	The temporary land required for the HDD Construction Areas roads will be restored following construction in line with the Site Restoration Plan as developed by the Contractor	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required	X			X			X		X	X	X					
	X			76	Any residues and wastes generated from pre-commissioning activities will be managed in accordance with the site Waste Management Plan	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X	X	X		X	X	X	X					
	X			77	For any chemical usage [with respect to pre-commissioning], a thorough Chemical Risk Assessment will be undertaken and lowest toxicity chemicals will be used wherever possible	X		Chemical Management Plan, Emergency Preparedness and Response Plan (ERP)	Contractors, Project Proponents' representatives for different phases of works, HSE team	Regular audits, as detailed in the ESMP	X			X	X	X			X	X	X			X		
	X			78	The site manpower requirements will be in compliance with all relevant provisions of Ugandan law	X		Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP	X											X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			79	The Project will aim to achieve a large proportion of Ugandan nationals in the workforce	X		Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP	X												X				
	X			80	A Road Safety and Transport Management Plan will be developed prior to commencing the Construction and Pre-Commissioning Phase	X		Road Safety and Transport Management Plan	Project Proponents' RSES and HSE teamProject Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X			X								X		X		
	X			81	All transportation will be compliant with applicable road transport regulations. In the Project Area, routine transportation operations will normally only occur in day light. Deliveries of equipment and the movement of people will be scheduled in convoys, where practicable	X		Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X	X	X									X		X		
	X			82	All construction vehicles/equipment will be kept on site when not in use	X		Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X						X			X		X				
X	X	X	X	83	The base case for Tilenga is that there will be no night driving. However, night driving may be permitted in exceptional circumstances and with internal derogation where it is deemed safe and practicable to do so	X		Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X		X				X			X		X		X		X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	84	Drivers will be required to have a break every 2 hours of driving	X		Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.	X											X		X		X
	X			85	[Decommissioning of Masindi] All wastes will be removed and disposed of at dedicated waste treatment facilities in accordance with the Waste Management Plan. A detailed Decommissioning Plan will be developed for the works during the Site Preparation and Enabling Works Phase of the Project	X		Waste Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X	X	X	X	X			X					
	X			86	Decommissioning work at the Buliisa Camp, Bugungu Camp and 17 ha of the Tangi Camp will be undertaken at the end of the Construction and Pre-Commissioning Phase. The land will be restored in line with the Site Restoration Plan as developed by the Contractor	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required	X			X			X									
	X			87	At the end of the Construction and Pre-Commissioning Phase the C1 road will be restored in accordance with a Site Restoration Plan by the Contractor	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required	X						X		X	X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		X		88	Commissioning tests will be undertaken using feedstock oil, natural gas, methanol and chemicals. All commissioning fluids will be managed either at CPF or transferred off site for disposal	X		Chemical Management Plan	Contractors, Project Proponents' representatives for different phases of works, HSE team	Regular audits, as detailed in the ESMP	X			X	X	X		X			X					
		X		89	A dedicated Pipeline Integrity Management System will be implemented during the Commissioning and Operations Phase. This will include regular preventative maintenance including operational pigging, intelligent pigging and inspection campaigns to monitor the status of pipelines	X		Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical Management Plan	Project Proponents' RSES and HSE team Contractors	Regular audits, as detailed in the ESMP	X			X	X	X					X					X
		X		90	The chemicals used for polymer injection will be subject to detailed environmental risk assessment prior to use taking into account all chemical /biological properties and the specific requirements for early oil recovery use	X		Chemical Management Plan	Contractors, Project Proponents' representatives for different phases of works, HSE team	Regular audits, as detailed in the ESMP	X			X	X	X					X					
		X		91	Given that the Project Area is located within the EARS, the Project Proponents will establish a Passive Seismic Network programme, of seismograph stations in the area to enable detection of naturally occurring seismic events	X		Physical Environment Monitoring Plan	Project Proponents	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X			X												X
		X		92	The Project Proponents will undertake analysis of archive images from Interferometric Synthetic Aperture Radar (InSAR) for ground movement data in the Project Area	X		Physical Environment Monitoring Plan	Project Proponents	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X			X												X
		X		93	The ferry will operate for 8 hours a day and will be dedicated to Project use only. There will be no ferry movements during night time hours-except in exceptional circumstances and with internal derogation	X		Journey Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record road trip numbers, any deviations from designated routes, accidents and incidents inside the Project Area, vehicle	X		X				X			X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										speeds, and fuel usage.																
		X		94	The permanent RoW will be kept clear of trees, deep rooting vegetation, poles, structures and graves. Regular monitoring will be undertaken, which will include removal of vegetation overgrowth and uprooting tree seedlings	X		Site Clearance Plan	HSE Representative from the Project Proponents	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.	X			X			X		X	X						
		X		95	There will be no permanent access restrictions to the pipeline RoW	X		Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP	X			X			X					X				
			X	96	A review of relevant studies, if necessary, will be undertaken during the Commissioning and Operations Phase to confirm that the planned decommissioning activities utilise good industry practices and are the most appropriate to the prevailing circumstances and future land use	X		Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	X	X	X	X	X	X					X					
			X	97	The Project Proponents will obtain all relevant approvals and authorisations for all decommissioning activities from the GoU departments responsible at the time	X		Overarching ESMP	Project Proponents	Regular audits, as detailed in the ESMP	X										X					
			X	98	In general, the following principles will be adopted where practicable and will be subject to detailed assessment prior to decommissioning: • Above ground infrastructure will be removed to 0.5 m below ground level and backfilled and vegetated; • Access roads may be left in place depending upon the subsequent use of the land; • Shallow foundations for infrastructure may be excavated, demolished and disposed of; • Where piled foundations exist, these may be excavated to a depth of 1 m below the existing ground level and removed;	X		Landscape Management Plan, Waste Management Plan, Biodiversity and Ecosystem Services Action Plan	Project Proponents, HSE team, and Project Proponents Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.	X			X	X	X	X	X			X		X			

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					• Excavations resulting from the removal of foundations will be backfilled; • It is expected that pipelines will be cleaned, capped and let in situ, to prevent disturbing the reinstated habitats; and • Where the environment assessment identifies it is acceptable, in some locations pipeline sections may be cleaned, reclaimed and re-used.																			
			X	99	During the Decommissioning Phase the following assumptions are applicable regarding supporting facilities: • Water will be supplied from dedicated abstraction boreholes;• Localised effluent collection facilities will be provided for chemical storage, hazardous materials storage, liquid waste storage, tanks, and fuelling facilities. Such containment will include impermeable areas, kerbing, bunding and drip trays as appropriate;• Drainage systems will remain until sites are free of contamination. SuDS will also manage flood risk during this phase of work;• No discharge of water used for decommissioning activities will be discharged to the environment;• Sewage will be treated by existing wastewater treatment plants (WWTPs) and discharged in accordance with wastewater treatment standards as presented in Chapter 10: Surface Water or collected and transferred to suitably licensed treatment facilities for processing and disposal;• Lighting will be reduced to the minimum without impacting safety and security. Where feasible. the light will be directed inwards the facilities and will be of a warm / neutral colour so as to limit nuisance to the surrounding communities and to avoid attracting animals. There will be no night activities	X		Water Management Plan, Surface Runoff and Drainage Management Plan	Project Proponents' representatives for different phases of work	Regular audits, as detailed in the ESMP	X	X	X	X	X	X	X	X			X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					associated with this Phase except in case of emergency;• A Construction Support Base will be constructed within the Industrial Area for use during the Decommissioning Phase;• For power generation, a centralised diesel generator package including back up facilities will be located at the Construction Support Base to service the decommissioning activities within the Industrial Area. Dedicated generator packages of varying sizes will also be mobilised to provide the power at discrete locations including the Lake Water Abstraction System, well pads and pipeline decommissioning sites; and • Waste will be segregated and managed in accordance with a Waste Management Plan.																						
			X	100	Depending on the final land use agreed with the Ugandan authorities, all or part of the site may need to be rehabilitated. In such circumstances, the Project Proponents will also develop a monitoring programme for completion criteria to verify that the sites are being returned to the agreed representative state.	X		Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required	X			X	X	X	X		X		X					
X	X	X		101	A Waste Management Plan will be developed and maintained to cover the duration of the Project; and will address the anticipated waste streams, likely quantities and any special handling requirements. The Project Proponent's will implement a waste tracking system to ensure traceability of all wastes removed off site.	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X	X		X	X	X		X	X	X	X			X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X		102	Prior to transfer offsite to a licensed waste treatment facility, waste materials will be segregated and stored in appropriate containers to prevent: • Accidental spillage or leakage; • Contamination of soils and groundwater; • Corrosion or wear of containers; • Loss of integrity from accidental collisions or weathering; • Theft; and • Odour and scavenging by animals.	X		Waste Management Plan, Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X	X		X	X	X		X			X			X		
X	X			103	The existing camps have operating Waste Water Treatment Plants (WWTPs). Sewage produced from the camps will be treated at the WWTPs in compliance with regulatory requirements (refer to Chapter 10: Surface Water). Sewage from other Project Areas (e.g. road work sites) will be collected and transferred to WWTPs and/or suitably licensed treatment facilities for processing and disposal. All sewage sludge will be removed periodically from WWTPs and transferred off site for disposal	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X	X		X	X	X		X			X					
X	X			104	A flow meter will be integrated at the discharge point of the WWTPs to record to all discharges and a sample point will be established to collect spot samples for analysis	X		Water Management Plan	Project Proponents' representatives for different phases of work	Regular audits, as detailed in the ESMP	X			X	X	X		X			X					
				105	For the Masindi Vehicle Check Point, waste will be collected and transferred to an approved waste treatment facility for recycling, treatment, recovery and/or disposal	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X			X	X	X		X			X					
X	X	X		106	Sewage produced from the camps and other Project Areas will be treated at the WWTPs located at the camps in compliance with regulatory	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities	X	X		X	X	X		X	X	X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					requirements (refer to Chapter 10: Surface Water). Wastewater from the well pads will be collected and transferred by tanker to the nearest WWTPs					and waste management companies will be established.																
X	X			107	For the Masindi Vehicle Check Point, sewage will either be treated by a wastewater treatment plant on site and discharged in accordance with the wastewater treatment standards presented in Chapter 10: Surface Water or transferred to the Masindi sewage treatment plant for processing (depending on capacity and approval)	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X	X		X	X	X		X			X					
		X		108	During the Commissioning and Operations Phase waste will be stored and processed at the Integrated Waste Management Area located south of Victoria Nile. There will be no waste management facility located north of the Victoria Nile within the MFNP	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X	X		X	X	X		X			X					
	X			109	For the well pads, Victoria Nile Ferry Crossing Facility and the Lake Water Abstraction System, sewage will be collected and transferred to suitably licensed treatment facilities for processing and disposal	X		Waste Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.	X	X		X	X	X		X			X					
X	X		X	110	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X															

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	111	Undertake periodic inspections, where receptors are nearby, to visually monitor dust for soiling checks of surfaces on personal property such as houses and vehicles within 100 m of boundaries of the worksites		X	Dust Control Plan	HSE Representative from the Project Proponents	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														
X	X		X	112	Plan site layouts so that machinery and dust causing activities (such as stockpiles) are located away from the nearest dust sensitive receptors (typically residential properties located closest to the construction worksite boundaries), as far as is practicable		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														
X	X		X	113	For work activities located close to dust sensitive receptors, mitigations will be considered to minimize the dust emissions. A range of specific dust supression measures shall be implemented to minimise potential impacts. Such measures shall be implemented on a case by case basis and may include the use screens, covers and/or barriers.		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X								X	X			X		
X	X		X	114	Use enclosed chutes and conveyors and covered skips, where practicable		X	Dust Control Plan	Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to		X														

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										sensitive receptors.																
X	X		X	115	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate		X	Dust Control Plan	Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														
X	X	X	X	116	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X		X												
X	X		X	117	Re-vegetate exposed areas/soil stockpiles to stabilise surfaces as soon as practicable		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractor	A monitoring procedure will be developed to track progress and implementation of adaptive management processes if required		X														
X	X		X	118	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	119	Use water-assisted dust sweeper(s) on the tarmacked access roads, to remove, as necessary any material tracked out of the site as required		X	Dust Control Plan	HSE Representative from the Project ProponentsProject Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														
X	X		X	120	Vehicle access points to be sited at suitable locations and where possible, away from receptors to limit impacts from dust generation		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														
X	X		X	121	Enforcement of a low speed limit for Non-Road Mobile Machinery (NRMM), such as 10 kilometres per hour (kph) within working areas		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X														
X	X		X	122	Regular servicing and maintenance of NRMM plant to ensure they are operating as per manufacturer's specification		X	Physical Environment Monitoring Plan	Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X														
X	X		X	123	Allowing only trained and accredited (as required) personnel in the use of NRMM		X	Physical Environment Monitoring Plan	Project Contractors	Periodic monitoring will be performed in line with		X		X	X	X										X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										regulatory requirements and permit conditions																
X	X		X	124	Phased planning of construction activities on the worksites so that NRMM plant are not regularly located in close proximity to nearby sensitive receptors		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.		X													
X	X			125	Majority of coating and painting activities shall be done at the Construction Support Base in dedicated buildings		X	Physical Environment Monitoring Plan	HSE Representative from the Project Proponents Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X		X	X	X										
X	X			126	On site painting and coating shall be limited to touch up and roller application		X	Physical Environment Monitoring Plan	HSE Representative from the Project Proponents Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X		X	X	X										
X	X		X	127	The opening of waste storage vessels for limited periods of filling and emptying		X	Spill Prevention Plan and Oil Spill Contingency Plan (OSCP)	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP		X														
X	X	X	X	128	Ensure spill response equipment (including sampling and personal protective equipment) is readily available on site to contain and clean any spillages as soon as reasonably practicable after the event		X	Spill Prevention Plan and Oil Spill Contingency Plan (OSCP)	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team	Regular audits, as detailed in the ESMP A strategy will be developed for monitoring the effectiveness of the response measures and reinstatement after an unplanned or		X		X	X	X			X	X	X					X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										emergency event. Changes in legislation, guidance, and GIPP will also be regularly checked.																
X	X	X	X	129	The positioning of potentially odorous waste storage vessels at locations as far away from odour sensitive receptors as practically possible		X	Physical Environment Monitoring Plan, Waste Management Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X														
X	X	X	X	130	The removal of potentially odorous waste from the Project Area at appropriate time and frequency		X	Physical Environment Monitoring Plan, Waste Management Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X														
X	X		X	131	Undertake regular observation and recording of site odour conditions		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X														
X	X	X	X	132	Prohibit the unnecessary idling of Project vehicles		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X	X													
X	X	X	X	133	Allowing only trained personnel to drive Project vehicles		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.		X														

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	134	Operating the energy generation plant as and when required, and at the load required to meet the energy demand of the worksite/activity at that time		X	Physical Environment Monitoring Plan	Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X	X													
X	X		X	135	Ensuring the energy generation plant is well maintained and used in accordance with manufacturer's specification		X	Physical Environment Monitoring Plan, HSE Management System	Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X														
X	X			136	The use of centralised power generation will be implemented on the Construction Support Base to minimise the number of discrete diesel generators required to support construction activities at the Industrial Area		X	Physical Environment Monitoring Plan	Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X	X													
X	X			137	All spray applications will normally be carried out in the enclosed blast and paint shop, which will be fitted with the necessary air filters to prevent fugitive emissions to air and will use non-toxic paint, where available, and containment practices to stop overspray		X	Physical Environment Monitoring Plan	Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X														
		X		138	Implementation of a fugitive emissions measurement program and leak detection system		X	Emergency Preparedness and Response Plan (ERP); and Physical Environmental Monitoring Plan	HSE Representative from the Project Proponents' Project Contractors	A strategy will be developed for monitoring the effectiveness of the response measures and reinstatement after an unplanned or emergency event. Changes in legislation, guidance, and GIPP will also be regularly checked.		X														

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	139	Regular servicing and maintenance of vehicles and plant to ensure they are operating as per manufacture's specification		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.		X	X													
X	X	X	X	140	An **Environmental Monitoring Programme** to be established. This will include - air quality - monitoring noise levels at nearby sensitive receptors - soil monitoring such as but not limited to quality and erosion, at relevant locations - a comprehensive groundwater quality and level monitoring networks to ensure that the site condition is monitored throughout each project phase. The location of groundwater monitoring points and criteria for monitoring shall be selected based on receptor sensitivity and impact magnitude - a comprehensive surface water quality and water level monitoring measures to ensure that the site condition is monitored throughout each Project phase. The location of surface water monitoring points and criteria for monitoring shall be selected based on receptor sensitivity and impact magnitude - landscape and visual monitoring, focussed on reinstatement works		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions		X	X	X	X	X	X		X	X	X					
X	X		X	141	For work activities located close to noise sensitive receptors, mitigation measures will be implemented to minimise the impact. A range of specific noise mitigation measures shall be implemented to minimise impacts. Such measures shall be implemented on a case by case basis and may include the use of		X	Noise and Vibration Management Plan	Project Proponents' HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X							X	X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					temporary abatement such as dampening and shielding techniques, noise barriers, and mufflers. Specific noise regulations and thresholds will be specified in the Noise and Vibration Management Plan																					
X	X		X	142	Where possible, selection of low-noise rated machinery and generators		X	Noise and Vibration Management Plan	Project Proponents' HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X													
X	X		X	143	Community engagement before work commences and after on a regular basis according to the **Stakeholder Engagement Plan**		X	Stakeholder Engagement Plan	Project Proponents' HSE teamProject Contractors				X													
X	X		X	144	During detailed engineering phase the present noise study will be refined by the selected engineering company and drilling contractor(s) and based on selected vendor data and mitigations will be addressed accordingly to minimise the noise impact at receptors at acceptable noise levels		X	Noise and Vibration Management Plan	Project Proponents' HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X													
X	X		X	145	As far as possible, sourcing material from locations close to the Project Area to reduce haulage distances, and therefore the exposure to noise and emissions from traffic		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.			X													
X	X	X	X	146	Optimising the logistics to maximise use of available vehicles, reduce number of trips and reduce movements on more sensitive routes where possible; using convoys when appropriate (e.g. via using one shared logistics service provider who can ensure appropriate planning across all parts of the Project and ensure efficiencies are made)		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.			X													

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X	X	X	X	147	Developing and implementing a Road Safety and Transport Management Plan that will outline speed limits and setting and enforcing traffic management measures (e.g. 40 km/hr), and indicating vehicles should be driven at steady speeds observing the speed limit and not making unnecessary noise, such as sounding horns, etc.		X	Road Safety and Transport Management Plan, Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed		X	X	X												
X				148	Construction and upgrading of roads used as haul routes should be undertaken using best practice to ensure that there are no surface irregularities that may result in increased noise emissions from tyre/ road interactions		X	Road Safety and Transport Management Plan, Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed			X												
X	X	X	X	149	Roads will be well maintained to minimise noise generated from surface irregularities		X	Road Safety and Transport Management Plan, Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed			X												
	X			150	Avoiding activities which generate high noise levels during night-time work during construction (except for some drilling activities which due to the technical requirements have to be continuous until the well is developed)		X	Noise and Vibration Management Plan	Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												
	X			151	To avoid nuisance and potential damage to nearby structures from drilling activities, an assessment of potential vibration levels will be undertaken to determine impacts (if any) to nearby receptors. Investigations will be based well locations, manufacturers vibration data for equipment and vibration risk criteria as per industry guidance. Should at risk receptors be identified from the assessment, further vibration mitigation measures will be developed and applied on a case by case basis		X	Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			152	An additional detailed review of the noise generated by various project activities at each key Project component will be undertaken when the construction and drilling contractors are defined. Should significant potential impacts be identified, appropriate mitigation measures will be undertaken		X	Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												
	X			153	Noise abatement of drilling equipment, for example by use of mufflers, or noise barriers and enclosures where appropriate, especially during night time operations		X	Noise and Vibration Management Plan	Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												
	X			154	Multiple drilling activities close to identified sensitive receptors should be avoided where practicable		X	Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												
		X		155	Additional noise modelling should be undertaken during detailed engineering. Noise modelling will include finalised locations of plant items and detailed Sound Power Levels based on manufacturer's data. A mitigation strategy will be developed to minimise the impact upon nearby sensitive receptors.		X	Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												
		X		156	In principle, during ramp up power will be provided from power generation sources (within the Industrial Area and at each well pad); there will be no additional generators used during this activity		X	Noise and Vibration Management Plan	Project Proponents' RSES and HSE team Project Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X												
			X	157	Before decommissioning, a **Decommissioning Management Plan** will be prepared and agreed with NEMA and other relevant agencies prior to the commencement of any on-site works. It will include details on the methods and activities		X	Overarching ESMP	Project Proponents	Regular audits, as detailed in the ESMP Periodic monitoring will be performed in line with regulatory		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					associated with the decommissioning of the infrastructure, including the transportation and final disposal or re-use strategy for Project components and wastes. Completion criteria will be detailed in the management plans					requirements and permit conditions																
X	X	X	X	158	Regular inspection, servicing and maintenance of vehicles and plant to ensure they are operating as per manufacture's specification. Use manufacturer approved parts to minimise potentially serious accidents caused by equipment malfunction or premature failure		X	HSE Management System and Road Safety and Transport Management Plan	Project Proponents, HSE team Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year				X	X	X										X
X	X	X	X	159	Vehicle/equipment maintenance should only be done in designated areas		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Chemical Management Plan, Surface Run Off and Drainage Management Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X	X										X
X	X	X	X	160	Ensure proper handling of fuels and hazardous materials. Handling as per Materials Safety Data Sheets (MSDS) guidelines		X	Chemical Management Plan	Project Contractors, Project Proponents' representatives for different phases of works, HSE team	Regular audits, as detailed in the ESMP				X		X										
X	X	X	X	161	Develop and implement HSE Policies and Procedures, to include details of required safety measures (including personal protective equipment (PPE)) for construction and maintenance workers		X	HSE Management System	Project Proponents, HSE team Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year				X										X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	162	Optimising the logistics to maximise use of available vehicles, reduce number of trips and reduce movements on more sensitive routes where possible; using convoys when appropriate (e.g. via using one shared logistics service provider who can ensure appropriate planning across all parts of the Project and ensure efficiencies are made)		X	Road Safety and Transport Management Plan and Journey Management Plan	Project Proponents, RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.				X												
X	X	X	X	163	Sensitise drivers (as part of training), emphasising the need to adhere to designated routes and speed limits, and to avoid making wide turns at the edges of the site, as far as reasonably practicable		X	HSE Management System and Road Safety and Transport Management Plan	Project Proponents, HSE team Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year				X												
X	X		X	164	Minimise stockpile and laydown areas for storage of equipment and materials in the area of works		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.				X												
X	X		X	165	Undertake scarification after compaction to avoid long term compaction of the affected areas, only where necessary and where it would not adversely affect existing vegetation		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project ProponentsProject Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required				X												

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	166	Restore affected areas after completion of works; break-up compacted surfaces/replace topsoil		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required				X												
X	X	X	X	167	Educate workers (as part of training provided) about the potential for environmental contamination and communicate expectation that suspected areas of potential contamination should be reported		X	HSE Management System, Emergency Preparedness and Response Plan (ERP)	Project Proponents, HSE team Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year				X												
X	X	X	X	168	Develop and implement a Spill Prevention Plan, incorporating secondary containment as far as practicable for liquids contained on site		X	Spill Prevention Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X										X		
	X			169	Ensure adequate controls are in place for the movement of drill cuttings from well pads to waste consolidation area and final treatment/disposal facility including use of trucks with sealed bodies to prevent spillage		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Road Safety and Transport Management Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X			X								
X	X	X	X	170	Plan site layouts such that fuel storage and refuelling areas will be built on hardstanding, isolated and located away from the ground and surface water receptors as far as practicable		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical Management Plan, Surface Run Off and Drainage	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X	X					X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
								Management Plan																		
X	X	X	X	171	Remove contaminated soils that result from recent spills from work site for storage and subsequent treatment and/or disposal at an appropriate licensed facility		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Surface Run Off and Drainage Management Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X												
X	X	X	X	172	Undertake regular site inspections and audits during course of operations, including of machinery and chemical storage tanks to identify early signs of failure		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X												
X	X	X	X	173	MSDS for any chemicals are to be displayed at the point of storage		X	Chemical Management Plan	Contractors, Project Proponents' representatives for different phases of works, HSE team Project Contractors	Regular audits, as detailed in the ESMP				X												
X	X			174	Avoid unnecessary changes and minimise disturbance to natural drainage patterns, where possible. Consider topography and natural drainage patterns in drainage design for roads, well pads, Industrial Area. Existing artificial drainage to be diverted maintaining gravity flows		X	Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X		X									
X	X			175	Drainage will be designed to avoid concentrating flows and increasing runoff velocities, where feasible		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X											
X				176	Access and servitude roads should be designed to drain efficiently through formalised storm water crossings comprising an earth berm and causeway. The placement of		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct				X											

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					these should be assessed per road portion					mitigation measures if required.																
X	X	X	X	177	Storm water must be directed to areas of high stability (i.e. not prone to erosion) with the ability to reduce storm water velocity		X	Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Projet Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X												
X	X		X	178	Changes in natural gradients due to construction activities should be avoided where possible and minimised where unavoidable		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X												
X	X		X	179	Engineer slopes and drainage to minimise erosion and slope failure		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X					X	X	X					
X	X		X	180	Contouring and minimising length and steepness of slopes, to aid slope stabilisation and minimise erosion potential		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X					X	X	X					
X	X	X	X	181	Use perimeter drainage ditches and design for storm conditions		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X												
X	X			182	Make adequate drainage considerations during design in accordance with industry recognised design standards such as: use of cut-of drains, box culverts along flood plains,		X	Surface Run Off and Drainage Management Plan	Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct				X												

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					adoption of appropriate diameters, openings and strength of the hydraulic drainage structures					mitigation measures if required.																
X	X		X	183	Incorporate erosion protection measures through reuse of cleared material, scours checks, silt traps lining of drains and stepped drains in areas of steep gradient, vegetation cover, and slope protection		X	Surface Run Off and Drainage Management Plan, Waste Management Plan, Dust Control Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X											
X	X	-	X	184	Where required, settlement areas and silt traps will be provided downstream of the construction areas to remove or filter out sediment originating from access tracks or construction site drainage and protect water courses, wetlands, drainages and riparian areas. The most appropriate sedimentation and siltation control measures will be designed prior to excavation during the construction period, and will be dependent on site-specific characteristics	-	X	Surface Run Off and Drainage Management Plan, Physical Environment Monitoring Plan	Project Proponents' HSE team Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.	-	-	-	X	-	-	-	-	X	X	X	-	-	-	-	-
X	X	X	X	185	Design and management of site drainage to reduce risk of soil erosion in exposed subsoil areas or in stockpiles		X	Surface Run Off and Drainage Management Plan and Dust Control Plan	Project Proponents' HSE team Project EPC Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X		X										
X	X	X	X	186	Maintain a buffer of vegetation around the site (particularly in the lower lying areas) to prevent any eroded soil from leaving the site and being deposited in downstream water sources		X	Surface Run Off and Drainage Management Plan, Physical Environment Monitoring Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X											
X	X		X	187	Use sediment control measures such as straw bales or silt curtains, where required. Permeable check dams, made from coarsely graded rock fill, will be used to slow the discharge velocity in the		X	Surface Run Off and Drainage Management Plan, Physical Environment Monitoring Plan	Project Proponents' HSE teamProject Contractor	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation				X		X										

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					drainage channels. Particular care will be taken at and close to watercourse crossings, and when construction is located close to watercourses					measures if required.																
X	X		X	188	Any work in watercourses and wetlands will be avoided as far as is practicable in periods of heavy rainfall		X	HSE Management System	Project Proponents, HSE team Project Contractor	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year				X							X					
X	X		X	189	Exposed slopes shall be minimised as part of the design. Where slopes created are steep, appropriate design shall be installed and additional anti-erosion mechanisms implemented (such as knocking in stakes, installing gabions, geotextiles or similar).		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project EPC Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X												
X	X			190	Terracing will be used at Industrial Area to reduce exposure along slopes, depending on the site terrain. Other measures such as use of gabions, stone pitching and interlocking blocks should be considered depending on the site terrain		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X												
X	X	X	X	191	Suspended solids within water leaving the footprint area should not contain significantly higher levels of suspended solids (e.g. >10%) than water within locally occurring water resources		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X												
X	X		X	192	Protecting all stockpiled material including construction material from being washed away by rain run-off and wind by covering the stockpiles with tarpaulin (or equivalent), bunding the edges, vegetating and not storing in areas susceptible to erosion		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X		X										
X	X		X	193	Topsoil shall be stockpiled separately from subsoil with all soils being reinstated in the reverse order to that in which		X	Landscape Management Plan, Site Clearance Plan,	Project Proponents, HSE team, and Project Proponents Contractors	A monitoring programme will be developed to check the success				X						X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					they have been removed in order to initiate rehabilitation. All stockpiles shall be stabilised, not be higher than 3 m, and must blend in with the surrounding topography. Topsoils will also be monitored (e.g. for organic content)			Site Restoration Plan, HSE Management System		of the mitigation measures and audit the plan.																
X	X		X	194	Should additional bedding material or backfill be required, only material from an approved source free of alien invasive fauna and flora may be used		X	Alien/Invasive Species Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractor	The Project Area will be checked regularly for alien/invasive species. The success of any remedial measures to reduce the spread or such species will be verified through monitoring.				X												
X	X		X	195	Topsoil shall only be handled when necessary such as during excavation and reinstatement activities		X	HSE Management System	Project Proponents, HSE team Project Contractor	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year				X												
X	X		X	196	Avoid stockpiling near watercourses, within floodplains or unstable slopes		X	Physical Environment Monitoring Plan, Surface Run Off and Drainage Management Plan	Project Proponents, HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X		X										
X	X		X	197	Undertake regular site inspections and audits during course of construction, including checks around the construction areas for signs of erosion, blocked water courses, and localised flood. If encountered, undertake corrective measures		X	Physical Environment Monitoring Plan	Project Proponents, HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X												
	X			198	Design, management and monitoring of hydrotest carried out in line with the appropriate Hydrotest Specification for Pipeline hydrotesting		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements				X												

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										and permit conditions																
X	X		X	199	Care will be taken not to cause compaction of ground near wetlands resulting in hydrological or hydrogeological changes that may affect those habitats		X	Wetland Management Plan	HSE Representative from the Project Proponents Project Contractor	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.				X	X	X			X	X	X					
X	X	X	X	200	Fixed traffic routes (one-track or single-track policy): Fixed traffic routes will limit the development of extensive braided tracks. Where reasonably feasible, vehicles will be limited to signposted, flagged and fixed routes in order to prevent cross-country driving and the use of shortcuts. This will assist in reducing soil cover erosion		X	Dust Control Plan, Road Safety and Transport Management Plan	HSE Representative from the Project Proponents	An audit system will be setup to regularly check the logged grievances, Project Proponents' responses, and effectiveness and fairness of any actions or outcomes. The response time will also be monitored.				X									X			
			X	201	Prior to release of land within the Project Area for agricultural purposes, testing must be undertaken to ensure the soils comply with the Minimum Standards for Management of Soil Quality (National Environment Regulations, 2001) and the baseline conditions as a minimum.		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X											
	X	X		202	An **Oil Spill Contingency Plan** to be established. This will define notification procedure, response strategy, means, and post-spill actions such as clean-up, monitoring, etc. in the event of uncontrolled/accidental discharge		X	Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	HSE Representative from the Project Proponents' Project Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.				X	X	X			X	X	X					X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	203	Abstraction and discharge permits will be obtained, as required		X	Water Management Plan	Project Proponents' representatives for different phases of work	Regular audits, as detailed in the ESMP Periodic monitoring will be performed in line with regulatory requirements and permit conditions					X	X					X					
X	X	X	X	204	Ensuring compliance to the abstraction and discharge limits permitted. Records for the abstraction and discharge to be maintained		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions					X	X					X					
X	X	X	X	205	Implement efficient water use by sensitising workers (as part of training) about the importance of efficient water use, adopting suitable water conservation techniques such as water re-use measures and training all contractors working on the Project to implement working methods that control water consumption and ensure water is used efficiently during the Project life		X	Water Management Plan	Project Proponents' representatives for different phases of work Project Contractors	Regular audits, as detailed in the ESMP					X	X										
X	X	X	X	206	The **Environment Monitoring Programme** will draw on the results of other ongoing studies and will include: 1. review of the suitability of existing water quality baseline information and whether there is need to update it; 2. establishment of water monitoring in the Project Area and implementation of an 'early warning' system when the concentration of certain pollutants rises above a threshold value; and 3. assessment of the effectiveness and success of water conservation measures.		X	Physical Environment Monitoring Plan, Water Management Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions					X										
X	X			207	Testing of new abstraction boreholes. For all new groundwater abstraction boreholes, it is recommended		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with					X										

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					that pumping tests are undertaken to provide site-specific hydrogeological properties of the sand aquifer and refine distance-drawdown estimates. If necessary, the impact assessment on existing water supply boreholes in the area should be repeated to identify the need for any additional mitigation					regulatory requirements and permit conditions																
	X			208	Drilling fluids are to be stored in tanks. Drilling fluids will not be stored in below ground pits		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical Management Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X											
X	X		X	209	Have adequate sumps and drainage around construction areas which are subject of possible pollution to capture spills		X	Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.				X	X	X									
	X			210	Design, management and monitoring of hydrotest carried out in line with the appropriate Hydrotest Specification for Pipeline hydrotesting		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical Management Plan, Surface Run Off and Drainage Management Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP					X									X		
	X			211	Halt hydro-testing if leakage is detected and remediate as far as practicable any pollution of soil or water		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP				X	X											

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
								Management Plan																		
			X	212	Prior to decommissioning, an intrusive ground investigation will be carried out as deemed necessary based on historical site data and monitoring data done throughout the life of the field		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X	X				X	X	X					X
X	X	X	X	213	The drainage system of any bunded area should be sealed to prevent discharge of potentially contaminated water		X	Spill Prevention Plan, Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP), Chemical Management Plan, Surface Run Off and Drainage Management Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP						X											
X	X	X	X	214	**Livelihood Restoration Plan** (for PAPs) and the **Community Content, Economic Development and Livelihood Plan** (for PACs) will include improvement of access to water measures subject to feasibility studies as defined in **Chapter 16: Social**		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan, Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team							X											
X	X		X	215	Minimise construction impacts on receiving water bodies by implementing **Surface Runoff and Drainage Management Plan** which should include best management practice		X	Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Project Contractors	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.						X											
X	X		X	216	Any ingress of water into excavations will be removed/ discharged immediately in a condition appropriate to meet the requirements of NEMA or other acceptable standard		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X						-	-	-	-	

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
-	X	-	-	217	Appropriate tunnelling and slurry management practice for HDD to stabilise soil and minimise slurry loss from the tunnel into surrounding aquifers/surface waters	-	X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions	-	-	-		-	X	-	-	-	-	-					X
	X			218	For sections of pipelines that cross seasonal wetlands/rivers, pipeline construction works will take place in the dry season where possible. This is to prevent disruption of surface water / shallow groundwater flow thus affecting habitats as well as disturbing the animals relying on those wetlands		X	Wetland Management Plan	Project Proponents' HSE team Project Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.						X			X	X	X					
X	X		X	219	Reinstate streams disturbed by Project activities as close to original condition as possible		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										
X	X			220	All works carried out during the construction and installation of the Water Abstraction System and Victoria Nile Ferry Crossing should be follow best practices in order to avoid /reduce release of contamination such as cement and other associated hazardous chemical (e.g. paint, fuels, oil) into the lake or river		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										
	X			221	During the HDD works at the Victoria Nile River crossing, adequate temporary measures should be put in place mainly at the entrance of the tunnel area to ensure surface water runoff does not enter the pipeline trenches and tunnel excavation sites		X	Physical Environment Monitoring Plan, Surface Run Off and Drainage Management Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										
X	X			222	Further geomorphology studies are currently being undertaken in relation to the Water Abstraction point in order to further define the design of the scheme		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	223	The planned water abstraction rate will be agreed with regulators and confirmed as sustainable based on studies performed		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										
X				224	The design of Victoria Nile ferry crossing jetty should take into consideration flood risk and consider flood compensatory storage if required		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project EPC Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										
X				225	The design of the Victoria Nile ferry crossing jetty should take into account the sensitivity of the Ramsar wetland downstream to ensure impacts on hydrology and morphology are minimised as much as possible		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project EPC Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X										
X				226	Avoid introduction of roads at right angles to existing roads, where practicable		X	Road Safety and Transport Management Plan	Project Proponents Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.							X										
X				227	Materials required for roads shall meet the material specifications and mechanical properties required for the class of road. However, where possible, material selection shall also take into account aesthetic aspects to blend in with existing landscape subject to technical constraints and availability		X	Physical Environment Monitoring Plan	Project Proponent	Periodic monitoring will be performed in line with regulatory requirements and permit conditions							X										
X	X	X		228	Vegetating stockpiles of material remaining on site for a significant amount of time to merge with the surroundings as much as practicable		X	Landscape Management Plan	Project Proponents Project Proponents Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.							X										

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		X		229	Use of lights, for example on well pads, will be minimised, and light spill controlled (e.g. restricted lighting height, shading light sources and/or direct them onto site areas)		X	Physical Environment Monitoring Plan, Landscape Management Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions							X								
X	X		X	230	Any areas of land which are disturbed during construction should be restored to help prevent any erosion		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.							X								
	X	X		231	Design the Project to use colours that match the surroundings for the infrastructure and fencing. This includes a blend of subtle light browns, pastel greens, rust, and greys		X	Landscape Management Plan	Project Proponents Project EPC Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.							X								
	X	X		232	Design the Project to use of materials on the infrastructure that will minimise glare, as much as practicable		X	Landscape Management Plan	Project Proponents Project EPC Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.							X								
	X	X		233	Material finishes to building to be non-reflective and muted colour palette		X	Landscape Management Plan	Project Proponents Project Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.							X								
	X	X		234	Consideration shall be given to planting naturalistic woodland/bush to blend subject to site specific conditions		X	Landscape Management Plan	Project Proponents Project Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.							X								
	X	X		235	Soften boundary edges of Industrial Area/CPF with native planting which could also benefit the community (formation of		X	Landscape Management Plan	Project Proponents Project Contractors	A monitoring programme will be developed to check the success							X								

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					allotments/gardens and /or tree or plant nurseries)					of the mitigation measures and audit the plan.																
X	X	X	X	236	Roads will be well maintained to keep the roads usable. Responsibilities for roads maintenance will be defined with relevant authorities. A dedicated handover plan for roads will be implemented with the relevant Authorities when the Construction and Pre-commissioning Phase is complete. The handover plan will be subject to consultation and agreement with the authorities and shall specify the long term arrangements and responsibilities to be adopted		X	Road Safety and Transport Management Plan	RSES and HSE team	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.							X									
X	X	X	X	237	Completion of comprehensive waste mapping exercise for each project phase during FEED to accurately identify waste types, quantities, transportation, treatment and disposal options		X	Waste Management Plan	Project Proponents and Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.								X								
X	X	X	X	238	Waste mapping information will be shared as part of the ongoing waste management competitive call for tender to determine available expertise and capacity of prospective waste management providers		X	Waste Management Plan	Project Proponents and Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.								X								
X	X	X	X	239	Proposals will be developed to address any gaps related to expertise and capacity of waste management providers		X	Waste Management Plan	Project Proponents and Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.								X								
X	X	X	X	240	Detailed information regarding facility compliance with Uganda national regulatory requirements, IFC and GIIP will be obtained as part of a series of site visits for prospective waste management providers		X	Waste Management Plan	Project Proponents	A monitoring regime and periodic audits of the Project waste storage facilities and waste management								X								

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										companies will be established.																
	X	X		241	LSA/NORM monitoring strategy shall be developed and implemented for development drilling and production phases. In the event that presence is detected, a suite of management procedures shall be developed to ensure that any LSA/NORM contaminated materials and wastes are stored and managed appropriately		X	Waste Management Plan	Project Proponents and Project Contractors	A monitoring regime and periodic audits of the Project waste storage facilities and waste management companies will be established.								X							
X	X			242	The Site Clearance Plan will be developed to structure and schedule clearly site clearance activities, noting any constraints		X	Site Clearance Plan	HSE Representative from the Project Proponents	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.									X	X						
X	X	X	X	243	A Site Restoration Plan for the Project will be developed and will be updated prior to commencement of every stage of the Project		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required									X	X						
X	X	X	X	244	Works and traffic/plant movement will maintain strict adherence to agreed footprint design including access roads and other infrastructure		X	Physical Environment Monitoring Plan Road Safety and Transport Management Plan and Dust Control Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X					X	X						
	X			245	Materials to be used in forming platforms, bund walls and other site preparation works within Protected Areas will be locally sourced as much as possible (i.e.		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory									X	X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					materials used in the MFNP should be from other sites within the MFNP), but away from sensitive biodiversity areas where practicable					requirements and permit conditions																
X	X		X	246	Where unavoidable, soil and/or other materials shall be brought from outside of Protected Areas for use within the Protected Areas only upon approval by the responsible government agency (i.e. UWA or NFA), and this process will be subject to a risk assessment process as described in the scope for the Alien/Invasive Species Management Plan		X	Physical Environment Monitoring Plan and Alien/Invasive Species Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	X						
	X			247	The design of the bund walls in the park will be optimised to minimise requirement for materials taken from outside of the park		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project EPC Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	X						
X	X	X	X	248	There will be no smoking outside of any designated areas due to risk of fire and consequently loss of adjacent habitats		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP); HSE Management System	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP									X	X						
X	X	X	X	249	Access to areas outside of site boundaries by workers will be prohibited within the park		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP									X	X						
X	X		X	250	Dust control measures will be implemented at each site and access road to prevent smothering of adjacent habitats (as outlined within the Air Quality and Climate chapter). Dust emissions will be strictly controlled via adhering to the operating procedures set out in the Dust Control Plan		X	Dust Control Plan	HSE Representative from the Project Proponents Project Contractors	A detailed monitoring programme will be produced to measure dust levels and deposition. Locations for monitoring will depend on activities and on proximity to sensitive receptors.									X	X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	251	Discussions will be held with UWA regarding the MFPA Management Plan in consideration of O&G development, burning regimes and animal species management initiatives to minimise further loss of suitable habitat and improve habitat quality in surrounding areas of habitat, similar to that which is lost		X	Biodiversity and Ecosystem Services Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.								X	X						
	X			252	If there are proposed changes to locations, alignment, working areas or footprint of Project components, the Avoidance Protocol, including site selection survey and mapping, will be carried out before determining the configuration of these components		X	Biodiversity and Ecosystem Services Management Plan, Community Impact Management Strategy	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions								X	X		X				
X	X		X	253	Plant nurseries will be established to provide plant materials (e.g. seedlings and/or seeds) for restoration of impacted sites, as well as for replacement of felled trees as appropriate. This will include trees as well as common herbaceous species (i.e. grasses, herbs, etc.) for general coverage		X	Physical Environment Monitoring Plan, Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.								X	X						
X	X		X	254	All temporary facilities, including temporary access roads, will be restored as soon as practicable after they are no longer required after use; in line with Site Restoration Plan		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required								X	X						
X	X		X	255	Temporary 'bogmats', riprap bridges and other measures to reduce compaction or erosion of soils and habitat degradation during wet conditions will be utilised		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X				X	X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	256	Burning of vegetation waste following site clearance will be prohibited within MFPA but could be considered in areas outside MFPA when no other appropriate alternative has been identified, to avoid air emissions and reduce the risk of fires. This requirement will be included in the Site Clearance Plan		X	Site Clearance Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring procedure will be developed to audit the Project activities against the requirements in this plan and measure the success of the mitigation measures.								X	X						
X	X			257	Consideration will be given to making cleared wood from the Industrial Area, from well pads and flowline wayleaves, available to the local community to help lower the need and demand for wood from protected areas. However it will be communicated to local communities that this supply will not remain during Operations Phase in order not to create expectations		X	Community Impact Management Strategy	Project Proponents Project Proponents' Contractors	An appropriate monitoring and evaluation methodology will be developed for impacts on peoples and communities.							X	X						
X	X			258	Soil spill, where soil spreads beyond the defined boundary of the component footprint, from well pad or other construction areas, will be minimised		X	Physical Environment Monitoring Plan	Project Proponents' Responsible on Site for Safety and Environment (RSES) and HSE team Project Contractors	Regular audits, as detailed in the ESMP								X	X						
X	X		X	259	A specialist ecologist (Ecological Compliance Officer) will be present on site during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases where site clearance and excavations are required (e.g. construction of flow lines) to oversee the works and ensure compliance		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions								X	X	X				
X	X	X	X	260	Provision will be made for - the recruitment of Ecological Compliance Officers (ECOs); and - the training and capacity building of the ECOs.		X	Physical Environment Monitoring Plan	Project Proponents' Ecological Compliance Officers (ECOs)	Periodic monitoring will be performed in line with regulatory requirements and permit conditions								X	X	X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	261	Prior to site clearance each site will be surveyed for the presence of plant species of conservation concern, as listed in the BMP. If any such species are found, these will be recorded and if possible either avoided or transplanted to similar habitat under supervision of a botanist/ecologist. This is important because there may be considerable time between baseline/avoidance surveys and actual site works and species may move into the area (also animals) that were not present during baseline surveys		X	Physical Environment Monitoring Plan	Project Proponents' Ecological Compliance Officers (ECOs)	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X							
X	X		X	262	Where trees are to be felled, the species will be identified and recorded by a competent ecologist. Where recorded trees are listed in the schedules to the National Forestry and Tree Planting Act, the appropriate licences will be applied for prior to removal of trees		X	Physical Environment Monitoring Plan	Project Proponents' Ecological Compliance Officers (ECOs)	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X							
X	X		X	263	Where it is necessary to remove trees (i.e. Mature trees of threatened species, NFA reserved trees and socially important trees) these will be identified to species level before felling. A replacement tree (or trees, or in some cases seedlings) of that species as much as practicable will be planted at a suitable location to be agreed with UWA and/or NFA and other relevant stakeholder. The planted trees will be monitored to check that they have developed successfully and any failed trees will be replaced. Any additional requirement will be defined as part of the BMP to achieve NNL/NG		X	Physical Environment Monitoring Plan	Project Proponents' Ecological Compliance Officers (ECOs)	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X							
X	X	X	X	264	Workers' instructions (e.g. either in the Labour Management Plan or in staff training/induction) will state that no plants are to be picked or collected at any time		X	Physical Environment Monitoring Plan	Project Proponents' HSE team, and Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X							

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	265	Water abstraction, and activities at other locations will ensure that they do not affect groundwater baseflow to wetlands (including wallows and watering holes) and other habitats resulting in degradation of those habitats. Flow rates and residual recharge rates will be sufficient to sustain sensitive habitats. To achieve this, water abstraction points will be carefully selected, as defined in Chapter 9: Hydrogeology. In addition, all water abstraction activities will comply with the requirements of water abstraction permits		X	Physical Environment Monitoring Plan, Wetland Management Plan	Project Proponents' HSE team, and Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions								X	X						
X	X		X	266	Construction techniques will allow unimpeded shallow groundwater and surface water flow where they have to cross seasonal watercourses (for example between JBR-01 & JBR-10/Nile crossing; JBR-03 & JBR-04; around JBR-09; between JBR-08 and JBR-09), through use of culverts and permeable layers, avoiding compaction of soils		X	Surface Run Off and Drainage Management Plan	Project Proponents' HSE team	Efficiency of the mitigation measures will be assessed on periodic basis, in order to correct mitigation measures if required.					X	X			X	X						
X	X		X	267	Use of concrete or other impermeable surfacing material at sites will be minimised. These materials will be used only at those areas that absolutely require it		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	X						
X	X	X	X	268	Herbicide will not be used at any Project location. Control of 'weeds' will be undertaken by hand weeding or use of permeable matting or other standard weed control measures		X	Alien/Invasive Species Management Plan	HSE Representative from the Project ProponentsProject Contractors	The Project Area will be checked regularly for alien/invasive species. The success of any remedial measures to reduce the spread or such species will be verified through monitoring.									X	X						

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Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	269	A Biodiversity (and Ecosystem Services) Action Plan (BAP) will be developed inline with relevant IFC Performance Standards, and will include key mitigation actions aiming at achieving No Net Loss/Net Gain to biodiversity		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									X	X	X					
X	X	X	X	270	Biodiversity codes of conduct for workers will be developed, which can be disseminated to economic dependents and others that may be able to enter Protected Areas. This may require punitive measures if not complied with		X	Biodiversity Strategy and Labour Management Plan	Project Proponents' HSE team	The Project will implement a carefully designed monitoring programme to track the scale of impacts and the effectiveness of interventions for priority biodiversity and ecosystem services.									X	X	X					
X	X	X	X	271	Workers will be prohibited from collecting shells, timber, firewood, fibres and other plant based resources. Fishing by workers will not be permitted. Ensure control at the camps and work sites		X	Community Environmental Conservation Plan (CECP) and Labour Management Plan	Project Proponents' HSE team and Project Contractors	Regular audits, as detailed in the ESMP									X	X	X					
X	X	X	X	272	Nurseries will be developed, and where possible plantations, to propagate plants/trees of economic importance to alleviate pressure on natural and protected environments for those resources in line with the Community Environmental Conservation Plan and at a scale and intensity proportional to Project impacts. This is not intended as a replacement for species lost during site clearance but as a measure to relieve pressure on natural resources within existing forests and other protected areas		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									X	X					
X	X	X	X	273	Ensure that the Resettlement Action Plan (RAP) does not increase pressure on natural or critical habitats by moving people into or where practicable closer to sensitive habitats or Protected Areas		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or									X	X					X	

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										scheduled resettlement milestones.																
X	X	X	X	274	As detailed in Chapter 16: Social, a Community Environmental Conservation Plan will be developed which will contain educational/information programmes to highlight importance of protected areas, identify plant species of conservation concern (and why they are important), and to explain how pressure on those will be alleviated		X	Community Environmental Conservation Plan (CECP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP									X	X						
X	X	X	X	275	As detailed in Chapter 16: Social dependence on firewood and charcoal will be used through development of the Community Environmental Conservation Plan, which will include promotion of alternative fuel use (e.g. briquettes, solar technology) and clean cookstoves through partnership with local organisations and social enterprises. Support schemes to find alternative fuel sources, reduce reliance on charcoal will be developed. The potential to involve communities in biodiversity conservation as alternative livelihood options will be explored		X	Community Environmental Conservation Plan	Project Proponents Project Contractors	An appropriate monitoring and evaluation methodology will be developed for impacts on peoples and communities.									X	X						
X	X	X	X	276	As detailed in Chapter 16: Social, an Influx Management Strategy will be developed to mitigate in-migration impacts and maximise benefits for local communities. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society. The Strategy will build on the recommendations provided in the In-Migration Risk Assessment (Ref. 16-11) and will set out the overarching approach and objectives for mitigating the negative impacts of influx and enhancing the benefits. The strategy will make reference to		X	Influx Management Strategy	The Project Proponents Project Contractors	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation									X	X		X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					more detailed actions and procedures contained within other environmental and social management plans that are relevant to addressing influx. The strategy will also propose a specific monitoring & evaluation framework to measure project-induced in-migration trends, hotspots and key impacts																					
X	X	X	X	277	The Influx Management Strategy will also consider potential impacts of increased pressure on natural resources due to population growth including looking at ways to provide alternative sources of fuel, building materials, farming land and food (particularly protein)		X	Influx Management Strategy	The Project Proponents Project Contractors	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation								X	X	X					
X	X	X	X	278	As detailed in Chapter 16: Social, the Community Content, Economic development and Livelihood Plan will consider measures aimed at mitigating impact of population growth such as increased pressure on fisheries resources		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP									-	-	X					
X	X	X	X	279	The Community Environmental Conservation Plan will consider (but not be limited to) community based programmes for extension of tree nurseries, promotion of alternative fuel use, fisheries management and monitoring programme that will entail engagement of communities through BMUs in fisheries management as defined in Chapter 16: Social		X	Community Environmental Conservation Plan (CECP)	Project Proponents' Ecological Compliance Officers (ECOs)	Regular audits, as detailed in the ESMP									X	X	X					
X	X	X	X	280	Resettlement Action Plans will include livelihood restoration and will also provide alternative livelihoods/ income diversification programmes to ease dependence on natural resources or protected areas as a source of livelihood as defined in Chapter 16: Social		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled									X	X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										resettlement milestones.																
X	X	X	X	281	Measures to conserve and restore forests and forest connectivity along the eastern shore of Lake Albert (including Budongo and Bugoma FRs): As part of reduction effort of in-migration impacts on forests, in order to maintain and restore key forest corridors and enhance protection of threatened species; the following will be considered (Subject to feasibility study). • Establishing agroforestry systems (combining shrub/tree planting with agricultural practices to create more diverse, healthy, productive and profitable sustainable land-use; • Support establishment of community land associations through which to coordinate and implement PES and micro-credit schemes to support livelihood diversification; • Promotion of alternative fuel use and clean cookstoves fuel-efficient stoves to reduce rate of fuelwood harvesting; • Establishing nurseries for community reforestation and sustainable resource extraction (e.g. wood production and NTFPs); • Specific activities to target the conservation of high priority species (e.g. actions to reduce hunting pressures (e.g. removal of snares) and activities that combat illegal hunting and trading will be important); and • Enhanced management of existing Forest Reserves will require support to the Government for enforcement activities (e.g. improved patrolling and boosting community conservation efforts).		X	Influx Management Strategy, Resettlement Action Plan (RAP), Community Content, Economic Development and Livelihood Plan (CCEDLP), Community Environmental Conservation Plan (CECP)	The Project Proponents	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation								X	X							

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	282	Measures to reduce human pressures and increase resilience of the MFPA: through enhanced park protection and community-based management. This will also include measures to protect and maintain connectivity of the savanna corridor outside the MFNP and including Bugungu Wildlife Reserve: manage in-migration impacts to savanna habitat and associated species by addressing threats and maintaining connectivity within and around Bugungu Wildlife Reserve. the following will be considered (Subject to feasibility study) : 1) In-kind Support to UWA for: - equipment needed to enhance its ability to protect the MFPA; - Recruitment, training and deployment of a rapid reaction team (RRT) for MFPA; - Training in community conservation; and - Strategic and tactical support to UWA including training, capacity building and independent data management, analysis and reporting. 2) Community-based interventions including: - Establishing community governance structures such as Village Saving and Loans Associations (VSLAs) and Community Land Associations (CLAs) assisting local communities to establish and develop PES or micro-credit schemes or animal husbandry and, where appropriate, to promote alternative wildlife-friendly enterprises - Recruitment and training of village wildlife scouts to empower and involve communities in park management; - Promotion of alternative fuel use and clean cookstoves to reduce level of fuelwood		X	Influx Management Strategy, Resettlement Action Plan (RAP), Community Content, Economic Development and Livelihood Plan (CCEDLP), Community Environmental Conservation Plan (CECP)	The Project Proponents	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation								X	X						

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					harvesting; - Identify areas with high incidence of human-wildlife carnivore conflict and assess means to address this, for example community-based insurance schemes linked to land-use planning; and - Assist local communities to establish and develop simple wildlife-friendly management plans.																					
X	X	X	X	283	Actions to manage and restore wetlands along the southern shore of the Albert Delta Ramsar site: manage anticipated impacts of in-migration on wetland habitat, fisheries and associated biodiversity around the Albert Delta Ramsar site through community-based management. the following will be considered (Subject to feasibility study): - Organisation/establishment of wetland user groups/management committees; - Developing agreed community management rules and regulation approaches; - Environmental awareness raising in local communities; - Establishing nurseries for revegetation of papyrus (and/or applying ecological engineering approaches to restoration); - Participatory monitoring and evaluation of wetland areas and resources; and - Micro-credit schemes to support livelihood diversification.		X	Wetland Management Plan	HSE Representative from the Project Proponents	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.								X	X	X					

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	284	Landscaping, including earth bunds around well pads within the park will be established, and will be covered with topsoil and plants associated with the immediate vicinity and monitored and maintained to ensure success and stability of these bunds. Consideration will be given to the need to avoid attracting animals (e.g. the oasis effect in dry seasons)		X	Landscape Management Plan, Site Clearance Plan, Site Restoration Plan	Project Proponents Project Proponents Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.							X		X	X						
		X		285	Rights of way will be regularly inspected and trees that become established along the pipeline route will be identified and removed as soon as possible		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	-						
	X	X		286	Pipeline trenches will be designed to ensure that they do not become preferential flow paths for groundwater, particularly where they cross seasonal wetland areas or terrain, which comprises catchment for wallows or waterholes. This could comprise placement of impermeable backfill (clay or similar) at certain locations within the trench to prevent lateral movement of water within the pipeline alignment		X	Physical Environment Monitoring Plan	Project Proponents' HSE teamProject EPC Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	X						
X	X	X	X	287	The detailed Site Restoration Plan will be implemented and at each site this will be monitored for success of vegetation establishment (i.e. where plants do not take successfully), erosion issues and presence of invasive species to ensure that all sites are effectively restored. Where such problems are encountered, further planting, site reprofiling and other remedial measures will be taken to ensure that site restoration is completed satisfactorily to the agreed standard or coverage and plant composition, which should match reasonably the sounding		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required									X	X	X					

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic														
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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					vegetation by the end of the restoration process																					
			X	288	Decommissioning activities will be confined within the Project footprint as much as practicable		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions				X	X				X	X	X					
			X	289	For areas of the Project that cross seasonal wetlands/rivers decommissioning works will take place in the dry season where possible. Where not possible, additional mitigation measures will need to be defined		X	Wetland Management Plan	HSE Representative from the Project Proponents Project Contractors	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.						X			X	X	X					
	X		X	290	Materials used in restoration will be locally sourced, where possible (i.e. materials used in the MFNP should be from other sites within the MFNP, where practicable), but away from sensitive biodiversity areas. Plants will be transplanted from nurseries to the site being restored (or from adjacent areas, as appropriate)		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required									X	X	X					
X	X	X	X	291	A Biodiversity and Ecosystem Services Management Plan (BMP) will be developed which will define how impacts of site clearance on animal species of conservation concern will be minimised. This will include maps showing locations of sensitive habitats and seasonal wetlands known to be preferred habitat of those species. The BMP will also indicate routes of large mammal movements if known (can be determined from presence of tracks) as well as other sensitive features such as kob leks		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X	X					
X	X		X	292	Activities scheduling will consider seasonal sensitivities of Priority Species as much as practicable. In any case, Project shall ensure that wide areas, free		X	Biodiversity and Ecosystem Services Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a										X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					of works, are maintained to allow animal movements and any other potential mitigations are investigated as appropriate					predetermined basis.																
X	X		X	293	Prior to commencement of site works, each site will be subject to a pre-start walkover survey by a qualified ecologist, to detect signs of active burrows, dens, bird nests, bat roosting, presence of reptiles/amphibians and critical wildlife movement routes and tracks (e.g. access to watering holes). This is important because species may have moved to the site since baseline surveys were undertaken		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X		X	294	If animal burrows are present and appear to be occupied then these should be carefully excavated to allow any occupant the opportunity to escape		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X		X	295	Where bird nests of threatened species are present within or close to the working area, then works must halt and access to these will be restricted in order to avoid disturbance to birds until any fledglings have hatched and left the nest		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X	X	X	296	Bird eggs of any species must not be taken or destroyed		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X	X	X	297	Where signs of small mammals (including bat roosts), amphibians (in wetland areas) or reptiles are encountered during pre-start surveys, individuals will be given time to escape. For amphibians or reptiles species of conservation concern, capture and translocation to adjacent similar habitat by an experienced field ecologist should be attempted		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	298	As indicated in Chapter 4: Project Description and Alternatives, open trench areas will be restricted to 1 km lengths. In addition, in remote areas and/or at night wildlife escape ramps from open trenches will be used. The use of animal crossing structures such as bridges, culverts, and over crossings, along pipeline and access road rights-of-way will be installed where necessary. At special points such as crossings, deep excavations and tie-in bell holes, safety barriers (such as fences) will be installed to prevent human or animal ingress. The barriers will be temporary structures and the intention is that they will be a deterrent to animals entering the working area rather than an impenetrable physical barrier to prevent animals colliding with them. Where fences are used, they should have opaque panels in them (e.g. cloth material), and a means of escape from the fenced areas by use of ramps, etc., will be included		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									X						
X	X		X	299	Prior to commencement of work each morning, every excavation and fenced area will be inspected, and any trapped animals allowed to escape safely		X	Biodiversity and Ecosystem Services Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X						
X	X	X	X	300	Training and awareness-raising will be undertaken on bushmeat issues and to communicate to all personnel requirements not to consume bushmeat while at work (e.g. notices will be placed around the site to remind staff of their responsibilities)		X	Labour Management Plan	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP										X						
X	X	X	X	301	Checks will be undertaken on all staff and contractor vehicles, either by TOTAL security staff or through support from UWA, to discourage poaching and to check that only authorised personnel are entering the park		X	Labour Management Plan	Project Proponents' HSE team	Regular audits, as detailed in the ESMP										X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					in company or contractor vehicles																					
X	X	X	X	302	A Road Safety and Transport Management Plan will be developed and implemented that will outline journey optimisation, speed restrictions, traffic rules (confirming that animals have right of way if encountered), and appropriate reporting procedures in case of collisions, as detailed in Chapter 16: Social		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.								-	X						
X	X	X	X	303	A risk-based Alien/Invasive Species Management Plan will be developed and implemented to include but not be limited to: • Developing a register of existing invasive species in the Area of Influence; • A risk assessment to identify existing and/or potential invasive species and/or threats/risks; • Definition of relevant control measures identified for each type of threat under project control e.g. bringing in topsoil from outside of Protected Areas, risk of vehicles introducing or spreading Alien/Invasive species. These could consist of dedicating a fleet of vehicles to serve activities in MFNP, implementing systematic checks on vehicles and considering washing as and where appropriate and practicable (at Masindi checkpoint and Tangi for instance); • Preparation of a 'risk map' showing areas of existing infestation; • Development of generic methods for incident management of broad groups of invasive species, as well as species specific measures; • On-site monitoring for invasive species; • Procedures for reporting and developing specific control measures for any new invasive		X	Alien/Invasive Species Management Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	The Project Area will be checked regularly for alien/invasive species. The success of any remedial measures to reduce the spread or such species will be verified through monitoring.								X	X	X					X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					alien species that are detected; • Procedures to contain or remove (as appropriate) any pre-existing invasive species on the Project site; and • Procedures to contain or remove pre-existing invasive species in areas close to the Project site.																					
X	X	X	X	304	Use of birds deflectors should be considered when a risk of collision or electrocution is identified; in particular with pylons/flare systems.		X	Biodiversity and Ecosystem Services Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					X	
X	X	X	X	305	As detailed in Chapter 16: Social, a Community Environmental Conservation Plan will be developed which will contain educational/information programmes to explain how pressure on those priority species should be alleviated as well as information concerning the conservation and legal status of priority species		X	Community Environmental Conservation Plan (CECP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP										X						
X	X			306	Construction of access roads and other infrastructure will ~~must~~ be similarly sequenced as much as practicable to restrict disturbance to ~~a~~ discrete areas at any one time.For areas of Project that cross seasonal wetlands/rivers pipeline construction works will take place in the dry season where possible. This is to prevent disruption of surface water / shallow groundwater flow thus affecting habitats as well as disturbing the animals relying on those wetlands		X	Road Safety and Transport Management Plan and Wetland Management Plan	Project Proponents' RSES and HSE teamProject Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.									X	X						
X				307	Roads will be designed so that their permanent and construction footprint will be minimised		X	Road Safety and Transport Management Plan	Project Proponents Project EPC Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for				X					X	X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										additional training.																
X	X	X	X	308	Where positioning of infrastructure could restrict animals' access to critical water resources, alternative access routes will be maintained or created, where practicable		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					X	
X	X	X	X	309	Loud music is not to be played.		X	Noise and Vibration Management Plan	Project Proponents' HSE team, and the Contractors	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X							X						
X	X	X	X	310	Lighting at night at well pads and other infrastructure will be minimised to avoid affecting commuting and feeding behaviour of bat species. This can be achieved by using directional lighting and by turning off lights (using timers or motion detectors where practicable and to ensure safety) when not required		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X						
X	X	X	X	311	No feeding of any wildlife will be permitted		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X						
X	X	X		312	When roads intercept key crossing points for certain species (e.g. amphibians near wetlands), design consideration should include needing to maintain crossing path as much as practicable		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X						
	X			313	Piling and other activities generating noise and vibration will be 'ramped up' (slow started) to allow wildlife to move away in good time		X	Biodiversity and Ecosystem Services Action Plan, Noise and Vibration Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X	X					

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic														
Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	314	Construction in and around bird roosting sites for Shoebill, Madagascar pond heron, Grey Crowned Crane and Pel's fishing owl within the Ramsar site will be avoided as much as practicable. When unavoidable, then works must halt and access to these will be restricted in order to avoid disturbance to birds until any fledglings have hatched and left the nest		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X		X	315	Where feasible, activities scheduling for construction activities should consider avoiding disturbance within Ramsar site during migratory bird season [October to March approximately]		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X	X				
X	X	X	X	316	Surface water management on site and pooling of water or open water storage will be managed so as not to create areas to which animals may be attracted		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X		X	317	For works taking place in or near the Ramsar site, where feasible, a buffer will be established around identified sensitive features where no works will take place, as defined in the Avoidance Protocol		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									X	X					
X	X	X	X	318	Measures to minimise human-wildlife conflict will be implemented. This will include provision of livestock management training, fencing (where appropriate) and other initiatives		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X	X				
X	X	X	X	319	Specific awareness training for Project staff/ contractors about roles of wildlife species in the ecosystem and impacts will be provided		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X	X				
X	X	X	X	320	Further engagement with NFA, Budongo Conservation Field Station, and other key stakeholders will be undertaken to ensure that appropriate measures are identified to mitigate potential impacts		X	Stakeholder Engagement Plan	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP										X					

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Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					associated with anticipated traffic																					
X	X	X		321	Consider contributing to development and implementation of a long-term chimpanzee monitoring and evaluation program through establishment of partnerships and information exchange with researchers and land managers (e.g. Budongo Forest Project, NFA, UWA, Makerere) to understand trends and threats to chimpanzees across the landscape and how Project can best contribute to minimising impacts and contributing to long-term persistence		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X	X		322	The Community Environmental Conservation Plan will contain educational/information programmes in villages affected by human-chimpanzee conflict		X	Community Environmental Conservation Plan (CECP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP										X					
X	X		X	323	Where feasible, activities scheduling should consider preventing barrier effects for seasonal movements of giraffe. Giraffe tend to be more concentrated in the Buligi area in the dry season (Nov-Feb) and move to the Ayago area when the rains start (Mar)		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X		X	324	Minimise the loss of key plant species for giraffe diet: namely *Acacia senegal*, *A. sieberiana*, A. *drepanolobium, Harrisonia abyssinica* and *Crateva adansonii*		X	Biodiversity and Ecosystem Services Action Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X	X		325	Continue long-term monitoring of giraffe (including population size and structure, incidence of snaring, movements, stress levels, reproduction) throughout the MFPA to assess longer term impacts and disturbances of oil activities		X	Biodiversity and Ecosystem Services Action Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X					
X	X	X	X	326	Minimise actual and effective traffic volume in MFNP, including requirements to travel in convoy with defined 'quiet times'		X	Noise and Vibration Management Plan, Road Safety and Transport Management Plan	Project Proponents' HSE team, and the Contractors	A detailed monitoring programme will be produced at pre-identified locations to an										X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										appropriate method.																
X	X	X	X	327	Consideration will be given, as appropriate, to future monitoring through undertaking relevant studies on the priority species		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions										X							
X	X		X	328	Where feasible, activities scheduling should consider preventing barrier effects for seasonal movements of elephants. Elephants tend to be more concentrated in the Ayago area in the dry season (Nov-Feb) and move to the Buligi area when the rains start (Mar)		X	Biodiversity and Ecosystem Services Action Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X							
X	X		X	329	Appropriate fencing/animal barriers will be designed with the help of elephant barrier experts where available		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents'HSE teamProject Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X							
	X	X		330	Creation of an "oasis" effect (e.g. lush vegetation from site drainage) will be avoided, that may attract and encourage elephants especially in the dry season, to attempt to break into the well pads and camps		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
	X	X		331	Planting of trees likely to attract elephants (e.g. mango) as ornamentals at Project sites will be prohibited to reduce the risk of human-elephant conflict		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	332	All chemicals, food, food waste, and other materials within current and potential elephant ranges will be stored in secure (ideally elephant-proof structures) to avoid accidental poisoning and / or frequent close encounters with elephants		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	333	Studies of elephant behavioural ecology and response to disturbance in Buligi and Ayago to understand impacts and adapt mitigation will be continued as required		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team	A monitoring regime will be developed. This will be reviewed and updated on a									-	X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										predetermined basis.																
X	X	X	X	334	Commissioning of studies of elephant movements outside of MFPA in order to understand better the risk of indirect impacts and human-elephant conflict will be considered		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	335	A Community Environmental Conservation Plan will be developed that will contain educational/information programmes in villages affected by human-elephant conflict		X	Community Environmental Conservation Plan (CECP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP									-	X						
X	X		X	336	When scheduling site construction, as much as practicable simultaneous works at two working areas within the same lion pride's territory will be avoided		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	337	Monitoring, using radio collars, will be continued. It should cover of all lion prides potentially affected by Project infrastructure and activities and a control pride		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	338	As this species is Critically Endangered, continue specific study of hyenas within the Project landscape to assess how they could be affected by the Project direct and indirect activities and disturbance		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	339	Within areas of current or potential hyena presence, all chemicals, food waste and hazardous waste will be stored / disposed of in hyena-proof structures (i.e. heavy duty metal freight containers and/or secure cabinets) to avoid accidental poisoning		X	Biodiversity and Ecosystem Services Action Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X		X	340	Where feasible, activities scheduling should consider preventing barrier effects for seasonal movements of kobs. Kobs tend to be more concentrated in the Ayago area in the dry season (Nov-Feb) and move to the Buligi area when the rains start (Mar). Lekking seems		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					to occur in June (possibly July) and works near identified leks should be avoided as much as practicable during these months																						
X	X		X	341	As this is priority species, consider specific study of vultures ~~w~~in order to define roosting/nesting and preferred feeding areas to assess how they could be affected by the Project direct and indirect activities and disturbance		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	342	Use of rodenticides and other toxic chemicals by site personnel and workers inhabiting site compounds will be prohibited during all phases of the Project		X	Biodiversity and Ecosystem Services Action Plan, Chemical Management Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X		X	343	Site preparation, construction and decommissioning works affecting wetland and seasonally inundated grassland habitat will be scheduled (as much as possible) to occur as far as practicable outside the November window when shoebill is most likely to be breeding (incubation phase)		X	Wetland Management Plan	HSE Representative from the Project Proponents	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.									-	X	X					
	X		X	344	Procedures and protocols for operating water vessels (barges) and ferries will be formulated and implemented. Water vessels will travel at reduced speeds while travelling along watercourses to reduce risk of disturbance of wildlife and collisions		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.									-	X						
X	X		X	345	Where practicable vegetation clearance activities will be undertaken outside of the crocodile nesting period (January- March) within the Ramsar site. However, if this is not practical a suitably experienced ecologist will inspect the site for any signs of crocodiles or their nest sites prior to the removal of habitats. Where active nests are recorded, they will be cordoned off until		X	Biodiversity and Ecosystem Services Action Plan	Ecological Compliance Officer (ECO) from the Project Proponents Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					the hatchlings have emerged and dispersed																					
X	X	X	X	346	Fencing will be erected around human occupied areas (well pads, barge pier facilities, water abstraction point *etc*.) situated close to watercourses (< 1 km) to prevent crocodiles interacting with people and vehicles		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X		X	347	Where practicable, construction in and around watercourses and waterbodies will not be undertaken at night. This will minimise the disturbance of hunting crocodiles		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.										X						
	X			348	The footprint of the HDD will be minimised to avoid unnecessary loss of wetland/riparian habitat		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									X	X	X					
	X			349	Further mitigation for the pipeline across the seasonal river between JBR-09 and JBR-08 will be considered. This is a deep gully and bridging may be required		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.						X			X	X	X					
X	X		X	350	Excavations will be furnished with ramps or other means of escape, which will be put into open trenches at regular intervals to allow animals to escape		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X		X	351	If temporary surface water pipelines are required, which are not fully buried, then means of crossing them for animals will be constructed, whether these are extended earth ramps or shallow burial of the pipelines		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	X						
X	X	X	X	352	Project Recruitment Centres locations should be defined in consideration of potential impacts it may generate on protected areas and unprotected forest areas		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	353	Access roads under project control will be reserved for Project use only, and appropriate barriers / control and enforcement mechanisms installed to prevent use for extraction of bushmeat or other illegal use of natural resources. This may include manned road blocks, punctual checkpoints and physical barriers		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE teamProject Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.										X						
X	X	X	X	354	Regular monitoring of the extent and impacts of in-migration, generally on natural resources, will be carried out as part of the Biodiversity Monitoring and Evaluation Plan, including regular acquisition and analysis of satellite imagery to assess landuse/landcover changes		X	Influx Management Strategy	The Project Proponents Project Contractors	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation									X	X	X				
X	X	X	X	355	Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of indirect effects, share understanding of causes and identify adapted or additional mitigation requirements		X	Stakeholder Engagement Plan	The Project Proponents Project Contractors	Regular audits, as detailed in the ESMP									X	X	X				
X	X	X	X	356	Relevant authorities will be engaged with and consideration will be given to fostering development of a plan with them to strengthen the protection of Bugungu Wildlife Reserve and adjacent areas of transitional habitat with direct community involvement. The objective will be to provide legal safeguard for wildlife populations and maintain an effective north-south savanna corridor in the landscape		X	Stakeholder Engagement Plan	The Project Proponents Project Contractors	Regular audits, as detailed in the ESMP									X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	357	The in-migration risk assessment will be regularly updated based on monitoring data to assess which protected areas, species and habitats are most at risk of indirect impacts, both imminently and in the foreseeable future		X	Influx Management Strategy	The Project Proponents Project Contractors	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation									X	X	X					
	X			358	Where feasible, activities scheduling for barge construction should consider avoiding disturbance during migratory fish season (October to March approximately)		X	Biodiversity and Ecosystem Services Action Plan	Project Proponents' HSE team Project Contractors	A monitoring regime will be developed. This will be reviewed and updated on a predetermined basis.									-	-	X			X		
X	X	X	X	359	A Chemical Management Plan will be developed that will describe the selection, transport, storage and usage processes as well as mitigation measures against releases or toxic effects and spill contingency measures in case of spills. The plan will be based on the results of Chemical Risk Assessment		X	Overarching ESMP	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP				X	X	X			X	X	X					X
X	X		X	360	Construction of facilities in a floodplain will be avoided as much as possible. Where unavoidable, appropriate mitigation measure shall be developed to minimise adverse impacts		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions											X					
X	X	X	X	361	A Wetland Management Plan will be established to ensure no disruption to wetland areas. The main measures will comprise avoiding and minimising impacts on wetlands and restricted exclusion zones		X	Wetland Management Plan	HSE Representative from the Project Proponents	A monitoring programme will be developed to check the success of the mitigation measures and audit the plan.									X	X	X					
X	X		X	362	Pre-construction surveys will be performed to confirm the extent and state of identified wetlands		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Proponents	Periodic monitoring will be performed in line with regulatory requirements									X	X	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										and permit conditions																
	X			363	Construction activities within 200 m for lake (Lake Albert) and 100 m for a river (River Nile) will be avoided as far as practicable. Should they be unavoidable, a permit for use of river banks and lake shores will be applied for activities within those zones (for Water Abstraction System, HDD crossing, Nile River Ferry Crossing)		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions						X			X	X	X				X	
X	X	X	X	364	Resettlement Action Plans will be developed and include livelihood restoration for fisheries based livelihoods and will also provide alternative livelihoods/ income diversification programmes to ease dependence on natural resources or protected areas as a source of livelihood as defined in Chapter 16: Social		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.									X	X	X					
	X	X		365	Non-toxic paints will be used to treat the pipeline to minimise any impacts on the aquatic environment as much as practicable		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									-	-	X					
X	X	X	X	366	A screen with a mesh size of 2mm will be used to reduce/prevent entrainment of aquatic species at the abstraction point in Lake Albert		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									-	-	X					
	X			367	Testing and Monitoring of the water intake will take place during pre-commissioning to ensure that intake velocities and activities at the Water Abstraction System (WAS) are not having a detrimental impact on fish. Any impingement or issues discovered will be addressed accordingly and appropriately prior to start-up of abstraction		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									-	-	X					

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X	X		368	Based on UK guidance the intake velocity should not exceed 75cms-1 for larger fish species and where possible should be lower than this to reduce impingement of smaller fish (Ref 15.43). At present based on the proposed pipe size and abstraction rate, the estimated escape velocity is 49cms-1		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions										-	X					
X	X			369	In locations where tracks, roads and/or pipelines cross smaller surface water bodies such as the River Tangi, crossing options/methods (e.g. bridges, culverts etc.) will be assessed and the most appropriate implemented		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions									X	X	X					
X	X	X	X	370	A pilot scheme for wetland restoration will be linked to the Restoration Plan - developed in partnership with WMD and DWRM		X	Site Restoration Plan	Ecological Compliance Officer (ECO) from the Project Proponents	A monitoring procedure will be developed to track progress towards meeting physical and biological rehabilitation completion criteria and implementation of adaptive management processes if required									X	X	X					
			X	371	An updated environmental assessment will be required before decommissioning commences in order to confirm that the planned activities are the most appropriate to the prevailing circumstances. This assessment would aim to demonstrate that the decommissioning activities would not cause unacceptable environmental impact on aquatic life and would lead to the development of specific management controls		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions										X					
	X	X	X	372	Develop a "Frack out" plan to ensure that preventive and responsive measures can be implemented		X	Frack Out Plan	Project Proponent representative for Construction Construction Contractor Project Contractor	Regular audits, as detailed in the ESMP																X

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Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			373	Design protocols will be defined with support from appropriate expertise (geotechnical and geophysical) to integrate appropriate recommendations regarding suitability of the formation to be bored in order to minimise likelihood		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions																X
	X			374	Pre-HDD surveys will be undertaken to identify and locate sensitive receptors at the site. The findings will be communicated to employees		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Project Contractor	Periodic monitoring will be performed in line with regulatory requirements and permit conditions																X
	X	X		375	Ensure that all field personnel understand their responsibility for timely reporting of frack outs		X	Frack Out Plan	Project Proponent representative for Construction Construction Contractor	Regular audits, as detailed in the ESMP																X
	X			376	To minimise the potential extent of impacts from a frack out, all HDD activity will be attended by a full-time monitor, to look for observable "frack out" conditions or lowered pressure readings on the drilling equipment		X	Frack Out Plan	Project Proponent representative for Construction Construction Contractor	Regular audits, as detailed in the ESMP																X
	X			377	HDD contractor shall possess sufficient knowledge, training and experience for HDD operation		X	Frack Out Plan, Emergency Preparedness and Response Plan (ERP)	Project Proponent representative for Construction, Construction Contractor, and HSE Representative from the Project Proponents' Contractors	A strategy will be developed for monitoring the effectiveness of the response measures and reinstatement after an unplanned or emergency event. Changes in legislation, guidance, and GIPP will also be regularly checked.																X
X	X	X	X	378	A 24 hour emergency response team will be established		X	Frack Out Plan, Emergency Preparedness and Response Plan (ERP), Oil Spill Contingency Plan	Project Proponent representative for Construction,Construction Contractor, andHSE Representative from the Project Proponent	A strategy will be developed for monitoring the effectiveness of the response measures and reinstatement after an unplanned or																X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										emergency event. Changes in legislation, guidance, and GIPP will also be regularly checked.																
X	X	X	X	379	Emergency spill response teams will have appropriate training to handle all types of spills		X	Frack Out Plan, Emergency Preparedness and Response Plan (ERP), Oil Spill Contingency Plan	Project Proponent representative for Construction, Construction Contractor, and HSE Representative from the Project Proponent	A strategy will be developed for monitoring the effectiveness of the response measures and reinstatement after an unplanned or emergency event. Changes in legislation, guidance, and GIPP will also be regularly checked.															X
X	X	X	X	380	In case of an unplanned event resulting in confirmed contamination of groundwater an alternative source of water supply to affected communities will be considered		X	Emergency Preparedness and Response Plan (ERP); and Physical Environmental Monitoring Plan	HSE Representative from the Project Proponent	Periodic monitoring will be performed in line with regulatory requirements and permit conditions															X
	X	X	X	381	A Blowout Contingency Plan (BOCP) to be established prior to commencement of drilling activities. This will explain the mitigation procedures to put in place to reduce the likelihood and the severity of such event including notification procedure and response strategy		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
	X		X	382	Strict procedures will be enforced when a workover rig is moving close to or on top of the wells. All lifting activities shall be also be risk assessed and supervised by a Competent		X	HSE Management System	Project Proponents, HSE team Workover Contractors	Performance objectives are set on an annual basis, and performance assessment by Project															X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					Person for Lifting Operations (CPLO)					Proponents' Management is undertaken twice a year																
	X	X		383	Conduct proper maintenance of the well cellar and well head		X	HSE Management System	Project Proponents, HSE team Project Contractors	Performance objectives are set on an annual basis, and performance assessment by Project Proponents' Management is undertaken twice a year																X
	X			384	Continuous monitoring of drilling parameters will be undertaken and any unexpected behaviour such as erratic torque, sudden drop in drill rate will be investigated. Mud returns at the shakers shall be also be monitored closely as per GIIP		X	Physical Environment Monitoring Plan	Project Proponents' HSE team Drilling Contractors	Periodic monitoring will be performed in line with regulatory requirements and permit conditions																X
	X	X		385	The BOP is also considered a safety and environmental critical equipment and, as such, will be certified by an independent competent authority and tested at least once every 3 weeks		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.																X
		X		386	Regular maintenance will be planned on DHSVs during production phase to assure their continued operation		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.																X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	X			387	the cementing operation will be analysed and a cement bond log will run accordingly to check quality of cement		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
	X	X		388	Firefighting equipment must be maintained and tested on the well pads		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
	X	X		389	In case of a kick, the effluent will be controlled by closing the BOP. The well will then be circulated with a fluid of density high enough to kill the well. If required a limited quantity of hydrocarbon will be diverted to a dedicated emergency storage pit on the well pad (there will be no flaring of hydrocarbon). Fluids will then be transferred to vacuum trucks for treatment and/or disposal at a licensed facility		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
	X	X		390	In the case of failure of all barriers including the BOP, the well will be killed via a capping device and/or drilling of a dedicated relief well		X	Blow Out Contingency Plan (BOCP)	Project Proponent representative for Drilling Drilling Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event.															X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
										Changes in legislation, guidance, and GIIP will also be regularly checked.																
	X	X		391	Key personnel will be provided with all mandatory well control training		X	Blow Out Contingency Plan (BOCP), Oil Spill Contingency Plan (OSCP), Emergency Preparedness and Response Plan (ERP)	Project Proponent representative for Drilling Drilling Contractors HSE Representative from the Project Proponents' Contractors	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
	X	X		392	The fibre optic monitoring system will be regularly tested and maintained		X	Physical Environment Monitoring Plan, Spill Prevention Plan	Project Proponent	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
		X		393	In the event of a leak being detected on the production line (depending on the location and extent), the production would be stopped and the leaking section of pipeline depressurised to the CPF. The section of line would then be flushed with hot water from the nearest well pad		X	Spill Prevention Plan, Emergency Response Plan, Oil Spill Contingency Plan	Project Proponent	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		X		394	Cathodic Protection (CP) will be applied to buried carbon steel non-insulated pipelines in accordance with the Cathodic Protection Philosophy. A high visibility polyethylene pipeline warning net shall be laid 0.3 m above the pipeline over the entire route of the pipeline		X	Spill Prevention Plan	Project Proponent	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
X	X	X	X	395	Fire risk associated with Project facilities will be minimised through: - The established buffer zones around the CPF, well pads and construction areas; - Competent personnel for supervision and response for fire fighting;- The definition and enforcement of strict control measures, including the implementation of a “permit to work” system for hot works with spark potential such as welding, grinding, cutting etc.;- Use of dedicated fire waters, mobile fire protection measures (fire trucks and mobile fire fighting measures); - Controlling Smoking with the use of designated smoking areas for workers during all phases of the Project; - Other ignition sources will also be prohibited, dry vegetation will be removed from the RoWs and from areas close to hot works; and - Fire breaks, which are cleared areas of vegetation to prevent spread of fire, will also be introduced around higher risk activities and specified in the Community Health, Sanitation, Safety & Security Plan		X	Emergency Response Plan	Project Proponent	A strategy will be developed for regular testing, monitoring the effectiveness of the contingency measures and reinstatement after an event. Changes in legislation, guidance, and GIIP will also be regularly checked.															X
X	X			396	There are no known underground or overhead utilities in the Project Area, however local and national utilities companies will be consulted and utilities maps reviewed by the Contractors		X	Physical Environment Monitoring Plan	Project Proponents’ HSE team	Periodic monitoring will be performed in line with regulatory requirements															X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					prior to commencement of site works					and permit conditions																
X	X			397	Should any utilities be identified or suspected, certain equipment may be prevented from using the right of way to avoid accidental damage. Procedures to stop work will also be implemented until the nature of the services can be established and the risk deemed safe. Project construction activities would restart following the definition of appropriate working methods which would avoid impacting upon the integrity of the subject services and/or the health and safety of the workers		X	Physical Environment Monitoring Plan	Project Proponents' HSE team	Periodic monitoring will be performed in line with regulatory requirements and permit conditions															X
X	X		X	398	Development of further RAPs and LRPs consistent with the goals, objectives, principles and processes described in the LARF and continuously drawing on lessons learned from RAP1. Resettlement planning and implementation will, as far as possible, be undertaken in one go for a defined geographic area/ footprint to minimise disturbance for communities from resettlement activities and to minimise the risk of double displacement.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				
X	X	X	X	399	Avoiding forced eviction		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X		X	400	The RAPs will adequately cater for the respective interests of the PAPs in accordance with criteria for eligibility and the PAPs choice of type of compensation (cash or in-kind) by ensuring that the process: - Provided compensation for loss of assets at replacement cost; - Ensures appropriate disclosure of information, consultation, and informed participation of those affected. - Improves livelihoods or at least restores the livelihoods and standards of living of displaced persons which choose to remain within the project area of influence; and - Improves living conditions among displaced persons which have chosen in-kind compensation through provision of adequate housing with security of tenure at resettlement sites.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				
X	X	X	X	401	**Livelihood Restoration of Project Affected Persons (PAPs)** In compliance with the LARF, support will be provided through the Livelihood Restoration Plans to re-establish community support groups and livelihood groups. Project Proponents will in consultation with local communities, government and civil society, consider investments to restore and improve existing economic activities such as fishing, crop farming, livestock farming, and trade, as well as programmes that support economic diversification for project affected persons. These programmes will be aligned with the strategic objectives outlined within the Project National and Community Content Programme and will as far as possible consider how project affected persons can be involved in Project employment opportunities (direct and		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					indirect) and how skills learned on the Project can be applied to other sectors in the local area. Specific training and job readiness support programmes that will be considered will include (but are not limited to): • Adult Literacy and Numeracy (including Financial literacy) • Business management training and links to microfinance; • Vocational training and linkage to employment; • Food security and agriculture programs (irrigation, crops, vegetables, trees, honey, livestock, fishing); • Improve management of natural resources and access to energy • Improve access to health, water and sanitation • Social assistance for vulnerable groups																							
X	X	X	X	402	Wherever possible, material for the Project will be sourced from existing borrows pits, to minimise the need for land acquisition.		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Contractors	Regular audits, as detailed in the ESMP												X				
X	X	X	X	403	**Financial literacy training and access to financial services for Project Affected Persons (PAPs).** Inclusive training in basic financial literacy will be provided to PAPs (men and women) who have opted for cash compensation including advice and assistance on how to open bank accounts, especially for savings. The aim is to minimise the risk of misuse of the compensation package. The Project Proponents will work with suitable partners to facilitate the rollout of banking (mobile where possible) services in remote locations. Additional assistance will also be given as per RAPs consideration on assistance and entitlement.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.												X				

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X	X	X	X	404	PAPs will be encouraged to take in-kind compensation as far as possible. The RAPs will have plans for support to PAPs in the relocation and resettlement process for eligible PAPs who choose in-kind compensation. Design of replacement housing will take into consideration cultural preferences where technically feasible and in accordance with the entitlement matrix to ensure fair and adequate compensation. In compliance with the LARF, the RAPs will include special provisions for vulnerable groups.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				
X	X	X	X	405	The orphaned land will be acquired by the project on a case by case basis.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				
X	X	X	X	406	Where replacement land has been identified, a suitability assessment will be undertaken to confirm the suitability of the sites in terms of legal due diligence, ground suitability, agricultural potential, water supply, access to public facilities, safety and distance from existing community and social network. The assessment will take into consideration environmental protected areas as well as the locations of future infrastructure development including for associated facilities and supporting infrastructure in order to avoid risks of double displacement.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				

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X	X	X	X	407	**Coordination with other developers:** - Project will propose to the RAC Chairperson (MEMD) to invite UNRA and Uganda Electricity Transmission Company Limited (UETCL) to participate in the RAC; - Coordination meetings will be held with UNRA and UETCL to advise on best practice approach for resettlement and to continue to share lessons learned from Project experience; and - UNRA and UETCL will be invited to consult with the Project before implementing resettlement to check that any proposed relocation sites do not fall within the Project footprint. - The Project Proponents will be involved as observers of any monitoring and evaluation bodies (e.g. committee) and/or review the monitoring and evaluation documentation of resettlement activities undertaken by UNRA and UETCL in addition to resettlement undertaken for direct Project components.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				
X	X	X	X	408	Where land is held collectively (as opposed to individual ownership of land), the RAPs will follow a process of identifying the affected groups and signing agreements with these groups (i.e. families and/ or clans) .		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				
X	X	X	X	409	Payment of compensation will be made at the household level (to husband and wife), and at the family or clan level where appropriate (through nominated representatives). Costs associated with opening bank accounts and bank charges incurred in the first six months after opening the account will be paid for those who choose cash compensation and are paid		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team Project Contractors (If in charge of temporary land access)	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.											X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					through the banking system (to avoid liquid cash injection and security issues).																					
X	X	X	X	410	**Vector and Malaria Control Programme - Specifications for surveillance and monitoring of vectors and vector control activities;** Review of building design for resettlement housing to reduce vector-human contact to minimise disease risk.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.												X		X		
X	X	X	X	411	**Community Impact Management Strategy**The Project Proponents will develop a Community Impact Management Strategy for the PACs, which will include an overarching policy statement on the key principles of community impact management (compliant with IFC PS, Ugandan regulations and Project Proponent HSE, Ethics, Anti-Corruption and Anti-Bribery standards). The Community Impact Management Strategy will involve the development of associated community plans in order to incorporate the aspects outlined below. Participative monitoring and evaluation will be part of the Community Impact Management Strategy and, as far as possible, will be integrated into the ESMP for ongoing monitoring of wider environmental and social mitigation implementation.		X	Community Impact Management Strategy	Project Proponents Project Proponents'Contractors	An appropriate monitoring and evaluation methodology will be developed for impacts on peoples and communities.												X			X	X

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	412	**Compensation Procedure for temporary disturbance associated to the Project Activity** A Compensation Procedure that provides standard and transparent compensation agreements for any accidental or unexpected damage directly due to the Project activities to either individual or community assets will be developed by the Project Proponents. All contractors and sub-contractors will be required to follow the measures and requirements set out in the Compensation Procedure. The Compensation Procedure will define the process for assessing claims and providing compensation for the following potential impacts that could arise upon evidence that is it specifically related to the Project activities: • Accidental damage to buildings, structures, equipment, machinery, land, crops, livestock, water resources and graves that are owned by community members or by the community; • Unexpected additional temporary land intake during the site preparation and enabling works phase or construction and pre-commissioning phase for land that is owned by community members or by the community; and • Unexpected temporary disturbance to the economic activity of community members. <u>The Compensation Procedure will define:</u> • The types of accidental damage and temporary disturbance that would be eligible for compensation; • The roles and responsibilities for the Project Proponents and Contractor in recording and resolving claims for compensation; • The process for receiving and		X	Community Impact Management Strategy	Project Proponents Project Proponents' Contractors	An appropriate monitoring and evaluation methodology will be developed for impacts on peoples and communities.											X				

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					assessing claims; • The basis for compensation, including standard compensation rates; • The process for providing compensation and closing compensation claims; and • Templates for use in recording claims and compensation <u>The following types of damage or disturbance to economic activity are not covered by this Compensation Procedure:</u> • Damage that is or will be subject to police investigation or legal proceedings, or involves personal injury or death; • Damage or disturbance to affected assets and economic activity that is part of the planned land expropriation and resettlement programme. This is covered by the resettlement process, and claims related to land expropriation will be managed under the scope of the RAPs; • Damage or disturbance to environmental, health, security aspects that is covered under the scope of the environmental and biodiversity and other social management plans; • Disturbance that does not lead to a noticeable impact on economic activity. Such complaints should be managed through the Grievance Mechanism; • Damage to Contractor or Project Proponent assets, or injury to their personnel; and • Disturbance to Contractor or Project Proponent economic activity, e.g. through labour stoppages. The Compensation Procedure will not replace the procedure for recording HSE incidents. HSE incidents that lead to a claim for compensation under the Compensation Plan should also be recorded and managed as HSE incidents.																							

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	413	**Transparent Accounting** The Project Proponents will make payments of taxes and royalties in a transparent, accurate and timely manner during the operations phase. Total is a signatory to the Extractives Industries Transparency Initiative (EITI) since its creation and is playing a very active role in the initiative which advocates for greater transparency in the oil revenues. We publish detailed information on exploration and production activities (mining rights, contracts, subsidiaries, figures on tax paid to national authorities etc) in countries where we operate. In Uganda, which has not yet joined the EITI, Total E&P Uganda is bound by contractual obligations under the Production Sharing Agreements not to disclose information relating to petroleum operations, without the prior consent of the Government of Uganda. We will extend our support if the Government decides to sign up for this initiative and disclose relevant information.		X	Community Impact Management Strategy	Project Proponents Project Proponents' Contractors	An appropriate monitoring and evaluation methodology will be developed for impacts on peoples and communities.											X				
X	X	X	X	414	The Project SEP will be reviewed and updated at the start of each Project phase and at least annually with phases. In addition to Project SEP and Project CTLOs, all contractors will also be required to have their own SEP and to appoint their own CTLOs (with supervisor where required). All SEPs will align with the Project Proponents' corporate requirements for stakeholder engagement and will include provisions to: • Acknowledge 2017 Guidelines by Cultural Institutions for Oil and Gas; • Provide for recruitment of CTLOs who speak local languages; • Provide for the training and capacity building of CTLOs;		X	Stakeholder Engagement Plan	The Project Proponents Project Contractors	Regular audits, as detailed in the ESMP											X			X	

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					• Produce all stakeholder materials in local languages; and • Provide sensitisation of contractor workers on local culture. • Grievance management procedure The Project SEP will include provisions for the establishment of a dedicated webpage and will assess the feasibility of setting up and managing social media platform(s) to facilitate information disclosure and communication with a wider local, national and international audience. The webpage and social media tools will be developed in line with a wider Externals Communications and Media Strategy developed for the Project and will be managed by the Corporate Affairs team.																								
X	X	X	X	415	**Community Engagement Capacity Building programme for local government** Measures will be taken to enhance local government's role in community engagement and their capacity to provide proactive information dissemination and feedback on their monitoring activities to local communities. Strengthening technical capacity will need to be supported with an increased resource capacity provided through local and national government budget allocation to provide for sufficient resources to mobilise to communities and undertake engagement activities. Focus will be placed on communicating around some of the key Project impacts and mitigation measures linked to employment, resettlement and influx, including but not limited to: • The resettlement process including information about land rights, the valuation process, and mediation mechanisms;		X	Stakeholder Engagement Plan	The Project Proponents	Regular audits, as detailed in the ESMP											X		X		

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					• Land speculation through community sensitisation, campaign to raise awareness of land rights implemented in partnership with government, local civil society organisations and community leaders; • The Project's Local Employment Procedure to anticipate conflicts over Project employment and; • The dangers of alcoholism, drug abuse, domestic violence, prostitution and the importance of safe sex.																			
X	X	X	X	416	**Building capacity for a participatory approach to social impact management, monitoring and evaluation.** A participatory model, in partnership with national and local government agencies, relevant NGOs or CBOs, will be followed for the planning and implementation of community programmes to manage and monitor community impacts. Ongoing capacity building support will be provided to help communities and implementing institutions develop competence in prioritising, planning, managing and monitoring development projects and programmes.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X				
X	X	X	X	417	**Child and Gender Based Violence Prevention Programme** A suitable partner will be identified to deliver awareness training to prevent child and gender based violence. The training will focus on increasing sensitisation amongst local communities within the Project Area as well as in influx hotspots (focusing on women and children) on their legal rights to protection from violence and avenues through which incidents of violence can be reported; training of community leaders (political leaders, cultural institutions, religious leaders and local police) to address this issue		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X				

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					with members of their communities; and targeted training of male employees and PAPs affected by resettlement against child and gender based violence (GBV). The exact format for delivery of the training and sensitisation programme will be defined following the selection of a suitable partner and completion of a feasibility study but will draw on lessons learned from similar programmes already carried out elsewhere in Uganda. The programme will be implemented for the duration of the Site Preparation and Enabling Works Phase and the beginning of the Construction and Pre-Commissioning Phase (up until peak employment). At that point the need for continuation of the programme will be determined following a review of the outputs and outcomes of its implementation.																							
X	X	X	X	418	**Legal Aid** The Project Proponents will investigate options to facilitate increased access to quality legal aid services to PAPs within Buliisa District. This is likely to take the form of a partnership with a suitable and qualified organisation. The partner will be selected following a due diligence process to establish its suitability to provide such a service in a prompt and efficient manner. The due diligence process should in particular assess the organisation's objectivity (no conflict of interest and no incentives to encourage individuals to pursue legal cases erroneously); knowledge of legal processes and alternative dispute resolution (ADR); knowledge of land rights and the land tenure system in Uganda and the Project Area; experience in sensitisation of local communities about their legal rights; and track record of		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP												X				

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					successfully resolving disputes for legal aid clients through legal proceedings or ADR mechanisms. Emphasis of legal aid provision should be to sensitise communities about their rights and the formal justice system and should avoid risk of trapping participants in court cases. This will be established through an MoU between the Project Proponents and the independent organisation. The MoU will be valid for an initial period of one year.																			
X	X	X	X	419	**Conflict Resolution & Crime Prevention Capacity Building programmes for local communities and local institutions.** • Facilitate dialogue with key partners; • Empower local institutions, NGO and government to find solutions to challenges of land speculation and land disputes; • Support training of community organisations, local leaders and police in mediation and conflict resolution. A suitable partner will be identified to deliver the training; • Build the capacity of the local government and security forces to deal with crime, working in particular with community crime preventers (mayumba kumi) and oil and gas police to provide a coordinated approach to crime prevention; and • Establish a conflict monitoring programme in partnership with local government (District Welfare Officer, Sub county councils, LC1s) and CSOs to monitor the incidence of conflict within villages in order to identify any emerging issues early on to prevent escalation. This may be through provision of equipment to register and track instances of conflict and allow a		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP												X			

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					rapid alert system (e.g. using mobile phones).																					
X	X	X	X	420	**Anti-bribery and anti-corruption capacity building programmes for local communities and local institutions.** Sensitisation on bribery and corruption and provide assistance, in partnership with UHRC or other suitable third party, to local and national governments to establish a whistleblowing mechanism to report corruption.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP													X				
X	X	X	X	421	**Health and wellness education and communication campaigns programme for local communities:** The Project Proponents will work with local government, the Ministry of Health, District Health Teams and selected NGO partners to deliver education and communication on key public health issues in PACs using media advertisements and talk shows on FM radio, through village health teams, placing posters and banners in public places (such as in health centres, local government offices, schools, police stations). Topics that will be covered will include, but will not be limited to:- Malaria prevention and management;- Hygiene and sanitation, including diarrhoeal disease prevention;- Indoor air pollution and household ventilation;- STI and HIV/AIDS prevention and management;- TB prevention and management;- Community Road safety (including messaging aimed particularly at children and delivered in partnership with local schools);- Access to clean and safe water;- Family planning (especially targeted at girls and young women);- Nutrition; and - Zoonotic disease including Emerging Infectious Disease delivered in partnership with the District Veterinary Officer. This		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents'HSE team	Regular audits, as detailed in the ESMP													X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					component will include information on the use of protective equipment when handling livestock, early diagnosis and treatment of infectious disease, vaccination programs, disposing of infected animals appropriately, appropriate sanitation practices, controlling for infestation of pests which can carry zoonotic infections; proper preparation of wild animal products before consumption (e.g. blood and meat should be properly cooked before eating); and raising awareness on human-to-human transmission of Emerging Infectious Diseases;																			
X	X	X	X	422	**Mobile Health Clinic** Assess feasibility of establishing a mobile clinic to provide healthcare services to communities in Buliisa District particularly those located remote from health centres. The equipment for the clinic would be provided by the Project and the clinic would be managed by the district health team. Specifically the project proponents would be responsible for undertaking the feasibility study for the clinic. If the project proponents can provide equipment for the set-up (i.e. fully equipped vehicle) the feasibility and sustainability of this measure will depend on input from national and local government stakeholders and/or community associations to provide resources for the ongoing operation and upkeep of mobile clinic (i.e. staff, fuel for vehicle, vehicle maintenance, medicine supplies, and replacing equipment when required). This will be established through an MoU between relevant parties		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					with potential support from donor organisations.																					
X	X	X	X	423	**Infection Prevention and Control Program** The Project Proponents will develop an Infection Prevention and Control Program to minimise the transmission of infectious diseases and to prepare for and prevent disease outbreaks. The Infection Prevention and Control Plan will include: • Requirements for health screening and vaccination of workers against common infectious diseases before admittance to the accommodation camps (provided for under the Labour Management Plan); • Sensitisation of workers and local communities on prevention and management of infections (delivered through wider education and communication campaigns for communities and workers); • Provide the District Health Team with information in regards to the identified infectious risks in the environment that Company medical team may have documented amongst the workers at the different facilities. The District Health Team will also be provided with the appropriate interventions undertaken by the Company. • Disease surveillance and rapid response measures developed in partnership with District Health Teams, local health centres, and the Office for the Prime Minister.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP), and Labour Management Plan	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP											X		X		
X	X	X	X	424	**Community Health monitoring and reporting:** The Project Proponents will also collaborate with the District Health Office and Ministry of Health to produce reporting on key community health and safety indicators (to be selected in partnership with government and NGO partners) in Buliisa		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					District, Hoima Municipality, Masindi Municipality, Pakwach Town Council and Purongo and Got Apwoyo sub counties;																					
X	X	X	X	425	**Human Rights Training for Security Personnel**: The Project will comply with the Voluntary Principles on Security and Human Rights. Project Proponents will agree a MoU with the Uganda Human Rights Commission (UHRC) or any relevant entity for provision of human rights training for all Project security personnel as well as local and regional security personnel in the Voluntary Principles on Security and Human Rights. The Project will also implement an incident reporting and investigation mechanism specifically covering incidents of excessive use of force by security personnel. Feasibility of implementing the mechanism via the Grievance mechanism will be explored.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP											X		X		
X	X	X	X	426	**Livestock Health:** The CHSSP will include provision of support for monitoring and surveillance of livestock health to identify any diseases that can be transmitted from livestock to humans. A monitoring and alert programme will be developed in partnership with District Veterinary Officer and District Health Teams.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X		X		
X	X	X	X	427	**Vector and Malaria Control Programme** will be developed and measures will be put in place and appropriately monitored to minimise the risk of malaria transmission. Resourcing requirements for implementation of activities under the Vector Control Programme will be met through employment of local staff as far as possible, provided they meet the requisite skills and education requirements. The Vector and Malaria Control Programme will include: • A Vector Control Policy,		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP), and Labour Management Plan	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X		X		

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					Management Plan and Standard Operating Procedures for vector and malaria control; • Measures to partner with government on malaria prevention through a Memorandum of Understanding (MoU). The MoU will include specifications that the Project Proponents will - Align their activities with the National Malaria Control Program. - Collaborate with District Health Offices to work with district vector control office, Community Extension Health Workers (When rolled out by MoH in Buliisa), Village Health Teams and Community-Based Distributors, and selected NGOs in the fight and treatment of malaria and other vector related disease.:. Measures to be considered may include application of selected insecticides for indoor residual spraying; larvae control programmes; distribution of insecticide treated nets (ITN) and initiatives to promote the correct use of ITN. - Undertake vector control awareness within public health and education facilities (e.g. use of screens, environmental management). - Review training needs and specific skills requirements for personnel involved in vector control. - Provide the District health office with monthly reporting on malaria cases among project workers in Buliisa District, Hoima Municipality, Masindi Municipality, Pakwach Town Council and Purongo and Got Apwoyo sub counties.																							
X	X	X	X	428	**Vector and Malaria Control Programme - Specifications for surveillance and monitoring of vectors and vector control activities in the community:**		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP), and	Project Proponents' HSE team	Regular audits, as detailed in the ESMP												X		X		

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					Sustained sensitization of the population on the causes and prevention of malaria (implemented through the health education programme delivered under the mitigation Health and wellness education and communication campaigns for local communities H1) with a focus on children by working with schools and educators;			Labour Management Plan																		
X	X	X	X	429	**Vector and Malaria Control Programme - Specifications for surveillance and monitoring of vectors and vector control activities within the workforce**; • Training specifications for all staff and contractors in vector control and malaria prevention and management; • Specifications for personal protection measures for all Project workers e.g. use of bed nets, limiting outside activity from dusk to dawn wherever possible, use of mosquito repellents particularly after dusk, use of chemoprophylaxis to decrease risk infection for non-immune personnel (i.e., workers from non-endemic areas); • Review of waste and water management practices against requirements to minimise pooling of water and avoid creation of vector breeding grounds as far as possible;		X	Labour Management Plan	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP											X		X		
X	X	X	X	430	Refresher training for Village Health Teams / Community extension workers.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X		X		

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X	X	X	X	431	**Economic Development of Project Affected Communities (PACs) to enhance their capacity to participate in the project supply chain** Project Proponents will, in consultation with local communities, government and civil society, consider investments to extend livelihood programs (targeting PAPs only) to the wider project affected communities, in order to improve food security and economic resilience of affected communities, develop local capacities and enhance activities such as fishing, crop farming, livestock farming, and trade, as well as programmes that support economic diversification. These programmes will be aligned with the strategic objectives outlined within the Project National and Community Content Programme and will as far as possible consider how affected communities can enhance their capacity to participate in the project supply chain, and how skills learned on the Project can be applied to other sectors in the local area. Specific training and job readiness support programmes that will be considered will include (but are not limited to): • Institutional capacity building (targeting local government, local institutions) • Adult Literacy and Numeracy (including Financial literacy) • Business management training and links to microfinance; • Vocational training and linkage to employment; • Food security and agriculture programs (irrigation, crops, vegetables, trees, honey, livestock, fishing); • Improve access to education and employability of youth and in particular girl & women empowerment		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP											X		X		

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					• Improve management of natural resources and access to energy • Improve access to health, water and sanitation • Social assistance for vulnerable groups																					
X	X	X	X	432	**Support to education to increase youth employability and improve adult literacy and numeracy**The Project will in consultation with relevant stakeholders (local communities and government, donor agencies, NGOs...), evaluate the feasibility and consider investments to support adult and children educational services provision in the project area to deal with the predicted growth in population and to enhance participation of the local population in the Project workforce and supply chain. The objective of educational support programmes will be to increase the completion rate of secondary school education thereby improving the employability of youths, and to improve adult literacy and numeracy which is a preliminary requirement for capacity building and development of vocational training. Interventions will be selected based on feasibility studies to identify how key challenges to existing education provision can be addressed. The feasibility and long term sustainability of this measure will		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents'HSE team	Regular audits, as detailed in the ESMP											X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					depend on government providing necessary resources and taking responsibility for ongoing management of the facilities (including staffing and upkeep of facilities), which will depend on availability of sufficient government funding (provided from local and national government). This will be established through an MoU between relevant parties with potential support from donor organisations.																					
X	X	X	X	433	**Financial literacy training and access to financial services for the local workforce and local businesses in the supply chain.** Inclusive training in financial literacy and financial management will be provided to the local Project workforce (targeting those unaccustomed to waged employment) including advice and assistance on how to open bank accounts, especially for savings. This aims to help employees to maximise the benefits of increased cash incomes and encourage re-investment of wages into productive activities or savings accounts. This will be provided with the assistance of a relevant local NGO or CBO or financial institutions and will be made available to employees and their families. The Project Proponents will work with suitable partners to facilitate the rollout of banking (mobile where possible) services in remote locations. Financial and business management training and advice will also be provided for local businesses that have expressed interest in participating directly or indirectly in the Project supply chain to promote local business development. Local businesses will be made aware about the opportunity to participate in the programme through announcements on local radio		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP											X				

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					and in local newspapers and will be required to meet minimum criteria (to be established as part of a feasibility study for the programme) for eligibility to participate in the training. The feasibility of expanding the programme to the wider local business community, to further enhance local business development, will be examined following the first phase of programme delivery targeted on the Project's direct and indirect supply chain.																			
X	X	X	X	434	**Institutional Capacity Building - Economic planning** Support capacity building for economic development planning, in partnership with international donors, to help national and local government plan the use of oil revenues during production to finance investments that will allow diversified economic growth.		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP													X				
X	X	X	X	435	**Institutional Capacity Building - Land use planning** The Project Proponents will provide support to the MLHUD and Buliisa District Government to develop a District Land use Plan through financing of a study that can be used as basis of such planning. The study will consider existing Land use and Land tenure, trends in Land use, and future Land use requirements including for Project infrastructure and for any mitigations required to off-set Project impacts, e.g. relocation Land, influx hotspots, and Land for biodiversity offsetting. The study will also identify areas that will benefit from improved accessibility across Buliisa District.		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP										X	X	X	X			X	
X	X	X	X	436	**Women and Girls capacity building programme:** Feasibility assessment for delivering a girls empowerment programme in partnership with suitable local organization to		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP												X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					build confidence of girls and women in PACs (e.g. education and sports programmes for girls).																					
X	X	X	X	437	**Community Environmental Conservation Plan** A number of environmental conservation initiatives will be undertaken in partnership with local communities, UWA, environmental and tourism organisations, following feasibility studies, to mitigate the project impacts and to give communities a sense of ownership over the management of their local environment and natural resources. Options that will be considered include but are not limited to: • Extension of tree nurseries; • Promotion of alternative fuel use e.g. solar technology, briquettes, fuel saving/ efficient cooking stoves business development; • Sensitisation on poaching and illegal fishing; • Sensitisation on the environmental consequences of deforestation, overgrazing, and over-harvesting of natural resources; • Community based fisheries management and monitoring programme that will entail engagement of communities through BMUs or other suitable local structures engaged in fisheries management e.g. beach landing sites to give them a sense of ownership over the management of their local environment and natural resources. Engage with UWA, National Fisheries Resources Research Institute (NaFirri), Ministry Agriculture, Animal Industry and Fisheries and Ministry of Defence to discuss options to support management and monitoring of fishing activities in Lake Albert and rivers within the Project Area		X	Community Environmental Conservation Plan (CECP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP								X	X	X	X			X	

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					e.g. through establishment and better management of protected zones, provision of equipment, advice on designing and implementing monitoring systems, joint training of communities on monitoring and conservation activities; • Sensitisation on the environmental consequences of deforestation, overgrazing, and over-harvesting of natural resources; • Community based tourism and conservation programs to develop alternative forms of income; and • Joint planning with environment and social teams to look at opportunities for both community forest use and use of tree plantations for conservation and to provide buffers around protected areas. This will draw on existing research. • Resettlement Action Plans (RAPs) will provide measures to avoid resettling people within or closer to sensitive habitats or protected areas in order to avoid placing any additional pressure on natural or critical habitats. Any longer term monitoring requirements related to this issue will be agreed with relevant Ugandan departments and international interested groups, where relevant.																					
X	X	X	X	438	**Community Wildlife Conflict Prevention:** The community-wildlife conflict prevention program will align with the goals and actions set out in the Community-Based Wildlife Crime Prevention Action Plan (2017-2023) prepared by UWA (April 2017). Specific actions include: - Sensitising workers about MFNP rules (Labour Management Plan); - Monitoring during all phases in support of rules enforcement; - Partnering with UWA to raise		X	Community Environmental Conservation Plan (CECP), and Labour Management Plan	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP									X				X	X	

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					awareness of MFNP rules amongst local communities especially in Nwoya district; and - Monitoring of the movement of key species (as per mitigation provided in Chapter 14 – Terrestrial Wildlife) will be undertaken. If it is found that species are encroaching into community areas outside the park suitable additional mitigation will be investigated and implemented. Any additional mitigation to address this issue will be developed in consultation with UWA and local communities.																		
X	X	X	X	439	**Community Natural Resources Enhancement:** The Plan will provide for extension of tree nurseries, including for trees with medicinal values, tree cover, honey for medical and other purposes.		X	Community Environmental Conservation Plan (CECP), and Labour Management Plan	Project Proponents' HSE team	Regular audits, as detailed in the ESMP									X					X	X	

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	440	**Project Road Safety and Transport Management Plan** The Project Proponents will establish a Project Road Safety and Transport Management Plan. All contractors will also be contractually required to develop their own Road Safety and Transport Management Plans in compliance with standards of the Project Proponents and with the overarching Project Road Safety and Transport Management Plan. Specific aspects that will be included in the Plan are: i. <u>An overarching policy statement</u> on Road Safety and Transport Management (compliant with IFC PS 4, Ugandan regulations and Project Proponent HSE standards). ii. <u>Traffic assessment:</u> A traffic assessment will be undertaken that will include: - Survey to collect existing baseline traffic data along project transport corridor; - Estimation of future baseline traffic flows (without Project); - Forecast cumulative vehicular trips along Project transport corridor; - Impact assessment of increased traffic flow; and - Identify location of key pedestrian (& cattle) road crossing points. iii. <u>Road maintenance</u> should be planned and implemented to keep the roads usable during site preparation and enabling works, and construction and pre-commissioning. A hand over plan will be developed to hand over responsibility for ongoing maintenance of roads to government for the Operations Phase onwards. iv. <u>Journey management plan and Route optimisation</u>: optimise logistics through maximising use of available vehicles and reducing number of		X	Road Safety and Transport Management Plan	Project Proponents' RSES and HSE team Project Contractors	A monitoring procedure will be developed to record driving performance, vehicle speeds, accidents and incidents outside the Project Area, and the need for additional training.										X					

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					trips; using convoys when appropriate. v. Minimising travel distances: As far as possible, sourcing materials close to the Project site to reduce haulage distances, and therefore the exposure to dust. vi. Maintaining speed limits as defined in the Land transportation procedure e.g. max. 40 km/hr for light trucks and 25 km/hr for heavy trucks transporting material in the Project Area. vii. Use of road signs: Providing temporary road signage during Project works. viii. Use of flag men: Deploying traffic guides (flag men) where necessary, particularly at high-risk locations and to manage road safe crossing points (for access to schools, access to health centres, cattle crossings, etc.…). ix. Project and Contractor Vehicle safety specifications, inspection and maintenance programs. x. Project and Contractor Driver: Sensitising drivers, emphasising the need to stick to designated routes and speed limits; all drivers will be required to complete and conduct refresher defensive driving training. All Project drivers will be required to comply with including a 'Code of Conduct' which forbids use of drugs or alcohol when on duty and strictly forbids Project drivers from using prostitutes while they are on a Project related journey. xi. Monitoring & Evaluation framework of the implementation of the Road Safety and Transport Management Plan with the definition of key performance indicators for inputs, outputs and outcomes.																						

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	441	**Community Road Safety**In conjunction with the Project Road Safety and Transport Management Plan, additional mitigation measures involving the affected community, local authorities and other project developers will developed, including (but not limited to):i. Community Transport Communication Plan (within the SEP): - Providing regular information to stakeholders regarding timing of the Project;- Use of the Grievance Mechanism, to allow recording and follow up of any complaints related to Project traffic and road maintenance; and- Safety briefings for all drivers entering the Project Area.- Coordinate with UNRA on scheduling of roadworks to avoid works on multiple roads taking place simultaneously in order to ensure reasonable access through Project Area for local communities is maintained at all times. ii. Road safety campaign and initiatives: Agree MoU with local government and Uganda Police about a road safety campaign that will include:- Sensitisation on road safety e.g. wearing seatbelt, respecting speed limits, not overloading vehicles, keeping safe distance from other vehicles, safe road crossing, dangers of driving under influence of drugs or alcohol, managing the presence of livestock and cattle crossing roads;- Targeted campaigns and provision of equipment to ensure that bicycle and motorcycle users wear appropriate protective helmets and reflective jackets'- Provision of equipment to traffic police to help monitor and enforce speed limits, verification of vehicle safety and driving licenses, use of protective helmets and other driving rules; andiii. Monitoring		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents'HSE teamProject Contractors	Regular audits, as detailed in the ESMP										X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					& Evaluation framework of the implementation of Community Road Safety initiatives with the definition of key performance indicators for inputs, outputs and outcomes.																					
X	X	X	X	442	**Influx Management Strategy** Development of an Influx Management Strategy to mitigate in-migration impacts and maximise benefits for local communities. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society. The Strategy will be built on the recommendations provided in the In-Migration Risk Assessment (Ref .16-11) and will set out the overarching approach and objectives for mitigating the negative impacts of influx and enhancing the benefits. The strategy will make reference to more detailed actions and procedures contained within other environmental and social management plans that are relevant to addressing influx. The strategy will also propose a specific monitoring & evaluation framework to measure Project-induced in-migration trends, hotspots and key social impacts throughout the site preparation and enabling works and construction and pre-commissioning phases. Specifically, the Influx		X	Influx Management Strategy	The Project Proponents Project Contractors	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation											X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					Management Strategy will include (but is not limited to): i. Working with local government in in-migration hot spots and building their capacity in dealing with impacts. ii. Reviewing the range of management plans which will deal with in-migration impacts and ensuring each Project department is putting in place the required measures. iii. Monitor in-migration impacts with local government and continue to provide capacity building support and report on findings to the Social Affairs Department. iv. The Project will roll out a series of education campaigns and capacity-building training to the PACs on a range of key in-migration impacts (e.g. the Project's Local Employment Procedure to anticipate conflicts over Project employment). v. Mechanism (implemented under Labour Management Plan) to verify where job applicants come from (e.g. checking ID cards) so that jobs prioritised for members of local communities are not given to in-migrants. vi. Provision for monitoring of local inflation e.g. price index - feasibility of extending the tool (Price indices) to Buliisa will be investigated. vii. Management of influx hotspots through support of public infrastructure																					
X	X	X	X	443	**Influx Management Strategy - Community content, economic development and livelihood plan** The project will set-up a Community content, economic development and livelihood plan with measures to mitigate impact of population growth and in particular increased pressure on farming areas, increased demand for crop products, increased pressure on grazing		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP									X		X	X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					areas, increased demand for fibres and ornamental resources and rise in harvesting pressure, and increased pressure on fisheries resources due to population growth including looking at ways of providing a registration scheme for the fishing industry (e.g. so only local people are registered and can fish).																						
X	X	X	X	444	**Influx Management Strategy - Community Health, Sanitation, Safety and Security Plan** The project will set-up a Community Health, Sanitation, Safety and security plan to - monitor water quality and use in PACs - monitor community health and safety impacts related to influx with the District local governments. - provide health and wellness education and communication campaigns programme for local communities in particular on the dangers of alcoholism, drug abuse, domestic violence, prostitution and safe sex. The plan will also include measures to - work with district health teams and health service providers in influx hotspots to identify gaps and provide capacity building measures amongst local health providers, - mitigate impact of increased demand for natural medicines and rise in harvesting pressures on medicinal plants and animals, - support Central Government working together with Buliisa District Authorities to implement a robust policing system to curtail the increasing criminal tendencies associated to increased influx.		X	Community Health, Sanitation, Safety and Security Plan (CHSSSP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP											X		X		

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X	X	X	X	445	**Influx Management Strategy - Masindi Check-point** Specific measures to assess the risk of and deter influx around Masindi check point including: - Operation of Masindi check point as a 'closed camp' following the same rules and procedures in place for other contractor accommodation camps; and - Engagement with Masindi district local government and local police force to discuss requirements to monitor illegal buildings, settlements, trading activities, and illicit activities within the vicinity of the Masindi check point. Support will be provided to facilitate monitoring activities based on an MoU between these parties and may include, for example, provision of vehicles or equipment (cameras, radios, sign posting etc.).		X	Influx Management Strategy	The Project Proponents Project Contractors	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation											X				
X	X	X	X	446	**Management of influx hotspots through support of public infrastructure:** The Project Proponents will, in consultation with relevant stakeholders (local communities and government, donor agencies, NGOs...), evaluate the feasibility and consider investments to improve access to and capacity of public infrastructure to meet the increased demand particularly in influx hot spots for the following key services: health, water, sanitation, education, etc. Investments will be based on feasibility studies and will align with government development plans and the land use plan (to be developed). The feasibility and sustainability of any measures to support improvement in public infrastructure will depend on input from national and local government stakeholders and/or community associations to		X	Influx Management Strategy	Project Proponents' HSE team	A monitoring strategy will be setup to measure the influx of workers and non-workers, to monitor the rate of expansion in migrant hot-spots in order to understand the rate of in-migration and to audit the actions and mitigation								X	X	X	X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					provide resources for the ongoing management, staffing and upkeep of such infrastructure. This will be established through an MoU between relevant parties with potential support from donor organisations.																						
X	X	X	X	447	**Labour Management Plan** A Project Labour Management Plan will be developed by the Project Proponents. All contractors will also be contractually required to develop their own Labour Management Plans in line with TEP Uganda standards. Necessary provisions will be provided in contracts to ensure compliance with the requirements set out in the Labour Management Plan, together with a monitoring system. The Project Labour Management Plan will include: i. An overarching policy statement on labour and working conditions (compliant with national laws and regulations, IFC PS 2 and ILO conventions). ii. Development of a comprehensive set of human resource policies, in line with national laws and regulations, IFC PS 2 and ILO conventions: - **Working Conditions and Management of Worker Relationship**, including: Working Conditions & Terms of Employment including minimum wages, working hours and rest time; Workers' Organisations and Freedom of Association; Non-Discrimination & Equal Opportunity; Retrenchment; Anti-harassment and Management of Grievances (Employee Grievance Mechanism for all workers; - **Recruitment**: Measures to provide for a transparent, fair and non-discriminatory and		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP										X		X		

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					ethical recruitment processes, which is developed in consultation with local communities and local government, will be provided; This shall also include measures to avoid unethical recruiting practices of migrant workers, and the recruitment policy and procedure shall clearly indicate in clear terms that the confiscation of identity documents by the employer is strictly forbidden. - **Protection of the Workforce**, including measures to identify and avoid child labour and forced labour, - **Occupational Health & Safety** including the provision to all employees and workers of PPE in good condition and free of charge; - **Workers Engaged by Third Parties**; and - **Procurement and the Supply Chain**: auditing of third parties who use subcontracted workers to make sure they are reputable and legitimate and have an appropriate Environmental and Social Management System (ESMS) that will allow them to operate in a manner consistent with the Project's requirements. Requirements should be incorporated into contractual agreements with third party employers. Due diligence to ensure that the Project does not inadvertently support, via its primary suppliers, child labour or forced labour, by including such wording in terms and conditions of business, and ensuring that it is part of all future contractual agreements. Where risks of use of child labour or forced labour are considered significant, the Project will institute a program of periodic monitoring and inspection of main suppliers' facilities. In cases where the Project's influence over suppliers																								

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					is limited, suppliers should be informed that future contracts will be dependent on these issues being addressed. iii. Procedures to manage the issues in point (b) will be developed. These will be clearly written, explaining step-by-step how Human Resources (HR) policies will be implemented. All of the above should be clearly communicated to workers at all levels of the company, in languages that they can understand.																					
X	X	X	X	448	An **employee whistleblowing system** will be established by the Project and its contractors to provide a confidential mechanism to report any cases of bribery and corruption, or labour rights infringements within the workforce.		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP													X			
X	X	X	X	449	The project and its contractors will implement a **Workforce Code of Conduct**, including (but not limited to) the following specifications: - Most project workers will reside at the Project camp where services like meals, waste management services and clean water will be provided, minimising need for worker interaction with local communities. - Requirement that all workers (direct and contracted) must do Anti-Bribery and Corruption and Ethics and Compliance training annually. - Cultural awareness induction training for all new staff regarding local customs, traditions and responsible community relations. - Ban on alcohol and drug use for workers - Rules to forbid staff/contractors from purchasing charcoal & provide sensitisation against unsustainable use of firewood		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP									X		X	X			

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					and charcoal. - General site rules will include ban on bushmeat hunting/purchase for employees and employee sensitisation against bush meat hunting/purchase (Within component on environmental awareness training).																						
X	X	X	X	450	The Project and its contractors will provide a **Retrenchment Plan**: to include analysis of alternatives and measures to minimise adverse impacts of collective dismissal including notification of public authorities, and provision of information to and consultation with workers and their organisations.		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP												X			
X	X	X	X	451	The project will provide a **Workforce Accommodation Plan** consistent with national and international guidelines (IFC, WB, EBRD). Provisions will be included within the supply chain management component of the Labour Management Plan to perform an HSE and sanitation check of contractor/sub-contractor accommodation outside the construction camps directly managed by the Project proponents or primary contractors, within the Project Area of Influence.		X	Labour Management Plan	Project ProponentsProject Contractors	Regular audits, as detailed in the ESMP												X		X		
X	X	X	X	452	The Project will update its **Community Employment Procedure** to manage local recruitment via clear, transparent process which will be compliant with Code of Conduct and to anticipate conflicts over Project employment. The Community Employment Procedure will set out the processes to: - Appointment of Community Employment Officers (respectively within the Project Proponents' CTLO team and the contractor CTLO teams) who will have responsibility for enhancing		X	National and Community Content Strategy / Framework, Community Content, Economic Development and Livelihood Plan (CCEDLP) and Labour Management Plan	Project Proponents Project Contractors	A monitoring mechanism for national and community content will be developed and implemented.												X			

PHASE				No.	Mitigation Measures - Master List	EMBEDDED MITIGATION	ADDITIONAL MITIGTAION	Relevant Plan	Responsible Person/ Organisation	Monitoring Requirement	Mitigation measure relevant to which topic															
Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					opportunities for local communities to benefit from employment opportunities created by the Project, e.g. through regular disclosure of information on employment opportunities and a fair, transparent and ethical recruitment processes, and to monitor and report back to relevant stakeholders on local content in a transparent way. - Verify where job applicants come from (e.g. checking ID cards) so that jobs prioritised for members of local communities. - Prioritisation of PAPs (first) and local residents (second), as far as possible, for local employment opportunities particularly where semi-skilled and non-skilled work is needed. - Fill vacancies for unskilled labour, semi-skilled labour from the Project Areas through a transparent and fair process that takes into consideration gender balance, equal opportunities should be given to women where feasible – some opportunities should be reserved for women where feasible. - Measures will be undertaken to engage marginalised groups including women and disabled, to allow the opportunity for employment benefits to reach all parts of local communities. - Provide a measure to ensure that anyone signing a contract for work understands the content of the contract they are signing. - The local recruitment processes will include but not limited to: adverts on radio, print, and notice boards.																							
X	X	X	X	453	**Training certification system**: Successful completion of training and attainment of competency in new skills will be formally recognised through a certification system. This system will also help trainees find work		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP											X				

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					elsewhere upon termination of employment on the Project. In addition, on-the-job training in simple tasks will be certified.																					
X	X	X	X	454	Measures to ensure gender-fair hiring and workplace policies. This will include development of a **Diversity Implementation Procedure,** enforcement of a zero-tolerance policy on sexual harassment, equal pay for men and women who perform the same jobs, and provision of maternity and paternity leave in line with national requirements.		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP												X				
X	X	X	X	455	The project and its contractors will foster partnerships with local government and civil society to promote healthy work environments and Project Proponents will sensitise local communities about labour rights.		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP												X				
X	X	X	X	456	**HIV Workplace Policy**: The Project Proponents will partner with the Ministry of Health (specifically the AIDS Control Program and Uganda AIDS Commission) and District Health Teams to develop a site specific HIV Workplace Policy for the Project that is aligned with the International Labour Organisation (ILO) HIV workplace policy as well as national requirements for HIV workplace policy.		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP												X				
X	X	X	X	457	**Workforce Health monitoring and reporting:** Disease cases amongst the Project workforce will be monitored and procedures will be put in place for notification to relevant government health agencies and programmes of cases (including the National TB Control Program, Malaria Control Program, AIDS Control Program, and Onchocerciasis Program); All primary and secondary contractors will implement a health surveillance programme for personnel working in areas where occupational exposures are close to or might exceed		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP												X		X		

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					occupational exposure limits. Should the surveillance programme indicate any potential problem, further mitigation measures will be sued to reduce exposure levels.																					
X	X	X	X	458	**Occupational Health and Safety Management measures:** All Project staff, including contractors, will be subject to the Project Proponents' Workplace HSE Policies and Standards and the Project's overall HSE Management System – this will be specified in contracts and contractors' capacity to meet these standards will be assessed as part of the tendering process. Special emphasis shall be placed on Malaria Management, Medical Fitness for Contractor and Subcontractor employees, and Land Transportation. Contractors auditing will be done to check compliance with Corporate standards and Ugandan regulations on a regular basis at each phase of the Tilenga Project and throughout Life Of Field. Specifically, contracts will include the following: All primary and secondary subcontractor contracts will specify H&S performance and monitoring requirements through training, site visits, audits, etc. Verification of the effectiveness of prevention and control strategies will include: • Safety inspection and testing of all safety features and hazard control measures and calibration of monitoring equipment; • Surveillance of the working environment; • Surveillance of workers health as appropriate; • Record of training provided to employees, contractors and visitors; • Reporting and investigation of all occupational injuries and near misses, suspected cases of		X	Labour Management Plan	Project Proponents Project Contractors	Regular audits, as detailed in the ESMP											X		X		

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					occupational disease and dangerous occurrences and incidents; All contractors and subcontractors will follow the Project's incident reporting requirement for the documentation and reporting of occupational accidents, diseases and incidents. Investigation of incidents should establish what happened, determine the cause and identify measures to prevent recurrence; All workers (including contractors and subcontractors) will have contracts that clearly state the H&S terms of their employment and their legal rights. This will include requirements to undertake as per project proponents specification mandatory medical fitness examination prior to and during contract execution, mandatory declaration of any pre-existing medical conditions, and commitment to undertake chemoprophylaxis as part of malaria management. Mandate to stop any job they feel is unsafe- without fear of reprimand, In addition, report all anomalies and unsafe situations, participate in H&S inductions and training, adherence to the H&S reporting system and access to an employee grievance mechanism to allow workers to report grievances related to insufficient OHS standards; Identification of potential hazards to workers will be undertaken prior to the start of each phase and periodically during each phase and appropriate mitigation/controls specified; All contractors and subcontractors working or staying at Project sites will follow the Project's procedures for emergency preparedness and																							

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					response; and all primary and secondary contractors will implement a health surveillance programme for personnel working in areas where occupational exposures are close to or might exceed occupational exposure limits. Should the surveillance programme indicate any potential problems, further mitigation measures will be used to reduce exposure levels.																					

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X	X	X	X	459	**A National and Community Content Strategy (NCCS)** for the Project is under development, which aims to increase local economic participation and increase local business access to contract opportunities. The ongoing stakeholder engagement programme will include engagement with local business associations, local and national government to jointly discuss the National and Community Content Strategy **The NCCS will incorporate the following key points:** i. A clear set of objectives and milestones on employment and training of National citizens for the Project. ii. A clear set of objectives and milestones on procurement of Goods and Services from Ugandan companies, registered entities and Ugandan citizens for the Project iii. A clear set of objectives and milestones for Technology Transfer, including capacity building, support to education and training,etc. Creation of joint-ventures and partnerships will be promoted between national and international companies to foster technology transfer and capacity building in O&G. **Alignment with government strategies including:** - Business Education, Technical Education, Vocational Education (BTVET) Policy and Strategic Plan 2011-2020, which provides for skilling Uganda with a special focus on the oil and gas sector; and - Skilling Uganda Technical, Vocational Education and Training (TVET) Reform Policy, which seeks to provide and enable technical institutes and polytechnic colleges to provide technical vocational training based on industrial needs and		X	National and Community Content Strategy / Framework	Project Proponents Project Proponents' Contractors	A monitoring mechanism for national and community content will be developed and implemented.											X				

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					the needs of specific sectors. **A Skills Development Programme under the National Content Plan will be defined and will include:** - Assessment of capacity development needs to ensure local businesses are able to deliver to required standards; - Requirements for educational and skills development and means to help meet the requirements will be detailed The Project Proponents and contractors will work with the sector skills council of the Uganda Petroleum Institute, Kigumba and other education & training institutions to review courses and curricula and to modify them to fit to the sector needs and demands through the Tilenga "Train the Trainers" programme. **Promotion of the Industrial Enhancement Centre:** Establishment of supplier linkage program in partnership with government, development partners and local NGOs and CBOS to help local businesses to access skills development programs particularly technical mentoring and business development skills. **Labour & Supplier Mobility Strategies:** - Development, in partnership with GoU and other relevant industry stakeholders, a labour mobility strategy (looking at options for redeploying skilled professionals from oil and gas industry to other fields); and - Development, in partnership with GoU and other relevant industry stakeholders a strategy for redeploying suppliers to other industries in Uganda or foreign markets, which demand similar goods and services. When selecting priority sectors for national content development, the programme will consider the																							

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					possibility of using products of these sectors in other industries in Uganda and/ or overseas. **NCC Monitoring & Evaluation:** Ongoing monitoring and reporting of implementation of local employment procedures will be undertaken; and - Monitoring and reporting of local procurement impacts using business activity and output indicators including value of goods and services procured locally, regionally and nationally; number of local suppliers; number of employees hired by local suppliers; and local procurement as a percentage of total procurement.																					
X	X	X	X	460	**National supplier development program aiming at building capacity at national level will be encouraged and monitored:** - Mapping of local businesses to identify their capabilities and identify which businesses could benefit most from opportunity to participate in local supply chains; - Criteria will be developed to identify opportunities and scopes of work that would best fit local, regional and national procurement; - Goods and services will be procured from local communities		X	National and Community Content Strategy / Framework	Project Proponents Project Proponents' Contractors	A monitoring mechanism for national and community content will be developed and implemented.											X				

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					where feasible and available, and following a risk assessment of potential indirect impacts (i.e. related to food security for example); - Capacity building will consider opportunities for local suppliers to supply to the Project as well as other clients and markets; - Adoption of tendering and procurement documents to suit local businesses as far as possible within the standards required for the Project;																			
X	X	X	X	461	**Regional / Community supplier development program aiming at building capacity at local level will be encouraged and monitored:**- Mapping of local businesses to identify their capabilities and identify which businesses could benefit most from opportunity to participate in local supply chains; - Criteria will be developed to identify opportunities and scopes of work that would best fit local, regional and national procurement;- Goods and services will be procured from local communities where feasible and available, and following a risk assessment of potential indirect impacts (i.e. related to food security for example);- Capacity building will consider opportunities for local suppliers to supply to the Project as well as other clients and markets; - Adoption of tendering and procurement documents to suit local businesses as far as possible within the standards required for the Project;		X	Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents'HSE teamProject Contractors	Regular audits, as detailed in the ESMP											X				
X	X	X	X	462	All contractors will be required to develop their own National and Community Content Plans that align with the overarching NCCP for the Project and must be able to demonstrate measures and staff organisation they will implement to comply with the Project's overarching NCCP. The Project Proponents		X	National and Community Content Strategy / Framework, Community Content, Economic Development and Livelihood Plan (CCEDLP)	Project Proponents Project Proponents' Contractors	A monitoring mechanism will be developed and implemented.											X				

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					and contractors will work with local and national government to develop a human resources database detailing skills and education levels available locally. This database will be consulted to identify the maximum number of locally available candidates for roles. Project Proponents and contractors will deliver a skills training programme to enhance employability of the local workforce.			and Labour Management Plan																
X	X	X	X	463	Information campaigns will be incorporated into the Stakeholder Engagement Plan on the Project's local employment policy and procedure. The Grievance Mechanism Procedure will include measures to record, respond to and monitor grievances related to employment and recruitment.		X	Stakeholder Engagement Plan	The Project Proponents Project Contractors	Regular audits, as detailed in the ESMP												X				
X	X	X	X	464	**Community Cultural Heritage & Archaeology** Support cultural activities and enhance the preservation and awareness of cultural heritage and traditions including language. The focus of programme activities will be identified through consultation with local communities and cultural leaders and will take into consideration recommendations included in the 2017 'guidelines by cultural institutions for oil and gas'. Where appropriate, outreach activities will be undertaken to involve local communities, particularly schoolchildren, in understanding and caring for their past.		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP														X	X			

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X	X	X	X	465	**Cultural Heritage and Archaeological Management Plan** The mitigation of archaeology and cultural heritage within the Project Area will involve a range of standard mitigation measures adhering to national and international best practice. Management, monitoring and reviewing systems, will be put in place by developing and implementing a Cultural Heritage and Archaeological Management Plan (CHMP) and a Chance Find Procedures (CFP). These will aim to avoid or minimise impacts during construction and operation and assure the systematic stewardship of archaeology and cultural heritage. The CHMP will set out the potential impacts that may arise during the pre-construction, construction and operation stages of the Project, mitigation to be implemented prior to or during works, the Chance Finds Procedure to be adopted during this phase of works and the staff cultural heritage awareness training to be undertaken. The CHMP and CFP will be developed in collaboration with the Department of Museums and Monuments, setting out the system for minimising and mitigating impacts on cultural heritage and developing a clear cultural heritage alert and notification process. The CHMP will be implemented, maintained and developed throughout all Project phases, monitoring its implementation and adapting it to any changing circumstances. **Archaeological and Cultural Heritage protection measures will include**: • Develop and implement Cultural Heritage and Archaeological Awareness		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP										X	X			

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					Training; • Fixed traffic routes (one-track or single-track policy); • Flagging of vulnerable sites; • Erosion prevention through re-vegetation. **Archaeological and Cultural Heritage mitigation measures will include (and also refer to the CFP)**: • Archaeological investigation and recording, including Archaeological test-pit evaluation; Archaeological investigation and recording (excavation); Archaeological watching briefs alongside some groundworks; Preservation in situ of significant archaeological sites, where necessary; and Appropriate expert assessment, analysis and reporting on fieldwork. • Relocation of graves; • Relocation of sacred sites (household family shrines); • Relocation of sacred sites (clan sites, sacred water bodies and sacred trees); • Stakeholder Capacity building in archaeology and cultural heritage management; and • Stakeholder Capacity building in museum development, linkage to existing and planned schemes for sustainable development and tourism in the regions, and sustainable planning and conservation initiatives.																						
X	X	X	X	466	All contractors involved in land excavation, site preparation and surface clearing work during the construction phase will be required to develop their own Cultural Heritage and Archaeological Management Plan and associated Skills & Training Programme that align with the overarching CHMP and CFPr for the Project and must be able to demonstrate measures they will take to comply with the Project's overarching CHMP.		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP											X	X			

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X	X		X	467	**Cultural Heritage Training Programme** An appropriate Cultural Heritage Training and Capacity Building Program will be developed and implemented for the Project: • Project and contractors staff are to receive Cultural Heritage Training which will include training in community relations, respect of local cultural norms and the Chance Find Procedure. A record of staff training is to be maintained. Project and contractors staff will be trained to identify items of potential archaeological importance, and to implement Chance Finds Procedures. Driver training will include an element of cultural heritage awareness training, which will encourage them to stay on marked tracks and adhere to signage. When operating in the vicinity of known palaeontological, archaeological and cultural heritage sites, staff toolbox talks will highlight the sensitivity of heritage and reiterate the CFPr. • It is recommended that fieldwork involves a component of training and capacity building of university students and employing them as assistants to give them field experience, developing local skills and capacity in rescue archaeology. Students will be employed alongside the experienced professional archaeologists who will design, lead and undertaken the archaeological mitigation works. This is necessary for the efficient unfolding of the Project, given that there will be a long-running construction programme and there are a very limited number of skilled Ugandan/regional experts. Lack of available skilled staff has potential to delay works and/or result in breach of permitting/regulations. This is		X	Cultural Heritage and Archaeology Management Plan (CHMP), and Labour Management Plan	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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					should be developed alongside specifying the construction and mitigation tender/contract, and developing cultural heritage elements of ongoing social programmes.																					
X	X		X	468	**Flagging of vulnerable sites** Any vulnerable sites will be protected with temporary flagging in the first instance. In the case of cultural sites, this will be subject to the consent of the site guardians. Short-term flagging or fencing would involve tall metal stakes / pins, painted used tyres, or other suitable materials used to identify sensitive sites. Such fencing will follow the operative site warning colour codes and must be subject to regular inspections and maintenance. Project and contractor staff cultural heritage awareness training and toolbox talks will be undertaken to prevent interference with flagged sites. All staff will be informed of their presence and instructed not to interfere with fencing or archaeological sites.		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			
X	X		X	469	**Erosion prevention through re-vegetation** Increased erosion may occur as a result of vegetation clearance over sites. For sites with fossils or archaeological artefacts, this could result on exposure of specimens or artefacts previously protected by cover. It may be necessary to re-vegetate areas of erosion with appropriate planting to ensure that any specimens or artefacts previously exposed by		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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					vegetation clearance are available to be retrieved for future study.																					
X	X		X	470	**Relocation of graves from Land Acquired for the Project** The Project Proponent will identify the caretakers of the dead and agree on the modalities to exhume and rebury the dead to an alternative location. The Project Proponent will consult with affected families, including any known descendants, and caretakers of burial grounds. The Project Proponent will provide customary ceremonial assistance for grave relocation. In liaison with the affected families, the Project Proponent will meet all costs for performance of appropriate cultural ceremonies; the removal, transportation and burial of remains and any other paraphernalia; burial related expenditure. Mitigation will apply to family graves identified during asset surveys. Unmarked graves identified through the chance find procedure will not qualify for ceremonial assistance, but will be exhumed and reburied at an appropriate local cemetery with due respect and ceremony, in accordance with Ugandan law and local customary practices		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.												X			
X	X		X	471	**Relocation of graves from other areas (unexpected land intake, other project impacts requiring mitigation...)** The Project Proponent will identify the caretakers of the dead and agree on the modalities to exhume and rebury the dead to an alternative location. The Project Proponent will consult with affected families, including any known descendants, and caretakers of burial grounds. The Project Proponent will provide		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					customary ceremonial assistance for relocation. In liaison with the affected families, the Project Proponent will meet all costs for performance of appropriate cultural ceremonies; the removal, transportation and burial of remains and any other paraphernalia; burial related expenditure. Mitigation will apply to family graves identified during asset surveys. Unmarked graves identified through the chance find procedure will not qualify for ceremonial assistance, but will be exhumed and reburied at an appropriate local cemetery with due respect and ceremony, in accordance with Ugandan law and local customary practices																					
X	X		X	472	**Relocation of sacred sites from Land Acquired for the Project** The Project Proponents will consult with leaders of affected clans or communities to ensure appropriate transfer of the cultural properties, to establish their requirements for the ceremonies that will need to be performed, to ensure continued accessibility for the clan members, and to facilitate the conduct of ceremonies and rituals prior to relocation. The selection of replacement sites should take into consideration linkages with the affected and relocated households.		X	Resettlement Action Plan (RAP) and Livelihood Restoration Plan	Project Proponents' HSE team	Monitoring day-to-day resettlement activities and tracking the progress in meeting predicted or scheduled resettlement milestones.												X			
X	X		X	473	**Relocation of sacred sites from other areas (unexpected land intake, other project impacts requiring mitigation...)** The Project Proponents will consult with leaders of affected clans or communities to ensure appropriate transfer of the cultural properties, to establish their requirements for the ceremonies that will need to be performed, to ensure continued accessibility for the clan members, and to facilitate the conduct of ceremonies and		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operation	Decommissioning								Project Description	Air Quality	Noise	Soils	Groundwater	Surface Water	Landscape and Visual	Waste	Terrestrial Vegetation	Terrestrial Wildlife	Aquatic Life	Social	Archaeology and Cultural Heritage	Health	Ecosystem Services	Unplanned Events
											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
					rituals prior to relocation. The selection of replacement sites should take into consideration linkages with the affected and relocated households.																					
X	X		X	474	**Relocation of places of worship from Land Acquired for the Project**The Project Proponent will consult with the leaders of places of worship and affected congregations and communities to establish their requirements and ensure appropriate relocation. Should any places of worship impacted by Project activities need to be relocated, compensation and support in relocating religious buildings, holding consecration ceremonies and assuring continued access to places of worship will be undertaken. The selection of replacement sites should take into consideration linkages with the affected and relocated households.		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents'HSE team	Regular audits, as detailed in the ESMP												X			
X	X		X	475	**Relocation of places of worship from other areas (unexpected land intake, other project impacts requiring mitigation...)** The Project Proponent will consult with the leaders of places of worship and affected congregations and communities to establish their requirements and ensure appropriate relocation. Should any places of worship impacted by Project activities need to be relocated, compensation and support in relocating religious buildings, holding consecration ceremonies and assuring continued access to places of worship will be undertaken. The selection of replacement sites should take into consideration linkages with the affected and relocated households.		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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											4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X	X	476	**Chance Find Procedure (CFP)** All chance finds will be reported, adequately protected with temporary flagging and promptly assessed by a qualified archaeologist. The CFP shall apply to any archaeological sites of interest that may be discovered during site preparation and early works, construction and pre-commissioning, commissioning and operation, as well as any stray finds or portable objects found within wellpads, or in the footprint of associated infrastructure and facilities. A CFP will be prepared, setting out actions to be taken in the event that suspected archaeological artefacts or palaeontological items are encountered. The CFP will be used only areas that are not accessible for archaeological evaluation and mitigation prior to intrusive groundworks. If a chance find appears to be of archaeological, palaeontological, ethnographical, historical and/or traditional interest, the Project proponent must notify the appropriate authorities of the find and request expert verification. Where appropriate, the local community will be notified in accordance with the Stakeholder Engagement Plan, subject to security considerations. The Department of Museums and Monuments (Commissioner of Antiquities) and the District Local Government will be notified within 14 days; While awaiting recommendations from authorities, the discovery will be protected; Appropriate post-excavation conservation, analysis, archiving, reporting, publication and dissemination will be undertaken. No culturally significant archaeological or historical sites, remains or		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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					objects accidentally discovered during groundworks, excavation or construction shall be disturbed until appropriately investigated. It is recommended that a team of trained and experienced professional field archaeologists are retained on site during all groundworks (including road construction and pipeline excavation) in order to undertake watching briefs on groundworks and to respond to any reported chance finds.																			
X	X	X	X	477	**Archaeological investigation and recording** A detailed walkover survey and, if required, test pit evaluation of the final project locations should be undertaken as part of a post-ESIA Setting Out/ Pre-Construction Ground Clearance Survey. This work should be undertaken by a qualified and experienced archaeologist accompanied by local cultural guides. Additional avoidance, control and mitigation measures will be agreed with the Uganda Department of Museums and Monuments. The locations, working methods and schedule of this work will be set out in the CHMP. All coordinates of the sites and find spots identified during baseline data collection will be forwarded to the Department of Museums and Monuments to enable them to update their databases. Where there are no reasonably feasible alternatives, palaeontological and archaeological sites will be recorded and removed using the best available techniques (permanent removal). These sites will be mitigated by recording in programmed,		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team Project Contractors	Regular audits, as detailed in the ESMP												X			

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					professional investigations undertaken. Nationally and internationally recognised practices for the protection, field-based study and documentation of the cultural heritage will be implemented. Consultation will be undertaken with local communities at the time of excavations to integrate any relevant information from their experience of living in the area. A programme of archaeological investigation will maximise the scientific research dividend in order to off-set the loss of the archaeological resource. A detailed scope of works, including a comprehensive archaeological research design, and a phased programme, will be prepared as part of the documentation involved in applying for a permit for archaeological field investigation. Archaeological fieldwork will be approved, permitted and supervised by the Department of Museums and Monuments and Uganda Museum. Archaeological sites will be mitigated subject to a general fieldwork permit negotiated for the entire scheme. Fieldwork will be led by a Project Archaeologist. Archaeological fieldwork will be followed by finds processing and conservation, assessment, analysis, scientific dating, reporting, illustration, accessible publication, dissemination of results and long-term curation of the archaeological excavation archive and the museum curation and display of finds.																								
X	X	X	X	478	**Monitoring of cultural heritage and archaeology management** The Project Proponents shall regularly undertake audits and inspections, which will be set out in the CHMP and CFPr.		X	Cultural Heritage and Archaeology Management Plan (CHMP)	Project Proponents' HSE team	Regular audits, as detailed in the ESMP													X			

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X	X	X	X	479	**Tourism Management Plan** A Tourism Management Plan that sets out objectives and procedures for managing relationships with and working with key tourism stakeholders to minimise potential negative effects of the Project on tourism and maximising benefits will be developed by the Project Proponents. All contractors and sub-contractors will be required to follow the measures and procedures set out in the plan. The Tourism Management Plan will include the following components: i. Communication Plan: to set out the requirements for regular engagement with tourism stakeholders (including UWA and tourism businesses) to: - notify them of upcoming Project activities especially those that may affect the peak tourism season (e.g. transport); - provide a mechanism to get regular feedback from them about the Project and the effectiveness of mitigation measures intended to avoid impacts on tourism; - notify them of the Grievance Mechanism; - notify them of Project contact details including those of an appointed tourism officer from within the CTLO team; and - Produce information pamphlets for visitors to the National Park that outline the activities taking place during each phase of the Project. Pamphlets should be provided to lodges and at entrances to the National Park. ii. Feasibility study of alternative tourism routes: the Project Proponents will, in partnership with UWA, Wetlands Management Department (WMD) and Ministry of Tourism, undertake a feasibility study of opening up alternative tourism routes within and outside the		X	Tourism Management Plan	Project Proponents	Regular audits, as detailed in the ESMP										X			X	X

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					park such that tourism activities and Project activities can be separated as far as possible. iii. Visitor Centre: the Project Proponents will assess the feasibility of opening a visitor centre at a central tourism location (e.g. the Paraa ferry crossing or the Masindi gate) to provide information to tourists and visitors about the Project including about how it is working with UWA to manage impacts in the park and enhancement measures being implemented to protect and promote biodiversity and support local communities. iii. Educational visits: the Project Proponents will assess the feasibility, in consultation with contractors, MEMD, UWA, ministry of education, and universities, of using the Project to provide educational opportunities for students and other technical specialists through visits to Project facilities. iv. Tourism promotion strategy: the Project Proponents will support tourism stakeholders to develop a strategy to promote tourism nationally and internationally through a communication campaign that advertises the areas of MFNP unaffected by Project activities as well as the wider area's attractions e.g. Ramsar sites. v. Monitoring: Regular monitoring of impacts on tourism will be undertaken such as through surveys of tourists post-visit, particularly during the peak tourist season, to understand their perceptions of the Project. The adequacy of the existing tourism baseline will be assessed as a basis for future monitoring and updated if necessary.																						
X	X	X	X	480	**Support for UWA:** If significant impacts on tourism which result in loss of revenue are identified (through a detailed assessment		X	Tourism Management Plan	Project Proponents	Regular audits, as detailed in the ESMP												X			X	

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					conducted by a suitable and qualified organization selected by the project proponent), options to provide in-kind support UWA in the management of MFNP will be assessed (in compliance with project anti-bribery and anti-corruption policies).																					
X	X	X	X	481	Where generation of noise or vibration in excess of regulatory limits is deemed unavoidable, the Project Proponents will obtain a licence to permit noise or vibration in excess of permissible limits		X	Noise and Vibration Management Plan	Project Proponents	A detailed monitoring programme will be produced at pre-identified locations to an appropriate method.			X													
X	X			482	Temporary land access will be managed in compliance with the requirements specified in the Project Proponents procedure		X	Temporary Land access procedure	Project Proponents and Project Contractors													X				
X	X	X	X	483	Consider the tourism peak activities (as identified in the baseline) when scheduling project activities as much as practicable		X	Tourism Management Plan	Project Proponents	As defined in the ESMP											X			X	