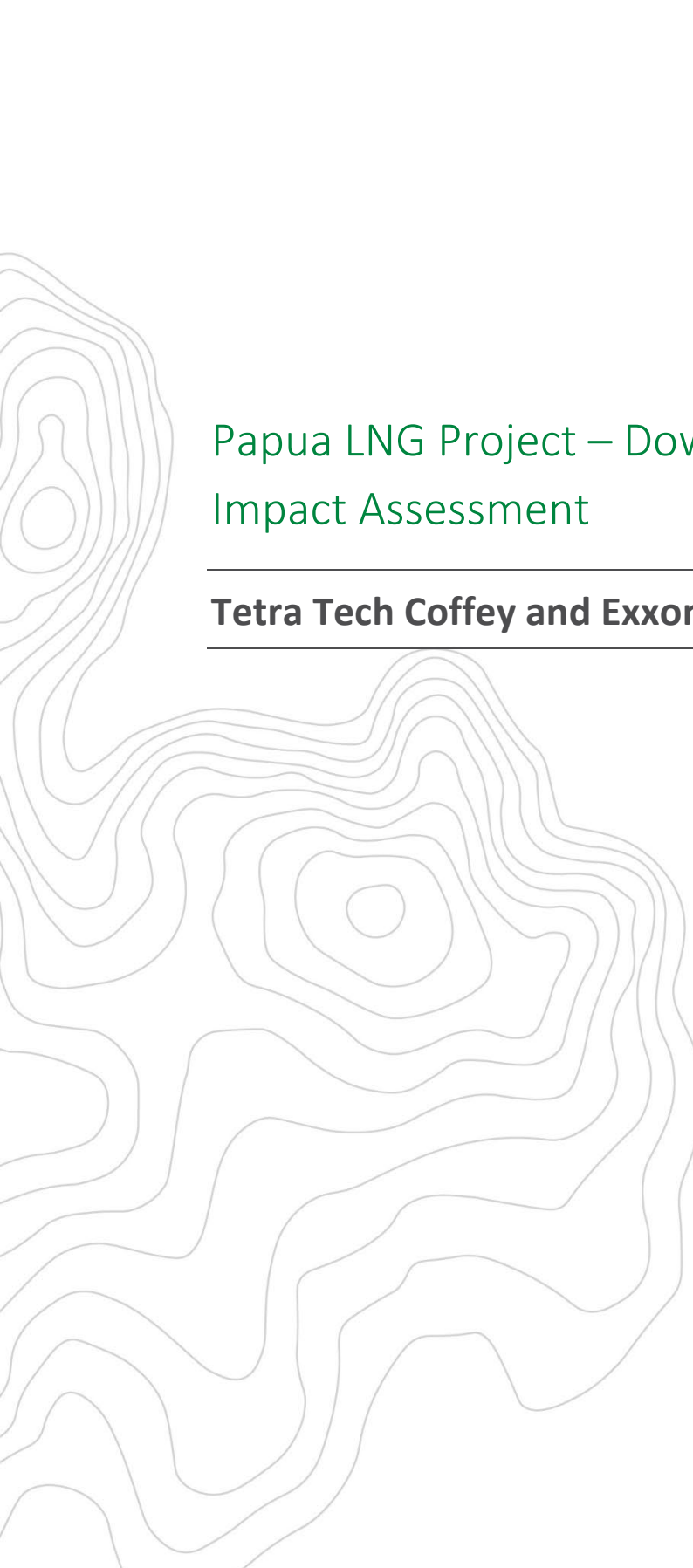


A stylized topographic map with green contour lines is positioned on the left side of the page, extending from the top to the bottom. The lines represent elevation, with some forming circular peaks and others following a winding path.

Papua LNG Project – Downstream Cultural Heritage Impact Assessment

Tetra Tech Coffey and ExxonMobil PNG Antelope Ltd

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Prepared by	Michael Green
Reviewed by	Zak Jones (ELA) and Dr John Muke (SRI)
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Template 2.8.1

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Abbreviations

Abbreviation	Description
AGX	Association Gas Expansion project
AMSL	Above mean sea level
BP	Before present (years)
C	Celsius (degrees)
CA	Community Affairs (EMPNG)
CEPA	Conservation Environment Protection Authority (PNG)
CHMP	Cultural Heritage Management Plan
E	East
EIS	Environmental impact statement
EMPNG	ExxonMobil PNG Limited
EMPNGA	ExxonMobil PNG Antelope Limited
ESIA	Environmental and social impact assessment
ENE	East-northeast

Abbreviation	Description
ESE	East-southeast
GPS	Global positioning system
h	Hour
ha	Hectare(s)
IFC	International Finance Corporation
LNG	Liquified natural gas
km	Kilometre(s)
kt	Knots
m	Metre(s)
mm	Millimetre(s)
Mtpa	Million tonnes per annum
N	North
NCC	National Cultural Commission (PNG)
NE	North-east
NMAG	National Museum and Art Gallery (PNG)
NNE	North-northeast
NNW	North-northwest
NSF	National Site File (NMAG)
NW	North-west
PNG	Papua New Guinea
ROW	Right of way
S	South
SRI	Social Research Institute
SSE	South-southeast
SSW	South-southwest
Total	Total E&P PNG Limited
W	West
WNW	West-northwest
WSW	West-southwest

Executive Summary

INTRODUCTION

Background

The proposed Papua LNG Project is a gas development project for the Papua LNG Project Joint Venture participants:

- TotalEnergies EP PNG Limited (TotalEnergies, an affiliate of TotalEnergies SA)
- ExxonMobil PNG Antelope Limited (EMPNGA) and ExxonMobil PNG Elk Limited
- Pac LNG Assets Limited, Pac LNG International Limited, Pac LNG Investments Limited, Pac LNG Overseas Limited and Pac LNG Holdings Limited (affiliates of Santos Limited)
- JX Nippon Oil and Gas Exploration Pty Ltd.

ExxonMobil PNG Antelope Limited is the Project proponent and the ExxonMobil affiliate responsible for the construction of the Project. Niugini LNG Operating Company Limited (NLOC) is the ExxonMobil affiliate responsible for the Project once it has been constructed and commissioned.

The existing Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project) commercialises gas reserves in the Hela, Western and Southern Highlands provinces of Papua New Guinea. The gas is transported to the LNG Plant via the PNG LNG pipeline where it is liquefied and exported by ship to international gas markets. The LNG Plant is currently operated by ExxonMobil PNG Limited (EMPNG).

The Papua LNG Project – Downstream (the Project) intends to expand the capacity of the existing LNG Plant located in Caution Bay (Central Province), approximately 20 km north-west of Port Moresby. The LNG Plant is a component of the Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project).

The new LNG processing trains will expand the capacity of the LNG Plant by approximately 4 million tonnes per annum (mtpa) stream day capacity (SDC), while also providing gas to utilise up to 2 mtpa of latent capacity of the existing LNG trains. This expansion will bring the total capacity of the integrated LNG Plant to approximately 12.8 Mtpa SDC. Gas for the Project will be supplied from the Elk and Antelope reservoirs in Gulf Province.

The Project requires the preparation of an Environmental Impact Study (EIS) under the PNG *Environment Act 2000*. A range of specialist environmental and social technical studies are being prepared to support the EIS, including this cultural heritage baseline and impact assessment.

Study Objectives

The objectives of the Project EIS cultural heritage study were to:

- 1) identify, describe and map cultural heritage values where Project activities are proposed
- 2) identify potential impacts to the identified cultural heritage values arising from Project activities
- 3) recommend measures to manage the potential impacts identified
- 4) determine the residual impacts expected following implementation of proposed management measures.

To achieve these objectives the Project EIS cultural heritage assessment comprises:

- a baseline assessment describing the existing cultural heritage environment within and around the study area and identifying the associated values
- an impact assessment detailing the potential, actual and perceived impacts of the Project, recommended management measures to address the identified impacts, and an assessment of the residual impacts assuming implementation of the recommended measures.

Study Area

The cultural heritage study area is situated 20 km north-west of Port Moresby at Caution Bay, on the south coast of Central Province, Papua New Guinea between the villages of Papa (2 km to the north) and Boera (4 km to the south). Most of the study area (306.4 ha or 83%) is situated on constructed or otherwise heavily disturbed ground surfaces within a security fence which defines the operational boundary of the LNG Plant. One component of the Project, the eastern soil stockpile (laydown) area comprising 61 ha (17%) of the study area, is situated within 50 m of the LNG Plant's eastern boundary at a location just outside the security fence and immediately adjacent to a north-south oriented road.

The cultural heritage study area is based on the terrestrial Project footprint and includes all onshore production components, supporting facilities and infrastructure and temporary facilities, buffered by an additional 10 m.

BASELINE ASSESSMENT

Cultural Groups

The four villages closest to the LNG Plant site comprise two main cultural groups – the Motu and the Koita (also called Koitabu by the Motu) – and are categorised as follows:

- Porebada: Western Motu
- Boera: Motu (more closely linked to Western Motu than Eastern Motu)
- Papa: Koita
- Lea Lea: Western Motu

The main ethnohistorical feature of the broader Caution Bay area is its role at the centre of the *hiri* trade. Motu (and to a lesser extent Koita) artisans manufactured tens of thousands of ceramic pots, which were traded over long distances around the coast of Gulf Province.

Previous Studies

Relevant prior studies were reviewed during the preparation of the baseline assessment. These include:

- the Environmental Impact Statement (EIS) prepared by Coffey Natural Systems for the PNG LNG Project in 2009 (Coffey Natural Systems 2009)
- a series of technical reports prepared by archaeologists at Monash University during the period 2008-2011 as part of the ESIA supporting the preparation of the EIS and subsequent archaeological salvage program at the LNG Plant site

- papers published by Monash University under the series title *Caution Bay Studies in Archaeology 1* (Richards et al. 2016).

Baseline Summary

During the period 2008-2010 EMPNG coordinated that largest archaeological survey and salvage excavation program in the southern hemisphere at the LNG Plant site. The findings of these archaeological programs have made a significant contribution to our understanding of the origins of the ceramic tradition in Papua New Guinea, and have provided further insights into the development of the *hiri* trading system, a prehistoric trading network that operated along the southern Papuan coastline and which continued well into the historical period. The discovery of Lapita pottery at Caution Bay has forced a reconsideration of the ways in which archaeologists now understand the colonisation of the Pacific.

The cultural heritage values identified within the vicinity of project study area during the baseline assessment comprise archaeological sites only. No previously recorded oral tradition sites or other forms of intangible heritage value intersect the study area.

The archaeological heritage values located within and in the vicinity of the study area include:

- 81 newly recorded sites located within the eastern soil stockpile study area during a 2019 field program completed for the Project
- seven previously recorded sites located within the proposed eastern soil stockpile area
- 244 previously recorded sites located within the existing LNG Plant west of the perimeter security fence.

The size and density distributions of newly recorded sites located in the laydown area are in keeping with site size and density distributions recorded for the general hinterland area inland from the coast (encompassing the eastern soil stockpile area) during the PNG LNG Project ESIA fieldwork program. The site prediction model generated during the preparation of the 2009-2011 cultural heritage assessment indicated that archaeological sites in the vicinity of the eastern soil stockpile area are most likely to be isolated artefacts or small low-density artefact scatters. Of the 81 newly recorded sites identified in the eastern soil stockpile area during the 2019 field program, 74 (or 91%) are small low-density sites.

The baseline characterisation of cultural heritage sites within the project study area as a whole is heavily influenced by the fact that post-EIS activities approved by the National Museum and Art Gallery of Papua New Guinea (NMAG) under arrangement with EMPNG, including surface artefact collection, salvage excavation and subsequent construction and operation of the LNG Plant, have already impacted recorded cultural heritage places within the LNG Plant, bypass road and LNG Plant lease boundary fence.

IMPACT ASSESSMENT

Potential Impacts to Cultural Heritage

Potential impacts to cultural heritage include:

- direct disturbance of archaeological site locations due to on-ground works including vegetation clearance, topsoil stripping, subsoil excavation and construction

- direct disturbance of archaeological sites due to the movement of Project employees and contractors and their vehicles (e.g., erosion, unauthorised removal of artefacts)
- restricted physical access of communities to archaeological sites due to Project activities and operational requirements.

Direct impacts have the potential to affect cultural heritage sites in the following ways:

- loss of connection between people and their places of cultural value through the destruction or damage of a site
- loss of information which could otherwise be gained by conducting research today
- loss of the archaeological resource for future research using methods and addressing questions not available today; and
- permanent loss of the physical record.

It should be noted, however, that many of the 221 archaeological sites identified during the preparation of the PNG LNG Project's ESIA during the period 2008-2009 (see Section 5.4.2) and now situated in the proposed Project footprint within the plant's perimeter security fence were mitigated prior to being disturbed during construction of the facility in 2010-2012. Appropriate cultural heritage management responses to impacts associated with construction were implemented in 2009 under the requirements of the approved PNG LNG Project Cultural Heritage Management Plan (CHMP), including an extensive archaeological salvage program.

On this basis, it is unlikely that the construction and operation of the Project will further impact the 221 archaeological sites situated within the Project impact footprint west of the perimeter security fence, and for this reason these sites were not included in the impact assessment.

Cultural Heritage Site Significance Assessments

The significance of the impact on each of the 88 cultural heritage sites, in the laydown area, included in the formal impact assessment was determined based on the cultural heritage significance of each site and the magnitude of the impact. The overall significance rating determined for each cultural heritage site was derived as a cumulative score across four cultural heritage values (historical, scientific, social and spiritual).

Eighty-seven cultural heritage sites (99%) were assessed as being of low cultural heritage significance, and one (1%) was assessed as being of medium cultural heritage significance.

Management Measures

The following management and mitigation measures were developed to manage impacts to cultural heritage values.

- avoidance (where practicable) of cultural heritage sites
- development and implementation of a CHMP which includes:
 - ongoing local community consultation
 - cultural awareness programs for all employees and contractors

- implementation of the Project Cultural Heritage Management Plan (CHMP, part of the Project ESMP) Chance Finds Protocol with clear processes for reporting, investigation and management of cultural heritage chance finds discovered during Project-related activities
- salvage and recording of a representative proportion of archaeological sites that cannot be avoided by Project-related impacts. Salvage can include archaeological survey, surface collection and preservation of artefacts, and controlled archaeological subsurface excavation.

A series of site-specific management recommendations are also included.

Residual Impact Assessment

Prior to the implementation of the proposed management measures, 87 archaeological sites would have experienced impacts rated as Moderate, and one site (DS021) would have experienced impacts rated as Major.

Assuming the implementation of recommended avoidance, management and mitigation measures, residual impacts to the 88 sites included in the impact assessment are:

- The impact response for 78 sites (89%) is No Action given that these sites almost uniformly contain 10 or less artefacts and mostly comprise heavily weathered undecorated ceramic fragments. The impact significance for these sites remains unchanged (Moderate).
- The impact significance for nine sites (10%) is reduced from Moderate to Minor.
- The impact significance for site DS021 is reduced from Major to Nil.

1. Introduction

1.1. Project Overview

ExxonMobil PNG Limited (EMPNG) is the operator of the PNG LNG Project, an integrated development that is commercialising the gas resources of Papua New Guinea. The Papua LNG Project is a gas development project for the Papua LNG Project Joint Venture participants, which at the date of the EIS are:

- TotalEnergies EP PNG Limited (TotalEnergies, an affiliate of TotalEnergies SA)
- ExxonMobil PNG Antelope Limited (EMPNGA) and ExxonMobil PNG Elk Limited
- Pac LNG Assets Limited, Pac LNG International Limited, Pac LNG Investments Limited, Pac LNG Overseas Limited and Pac LNG Holdings Limited (affiliates of Santos Limited)
- JX Nippon Oil and Gas Exploration Pty Ltd.

ExxonMobil PNG Antelope Limited is the Project proponent and the ExxonMobil affiliate responsible for the construction of the Project. Niugini LNG Operating Company Limited (NLOC) is the ExxonMobil affiliate responsible for the Project once it has been constructed and commissioned.

The Papua LNG Project will involve producing and processing the gas and condensate from the Elk and Antelope gas reserves in Petroleum Retention License 15 (PRL-15), located in Gulf Province, Papua New Guinea and piping them overland, then offshore in the Gulf of Papua, to the existing Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project) producing and exporting facility (LNG Plant) located in Caution Bay (Central Province) approximately 20 km north-west of Port Moresby (Figure 1).

The existing PNG LNG Project commercialises gas reserves in the Hela, Western and Southern Highlands provinces of Papua New Guinea. The gas is transported via the PNG LNG pipeline to the LNG Plant in Caution Bay, where it is liquefied and exported by ship to international gas markets.

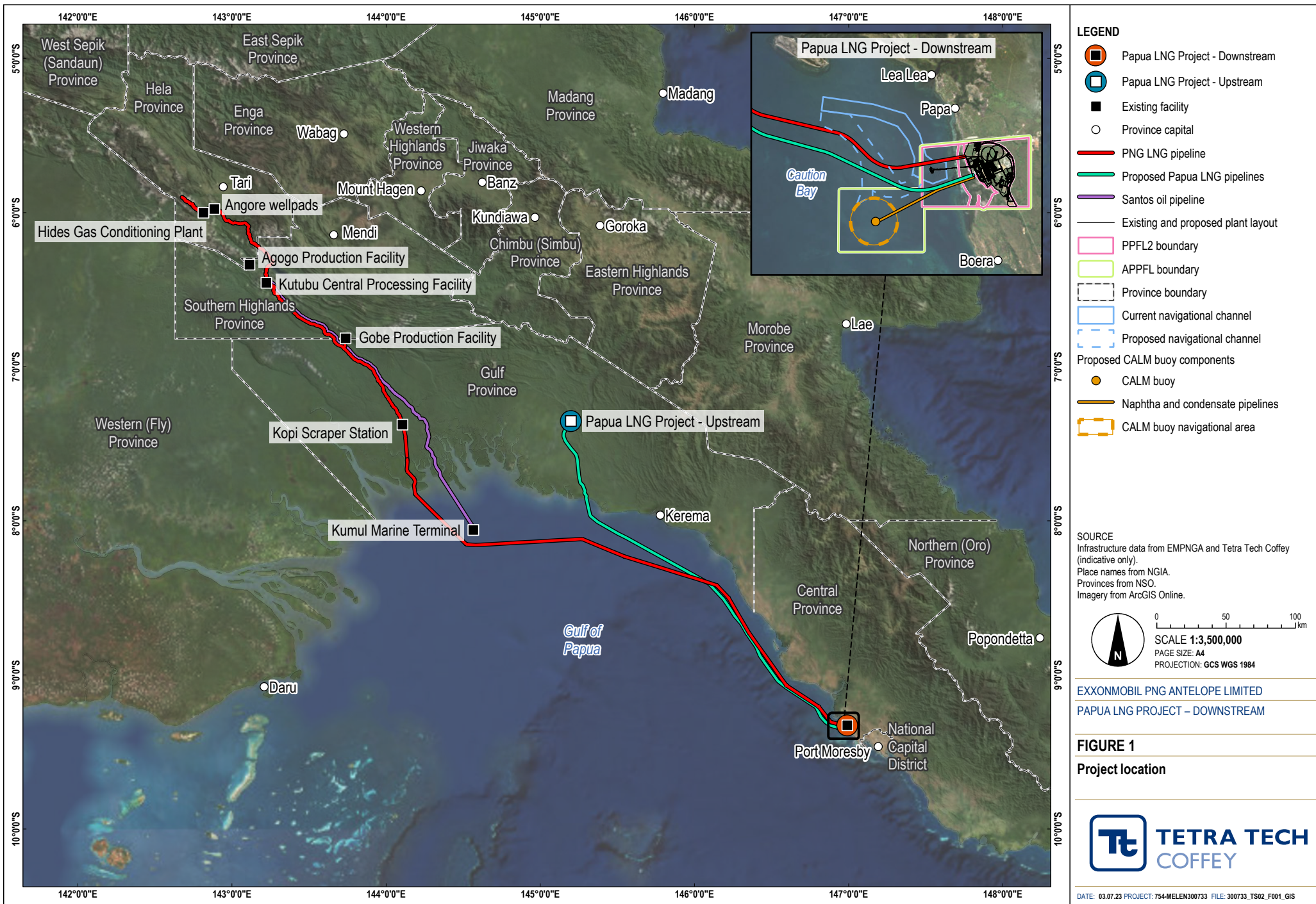
The Papua LNG Project involves two components:

- The Papua LNG Project – Upstream (referred to as the Upstream component)
- The Papua LNG Project – Downstream (the Project and the component addressed in this document).

Execution of the Upstream component and the Project is delimited in Caution Bay, with the approximate boundary (i.e., the scope break) between the components located near the fence of the LNG Plant, south of the existing jetty.

The Project requires the preparation of an Environmental Impact Study (EIS) under the PNG *Environment Act 2000*, which is currently scheduled for completion in the second quarter of 2023. A range of specialist environmental and social technical studies are being prepared to support the EIS, including this cultural heritage baseline and impact assessment.

TotalEnergies is responsible for managing cultural heritage associated with the gas conditioning facility and onshore and offshore pipeline as part of the Papua LNG Project - Upstream.



1.2. Study Objectives

The objectives of the Project cultural heritage study were to:

- 1) identify, describe and map cultural heritage values where Project activities are proposed
- 2) identify potential impacts to the identified cultural heritage values arising from Project activities
- 3) recommend measures to manage the potential impacts identified
- 4) determine the residual impacts expected following implementation of proposed management measures.

To achieve these objectives the Project EIS cultural heritage assessment comprises:

- a baseline assessment describing the existing cultural heritage environment in the study area (see Section 3 for study area definition) and identifying the associated values
- an impact assessment detailing the potential, actual and perceived impacts of the Project, recommended management measures to address the identified impacts, and an assessment of the residual impacts assuming implementation of the recommended measures.

1.3. Regulatory and Industry Frameworks

The regulatory and industry frameworks relevant to the present study include:

- PNG legislation and other regulatory requirements (Section 1.3.1)
- international principles, standards and guidelines including the Burra Charter and the International Finance Corporation's Performance Standards (Section 1.3.2)
- the PNG LNG Project Cultural Heritage Management Plan (CHMP) (Section 1.3.3).

1.3.1. Papua New Guinea legislation

Papua New Guinea national legislation and regulations relevant to the protection of cultural heritage generally and the specific range of cultural heritage site types likely to be encountered within the Project cultural heritage study area are described in Table 1.

Cultural property in PNG is protected under the *National Cultural Property (Preservation) Act 1965* (NCPP Act). The principal government institutions responsible for enforcing the NCPP Act are the National Museum and Art Gallery of Papua New Guinea (NMAG) and the National Cultural Commission (NCC), each of which is established under its own enabling legislation. In practice, the NMAG performs some of the statutory functions of the NCC, including:

- maintenance of a national cultural heritage site register
- issue of artefact export permits
- acting as the statutory body to which cultural heritage sites are reported.

PNG legislation requires that:

- cultural property is not wilfully destroyed, damaged or defaced
- the discovery of cultural property is reported to the NMAG/NCC.

Table 1: PNG legislation and relevance to this report

Act	Relevance
<i>National Cultural Property (Preservation) Act 1965 and National Cultural Property (Preservation) Regulations 1965</i>	The NCPP Act and Regulations protect moveable and immoveable cultural property, including both manufactured and natural objects that are connected with past and present traditional cultural practices. The NCPP Act specifies offences and penalties that apply to the wilful destruction, damage or defacement of national cultural property, and requires anyone who discovers the following to report the discovery to the regulatory authority: • cave or other place in which ancient remains, human or other, are to be found • carving, painting or other representation on rock or in a cave • deposit of ancient pottery or historical remains • place used in former times as a ceremonial or burying ground.
<i>National Cultural Commission Act 1994</i>	The NCC is established under the provisions of its enabling legislation, the <i>National Cultural Commission Act 1994</i> (NCC Act). The NCC is responsible for: • Preserving, protecting, developing, promoting and (for approved aspects) marketing the traditional and contemporary cultures of PNG. • Establishing three National Cultural Institutions (the Institute of PNG Studies, the National Film Institute and the National Performing Arts Troupe). However, beyond these general functions, the NCC Act does not provide any specific role in the protection of cultural heritage sites known or likely to be found in the study area.
<i>National Museum and Art Gallery Act 1992</i>	The NMAG Act establishes the National Museum and Art Gallery of Papua New Guinea (NMAG) as the principal government institution responsible for preserving PNG's cultural heritage. Section 4(1) of the NMAG Act lists the functions of the NMAG, which include: • Protect and conserve the cultural and natural heritage of Papua New Guinea as required by the <i>Environmental Planning Act 1978</i>, NCPP Act and the <i>Conservation Areas Act 1978</i>. • Administer the NCPP Act and <i>War Surplus Materials Act 1952</i> and any other Act that applies to the functions of the Museum. • Research and document the prehistory of Papua New Guinea by archaeological surveys and excavations and manage the national archaeological collections. • Monitor archaeological research in Papua New Guinea and issue archaeological permits for the short-term loan of archaeological material for study overseas. • Maintain the national register of traditional and archaeological sites, locate and record prehistoric sites and monuments, and carry out the salvage of archaeological excavations as required by the NCPP Act and the <i>Environmental Planning Act 1978</i>. • Identify, document and monitor the conditions of objects of national cultural significance, recommend their proclamation as national cultural property, and keep a register of national cultural property. • Monitor the collection and export of artefacts, issuing permits and perform other duties as required by the NCPP Act. • Monitor and affiliate researchers from other institutions carrying out research in the areas of the Museum's functions.
<i>War Surplus Material Act 1952</i>	This Act provides for the protection of material derived from World War II, along with the protection of historical period (contact period) properties in the context of buildings, structures, monuments, burial places and shipwrecks, and other relevant materials of historical significance to PNG.
<i>Cemeteries Act 1955</i>	The <i>Cemeteries Act 1955</i> allows for burials on private grounds to be considered cemeteries for the purposes of the Act. Section 29 of the Act allows for the exhumation of burials under certain conditions, if authorised by the Minister, a Provincial

Act	Relevance
	Administrator (under delegated authority from the Minister) or a coroner (subject to any law relating to coroners). This act is relevant to the Project in that the potential exhumation of traditional burials as a Project-related impact management measure requires a specific authority.
Compensation	Where destruction of cultural heritage sites occurs either by accident or following consultation with landowners, the PNG Valuer-General's <i>Compensation Schedule for Trees and Plants, All Regions</i> (Department of Lands 2008; see also PNG Chamber of Mines and Petroleum 2008) provides guidelines for appropriate compensation rates for ceremonial grounds, sacred sites and grave sites. These guidelines also note that: <i>Where there is disagreement over the authenticity, importance, or extent of any sacred site the matter should be referred to the Valuer-General, who may in turn refer the matter to an appropriately qualified person or organisation for adjudication</i> (Department of Lands 2008: 8).

1.3.2. International policies, standards and guidelines

International policies, standards and guidelines specific to cultural heritage include the Burra Charter, and Performance Standard 8 (Cultural Heritage) of the International Finance Corporation's (IFC) Performance Standards on Environmental and Social Sustainability. These are discussed in Table 2.

Table 2: Industry and best practice guidelines and relevance to this report

Guideline	Relevance
<i>Australia ICOMOS Charter for Places of Cultural Significance</i> , 'the Burra Charter' (Australia ICOMOS 2013; Marquis-Kyle & Walker 2004)	The Australia International Council on Monuments and Sites (ICOMOS) is a non-government, not-for-profit organisation of cultural heritage professionals which was formed as a national chapter of ICOMOS International in 1976. One of the key goals of Australia ICOMOS is to promote an understanding of the cultural significance of places and raise conservation standards through education and communications. The Australia ICOMOS Charter for Places of Cultural Significance 2013, generally referred to as the Burra Charter, is widely recognised as a benchmark standard for cultural heritage management in Australia. In general, it defines the basic principles and procedures to be followed in the conservation of heritage places (Australia ICOMOS 2013). The Burra Charter outlines a process for establishing cultural significance using a set of clearly defined criteria (see Section 4.2.2 for further details). These criteria were incorporated into the EIS cultural heritage impact assessment methodology.
International Finance Corporation (IFC) Performance Standards (International Finance Corporation 2012) ¹	The IFC's Performance Standards on Environmental and Social Sustainability provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), the IFC requires organisations to apply the Performance Standards to manage environmental and social risks and impacts. The objectives of IFC Performance Standard (PS) 8 (Cultural Heritage) are to protect cultural heritage from the adverse impacts of Project activities, support its preservation, and promote the equitable sharing of benefits from the use of cultural heritage,

¹ [Performance Standard 8 \(ifc.org\)](https://www.ifc.org/standards)

Guideline	Relevance
	regardless of whether or not it has been legally protected or previously disturbed. IFC PS 8 provides specific guidance on several matters relevant to this cultural heritage technical study, including: • protection of cultural heritage in Project design and execution • chance finds procedures (i.e., those found other than by deliberate search or information provided by sources) • consultation • community access • removal of replicable cultural heritage • removal of non-replicable cultural heritage.

1.3.3. PNG LNG Project CHMP

Esso Highlands Limited (EHL) prepared a CHMP (PNG LNG Project document PGGP-EH-SPENV-000018-015) as part of its Environmental and Social Management Plan (ESMP) for the PNG LNG Project. The Papua LNG Project - Downstream will be leveraging this plan to develop the Project's CHMP, to ensure consistent treatment of cultural heritage items during the construction of expansion facilities. The objectives of the CHMP are to:

- 1) avoid known cultural heritage sites (including both archaeological sites and oral tradition sites) where necessary and practicable
- 2) where avoidance is not possible, manage cultural heritage sites in consultation with PNG Government and landowners.

The CHMP includes requirements for:

- Company and Contractors to utilize the CHMP Chance Find procedures when working within the established boundary limits of the plant which were previously surveyed.
- For areas of disturbance outside the plant site, or not previously surveyed, to conduct cultural heritage surveys to identify cultural heritage (archaeological and oral tradition) sites in areas that will be impacted by the project, the outcomes being:
 - GPS registered cultural heritage constraints/sensitivities for avoidance
 - further research of appropriate archives, where relevant and required
 - liaison with the NMAG and the NCC, as required
 - landowner concurrence for cultural heritage management approach
- Contractors, when working in areas not previously surveyed, to:
 - Conduct preconstruction cultural heritage surveys designed to identify specific cultural heritage sites that may be impacted by construction of the project.
 - Develop site-specific CHMP Implementation Plans for each proposed disturbance area, to be approved by Company and include management measures endorsed by the NMAG as required for individual sites.
- Implementation of detailed management and mitigation measures specific to identified worksite locations, including the LNG Plant at Caution Bay.

- Implementation of archaeological salvage protocols (PNG LNG Project document PGGP-EH-SPENV-000018-015, Attachment 2) prepared by the Company and endorsed by the NMAG in instances where impacts to cultural heritage cannot practicably be avoided. These protocols include specific requirements relating to the LNG Plant.
- implementation of the Cultural Heritage Chance Finds Protocol (PNG LNG Project document PGGP-EH-SPENV-000018-015, Attachment 3) to manage the discovery of cultural heritage during construction works.
- Reporting of the outcomes of Company and Contractor cultural heritage surveys and reporting chance finds.

It is important to note that EHL obtained three permits from the NMAG:

- permit for the Cultural Heritage Management Plan, dated 26 August 2009
- permit for the Investigation & Salvage Protocol, dated 26 August 2009 (and specific to work conducted at the LNG Plant site)
- permit for salvage archaeology for the upstream scope of the PNG LNG Project, dated 30 September 2009.

These permits enabled the Project to manage archaeology in accordance with the Cultural Heritage Management Plan and its associated attachments.

Copies of the PNG LNG Project CHMP and Attachments 2 (Investigation and Salvage Protocol) and 3 (Chance Finds Protocol) are presented in Appendix A.

2. Project Description

The Project proposes to expand the capacity of the existing LNG Plant by 4 million tonnes per annum (mtpa) by installing new LNG processing trains and associated equipment.

The LNG Plant is located in Central Province, approximately 20 km north-west of Port Moresby, between the coastal settlements of Boera and Papa. The plant occupies three separate lease areas: Portion 2456, Portion 2457 (coastal strip) and Portion 2458 (offshore).

Prior to arriving at the inlet receiving and treatment system, the feed gas from the Project will undergo acid gas removal, dehydration, and dewpoint control at the Papua LNG Project – Upstream gas processing facility, which is to be constructed and operated by TotalEnergies. The Project will provide approximately 2 Mtpa of gas feeding ullage within the existing plant.

The Project incorporates the expansion of the LNG Plant's existing onshore and marine facilities in Caution Bay, including new LNG processing trains, two new offshore feed gas pipelines to the landfall and a pipeline tie-in point, and installation of a CALM buoy with dual export pipelines.

Figure 2 shows the proposed areas within the existing LNG Plant lease area where the new onshore facilities will be developed. A summary of the components of the Project is provided in Table 3.

2.1. Onshore Production Facilities

New liquefaction trains will be located adjacent to the existing trains 1 and 2 (Figure 2). As with the existing trains 1 and 2, processing of the gas into LNG requires removal of impurities and hydrocarbons that are heavier than methane, followed by super cooling to form a liquid. The new trains will utilise single mixed refrigerant (SMR) technology to process the gas.

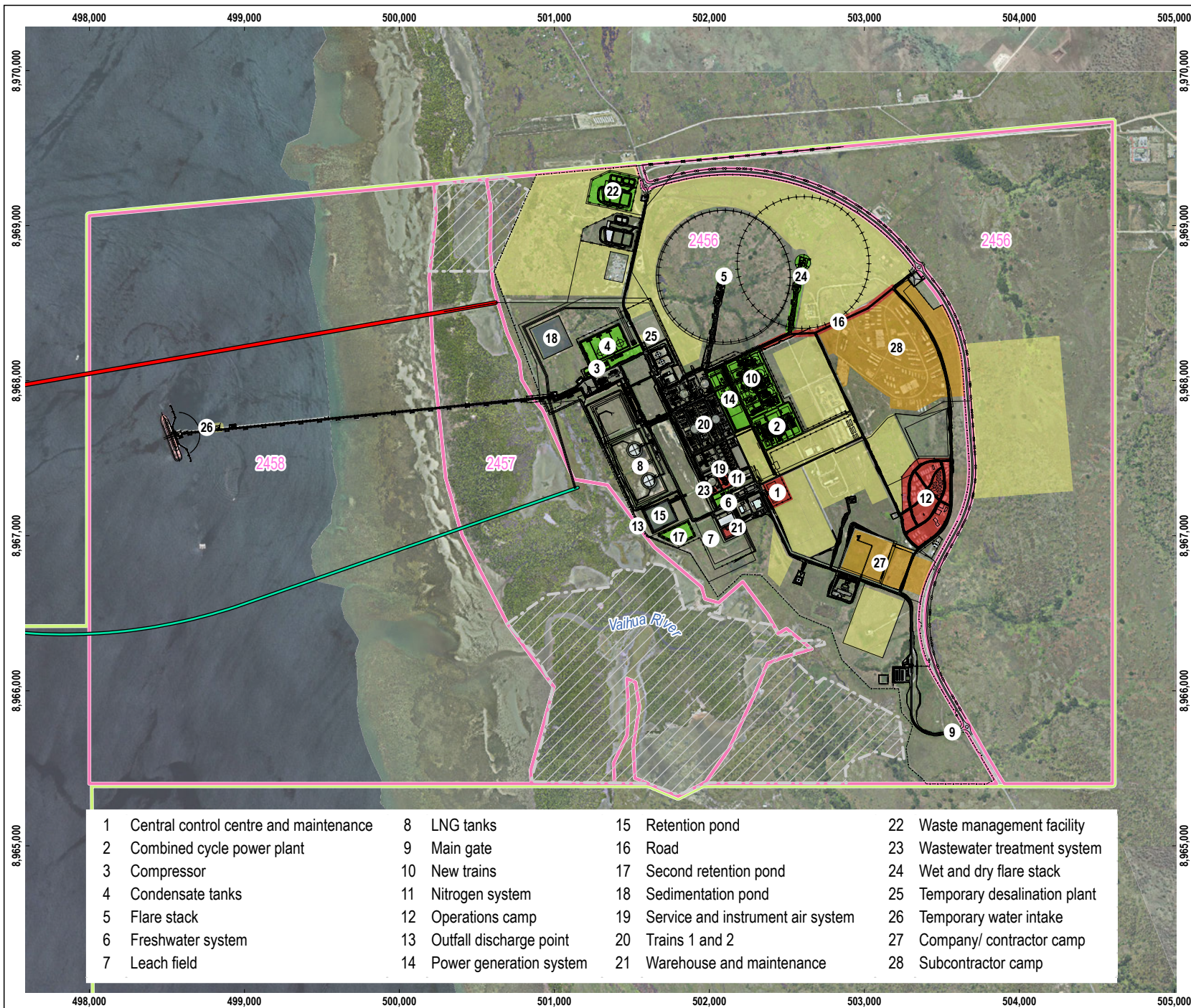
The main products produced by the Project include LNG and naphtha. The LNG Plant currently supplies gas to the Port Moresby Power Station for the domestic electricity market.

Sour naphtha recovered from the fractionation system will be blended with the Papua LNG field condensate and stored in new storage tanks with a total capacity of 110,000 m³. The blended product is then pumped from the new condensate storage tanks to the CALM buoy, to be loaded onto tankers for shipping.

2.2. Commissioning and Operation

Commissioning activities will be required to test the modified shared facilities and new facilities at the LNG Plant. These activities are expected to include testing the operation of individual components and systems, including flaring during start-up.

The operational and maintenance procedures are expected to be similar to those in place at the existing LNG Plant.



LEGEND

-  PNG LNG pipeline
-  Proposed Papua LNG pipelines route
-  Existing and proposed plant layout
-  Proposed new facility
-  Proposed expanded/upgraded facility
-  Temporary construction area
-  Temporary camp
-  PPFL2 boundary
-  APPFL boundary
-  Cultural heritage restricted area

SOURCE

Infrastructure, cultural heritage and lease boundary from EMPNG.
Imagery from EMPNG and Google Earth.



0 0.5 1 km
SCALE 1:35,000
PAGE SIZE: A4
PROJECTION: WGS 1984 UTM Zone 55S

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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 2

Proposed downstream onshore facilities for the Project



Table 3: Project components

Project Component	Description
Additional LNG trains	New LNG processing trains and supporting systems including: • Inlet gas receiving and treatment • Dehydration/mercaptan removal • Mercury removal • Heavy-hydrocarbon separation (which contains benzene, toluene, ethylbenzene, and xylenes (BTEX)) • Liquefaction • Stabilisation • Refrigeration system • Fractionation system (naphtha).
Expansion of existing utilities	Existing PNG LNG shared utilities to be expanded include: • Hot oil system • Service and instrument air system • Nitrogen system • Freshwater system • Desalinated water system • Potable water system • Diesel oil storage and distribution system • Open and closed drain systems • Sanitary wastewater treatment systems.
New utilities	Options for new separate utilities may include: • Integrated fuel gas system • Power generation system • Tempered water system • Highly demineralized water system for the Heat Recovery Steam Generators • Flare system (wet and dry gas) • Thermal oxidizer.
Product storage	Product storage will include: • New condensate storage tanks with a total storage capacity of up to 110,000 m³.
New marine facilities	Marine facilities will include: • CALM buoy and associated exclusion zones • Pipeline end manifold (Upstream construction component, Project operations component) • Naphtha and condensate export pipelines (Upstream construction component, Project operations component) • New feed pipelines including a gas pipeline and a condensate pipeline (Offshore: Upstream construction and operations; Nearshore Project construction component and Upstream operations component), with landfall and tie-in to the pipelines at the LNG Plant. The pipelines will be located south of the existing LNG Plant jetty. • Alternate shipping channel • Navigation and monitoring systems.
Temporary facilities	Temporary construction facilities will be located within the PNG LNG Project's lease boundaries and will include laydown areas, offices, workshops and concrete batching plants.
Waste	Options being reviewed for waste facilities may include: • Temporary onsite storage and segregation of waste, with transport to and disposal at third party waste management facility

Project Component	Description
	New engineered solid waste landfill within existing LNG Plant fence for disposal of non-restricted waste, with limited disposal of restricted waste by specialised service.
Logistics route	Most construction materials will be transported by truck from Motukea Port in Port Moresby to the LNG Plant site via the Lea Lea Road. Repairs or upgrades to the road, or relocation of overhead cables may be required to allow transport of large, heavy loads.
Workforce	Construction: Approximately 5,000 to 7,000 personnel at peak. Operation: Increase of approximately 50 operations and maintenance technicians with support staff anticipated to increase.
Accommodation	Construction: Up to 6,000 bed construction camps. Operation: Up to 500 beds at the existing operations camp.

2.3. Project Schedule

Timeframes for key project development milestones are shown in Table 4.

Table 4: Project timeframe

Key milestone	Timeframe
Environment surveys and approval process	2022 to 2023
Front-end engineering design	2023
Detailed engineering design	2024 to 2026
Construction	2023 to 2027
Commissioning and start-up	2027 to 2028

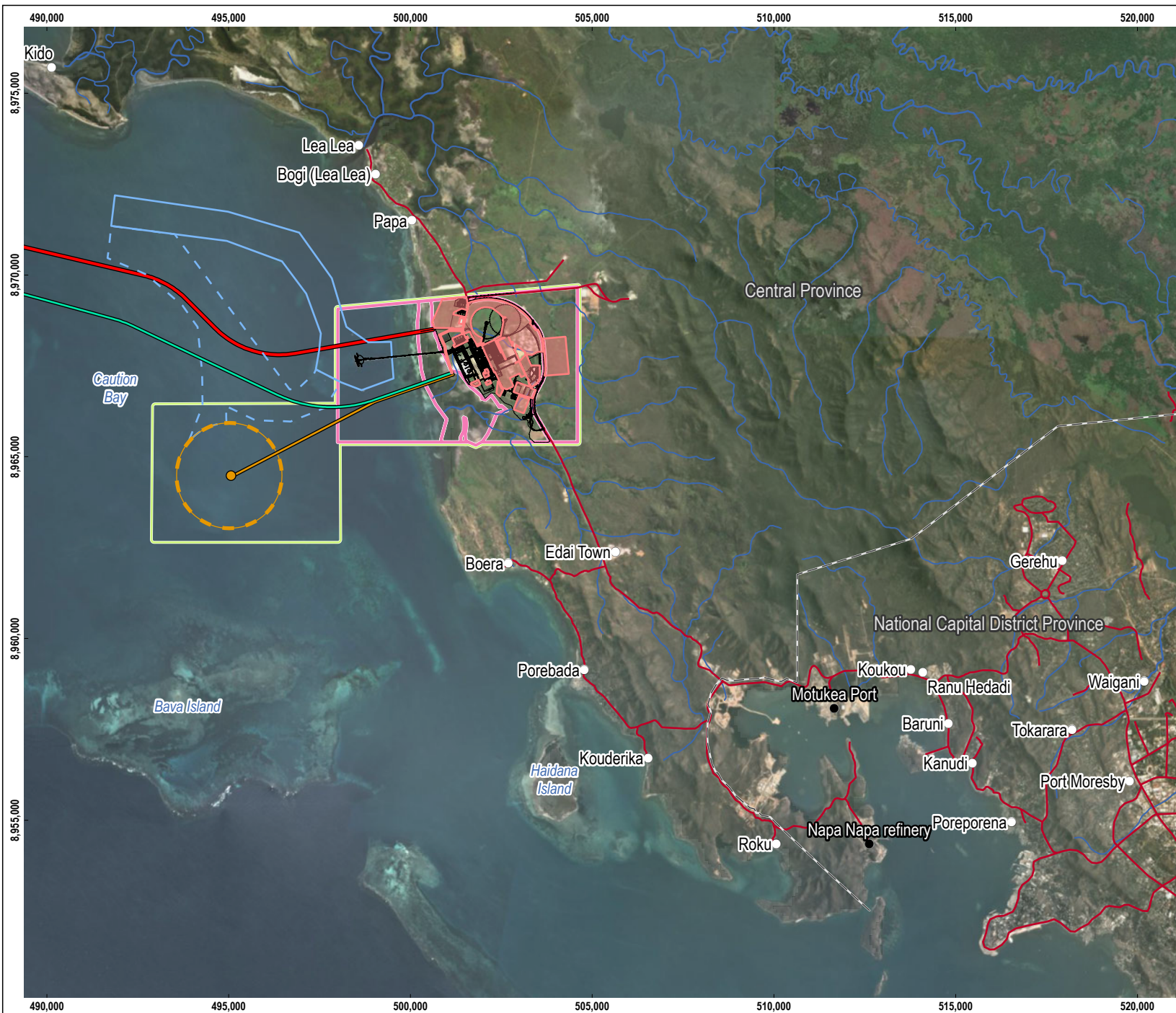
3. Study Area

The cultural heritage study area is situated 20 km north-west of Port Moresby at Caution Bay, on the south coast of Central Province, Papua New Guinea between the villages of Papa (2 km to the north) and Boera (4 km to the south) (Figure 3). Most of the study area (306.4 ha or 83%) is situated on constructed or otherwise heavily disturbed ground surfaces within a security fence which defines the operational boundary of the LNG Plant. One component of the Project, the eastern soil stockpile area comprising 61 ha (17%) of the study area, is situated within 50 m of the LNG Plant's eastern boundary at a location just outside the security fence and immediately adjacent to a north-south oriented Lea Lea Road.

The cultural heritage study area is based on the terrestrial Project footprint and includes all onshore production components, supporting facilities and infrastructure and temporary facilities described in Sections 2.1 to 2.3, buffered by an additional 10 m.

The study area does not include any offshore Project components, since the offshore is primarily the scope of the Papua LNG Project – Upstream, and the installation of the CALM Buoy by the Project was not determined to have impact on cultural heritage sites.

The extent of the study area investigated for the cultural heritage component of the Project EIS is mapped in Figure 4.



LEGEND

- Village
- Point of interest
- Road
- Watercourse
- PNG LNG pipeline
- Proposed Papua LNG pipelines route
- Existing and proposed plant layout
- Province boundary
- PPFL2 boundary
- APPL boundary
- Current navigational channel
- Proposed navigational channel
- Cultural heritage study area
- Proposed CALM buoy components
- CALM buoy
- Naphtha and condensate pipelines
- CALM buoy navigational area

SOURCE
Cultural heritage study area and data from ELA.
Villages from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Province boundary from NSO.
Imagery from Planet Labs.



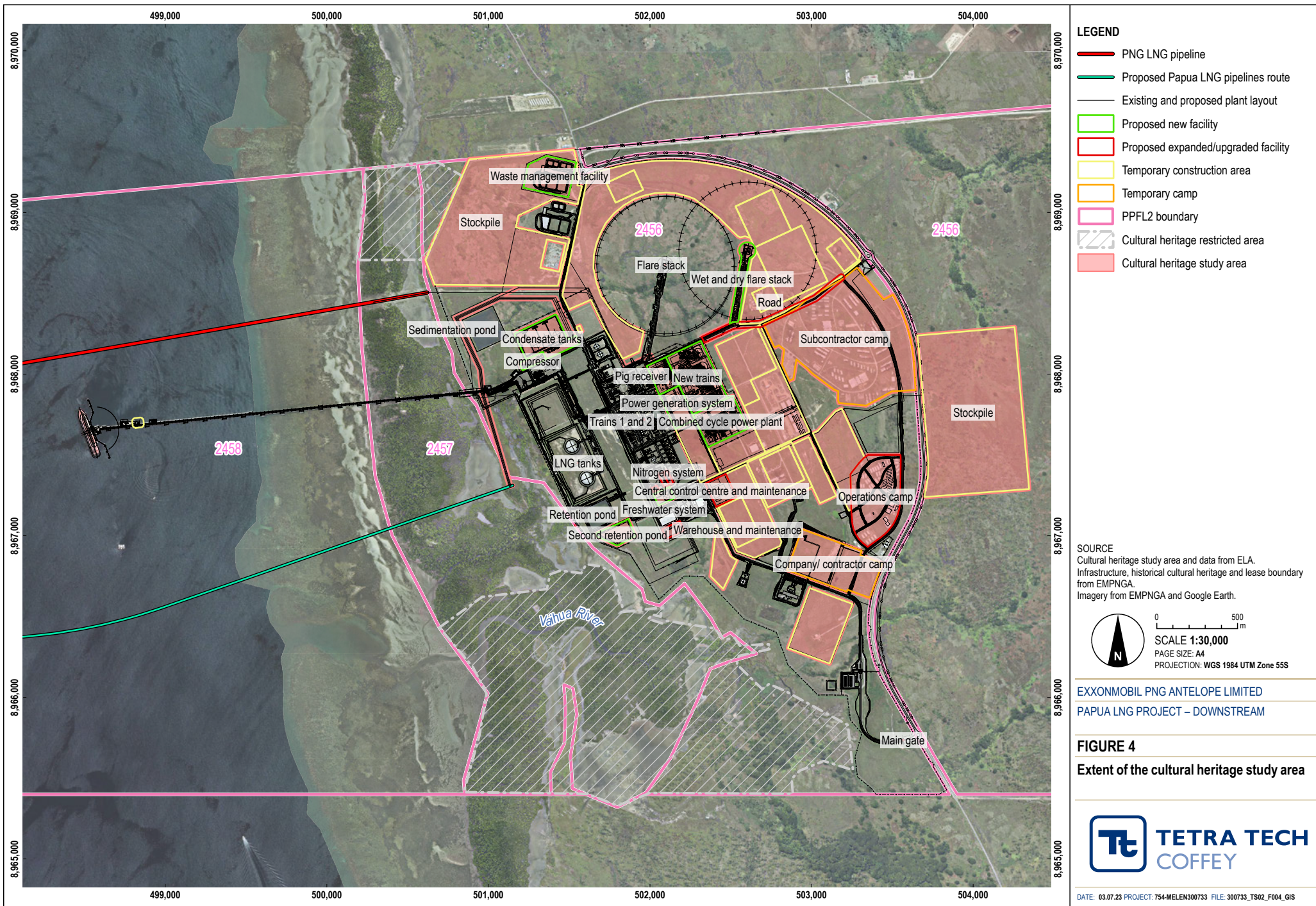
0 1 2 3 km
SCALE 1:150,000
PAGE SIZE: A4
PROJECTION: WGS 1984 UTM Zone 55S

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FIGURE 3

Location of the cultural heritage study area





4. Study Methods

The study method for the baseline and impact assessment components of the Project EIS cultural heritage assessment is described in the following sections.

Most of the new infrastructure proposed at the LNG Plant site will occupy space within the existing LNG Plant site security fence. Extensive cultural heritage field surveys and salvage programs were undertaken in 2009-2013 within and along the fence boundary and bypass road (now Lea Lea Road, a public road) prior to construction of the LNG Plant. The NMAG was actively involved in developing the salvage program in 2008-2010 and permitted and oversaw the program, which resulted in large volumes of archaeological materials being salvaged, analysed, recorded and delivered to the NMAG. Upon completion of the salvage programs at the LNG Plant site, the NMAG granted approval for ground disturbing works within the security fence and along the Bypass Road corridor, which was conducted in accordance with the PNG LNG Project Cultural Heritage Management Plan (i.e., Chance Finds Protocol) that had been endorsed by the NMAG.

4.1. Baseline Assessment

Considering that the previous cultural heritage assessments covered the majority of the study area, the baseline assessment comprised:

- A review of existing information focused mainly on the EIS and supporting cultural heritage technical reports and post-approvals salvage investigations prepared for the PNG LNG Project's LNG Plant site and its associated infrastructure.
- A field investigation of the proposed laydown area situated immediately east of the security fence (henceforth referred to as the laydown study zone). Tasks included the identification and recording of the current condition and state of preservation of previously unknown cultural heritage sites identified through community interviews and targeted archaeological surveys.

The sequence and details of each component of the general field methodology are described below.

4.1.1. 2019 field survey of laydown study zone

4.1.1.1. Pre-awareness discussions

EMPNG's Community Affairs (CA) department conducted pre-survey village awareness briefings with nominated communities to bring the fieldwork to their attention, to gain their endorsement to enter their lands and document the information gathered, and to identify individuals who would be willing to assist the field program by participating in interviews.

4.1.1.2. Community consultation

Interviews were held with representatives nominated by relevant cultural groups regarding known cultural heritage sites potentially located within the laydown study zone. All interviews were conducted with the assistance of EMPNGA CA staff.

A critical element in the consultation process was to ensure that community representatives understood that the sole purpose of the field program was to identify cultural heritage values associated with the

study area, which would then enable EMPNGA to progress the Project in ways that avoided or minimised the impact of their activities on cultural heritage to the greatest extent practicable.

Field inspections also included onsite consultation with local community representatives regarding the presence or absence of oral tradition sites within the laydown study zone. Community representatives were asked to state:

- whether the specific area of interest contained any oral tradition sites
- whether they had any concerns that the proposed works within the laydown study zone might negatively impact on any cultural heritage values that may be associated with these locations.

4.1.1.3. Archaeological field survey and cultural heritage site recording

The archaeological field survey included the identification and recording of unknown cultural heritage sites located within the study area.

The laydown study zone was progressively cleared of potential unexploded ordnance prior to the archaeological survey in the presence of an archaeologist.

The methodology originally developed for the archaeological survey was based on the following assumptions:

- all portions of the laydown study zone cleared during the UXO clearance process would be included in the archaeological survey
- all areas observed and visited by the archaeological field team must be cleared of UXO before the survey could commence
- the UXO clearance process would take place during two overlapping stages:
 - Stage 1: Vegetation clearance using tractor-towed slashers and manually operated brush cutters for creek lines. Vegetation was to be cut down to 20 cm to avoid damage to any items laying on the ground, including cultural heritage
 - Stage 2: Visual inspection of the cleared area by a UXO specialist.

The survey strategy was initially developed as a series of parallel pedestrian transects comprising two archaeologists spaced 5 m apart, designed to provide comprehensive coverage of all ground surfaces across the entire laydown study zone. Each transect was to include intensive inspection of all areas of relative exposure with good ground surface visibility.

However, this approach was modified by the field team after fieldwork commenced and it became apparent that 100% survey coverage target would not be achieved in the time available. A three-phase approach was eventually adopted that achieved an effective coverage of more than 90% of the laydown study zone.

Phase 1: Selected Polygon Surveys

Phase 1 surveys progressed based on the following approach:

- Commencing with a survey of two localities in the north-western portion of the study area that had excellent ground surface visibility (80%) because it had been burned by local villagers.

- Subsequent survey of a 200x200 m polygon located in the north-west corner of the study area, which had been selected and slashed by the UXO team in accordance with the original methodology.
- The field team then marked out 17 discrete locations where UXO clearance and archaeological survey activities should be focused. The selection of these locations was based on earlier results of the survey which identified stands of trees and/or elevated landforms at locations where artefacts were most likely to be found. The locations of the first seven slashed survey sample areas cleared as at 25 July 2019 (seven days after the survey commenced) and mapped archaeological survey tracks recorded within these cleared areas are presented in Figure 5.

Phase 2 – Systematic Transect Survey

Several transects running the full length and width of the study area were surveyed, following 2 m wide slashed and cleared corridors.

Phase 3 – Systematic Surface Scatter Survey

At the conclusion of Phases 1 and 2, two locations situated in the southern portion of the study area within an area of high artefact density were gridded into a 3x3 m and a 5x5 m survey area with internal quadrats defined every 1x1 m. The location of every artefact within each quadrat was recorded on an X and Y axis to the nearest centimetre.

The cultural materials identified within the laydown study zone during the archaeological field survey were not retained or removed. All archaeological material was left *in situ* at its original find location.

All cultural heritage exposures identified during phases 1 to 3 of the archaeological field survey were individually recorded using a standardised form, photographed and their locations recorded using a Garmin GPSmap 62 handheld global positioning system (GPS) device standardised to the WGS84 datum and UTM Zone 55S projection. Formal cultural heritage survey tracks were also recorded using the handheld Garmin. Archaeological exposures were defined based on the presence of material remains relating to past cultural activities (e.g., stone artefacts, pottery sherds or shells). All recorded archaeological exposures were assigned a unique, consecutively numbered field code using the acronym EX (Exposure; e.g., EX001, EX002).

In keeping with the archaeological analyses methods previously employed during earlier cultural heritage investigations of the PNG LNG Plant (e.g., Paterson, David and Richards 2009: 16), for the purposes of the present study an archaeological site is defined as a discrete archaeological object ('artefact') or feature or set of artefacts/features (i.e., exposures) separated by ≥ 15 m from its nearest neighbouring archaeological site. Neighbouring archaeological sites are differentiated when artefact concentrations are separated by areas devoid of surface cultural materials more than 15 m apart.

Site recording forms that include summary information on each defined archaeological or oral tradition site identified during the field assessment of the laydown study zone, including the site's size and contents, its environmental context, a general description of the site and preliminary observations were submitted to the Prehistory Department at the NMAG on 17 February 2020.



- LEGEND**
- Survey track point
 - Existing and proposed plant layout
 - Temporary construction area
 - PPFL2 boundary

SOURCE
 Cultural heritage study area and data from ELA.
 Infrastructure, historical cultural heritage and lease boundary from EMPNGA.
 Imagery from Google Earth (capture date 21/08/2019).



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 m
SCALE 1:7,500
 PAGE SIZE: A4
 PROJECTION: WGS 1984 UTM Zone 55S

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FIGURE 5

Phase 1 archaeological survey tracks mapped within slashed survey sample areas, laydown study zone, 29 July 2019



The field program, which commenced on 18 July and concluded on 16 August 2019, was developed and managed by Dr John Muke, Director at the Social Research Institute (SRI) based in Port Moresby. Dr Muke also participated in the field program, along with John Sepe and Les Muke, both Senior Specialists at SRI. Community consultation undertaken during the field program was facilitated by an EMPNGA CA Officer.

4.1.1.4. Archaeological fieldwork permits

It is common practice in Papua New Guinea that the NMAG issues permits for archaeological investigations. The 2019 cultural heritage field program was completed under the provisions of NMAG Permit for Archaeological Survey No. 0026, issued on 16 July 2019 by Alois Kuaso (Appendix B).

All field methods and site recording protocols employed during the survey meet the requirements of the Prehistory Department, NMAG.

No archaeological excavation program was undertaken during the 2019 field program.

4.2. Impact Assessment

4.2.1. Impact assessment framework

The impact assessment framework used in this study incorporates the following sequential elements:

- 1) Identification of the cultural heritage sites and values to be included in the assessment. For this study, these include all cultural heritage sites and values known to be located within the study area at the conclusion of the baseline characterisation.
- 2) Assessment of the significance of each cultural heritage site or value using established, internationally recognised criteria developed by Australia ICOMOS (the Burra Charter), as well as the opinions of the local communities.
- 3) Assessment of the magnitude of the impact from proposed Project activities on cultural heritage sites and values, based on an assessment of the severity, geographical extent and duration of the impact.
- 4) Determination of the significance of a potential Project impact on identified cultural heritage sites and values, based on the consideration of the site's/value's cultural heritage significance and the magnitude of the impact it is likely to experience.
- 5) Identification of avoidance and management measures that, if implemented, could either avoid Project impacts to cultural heritage sites and values altogether or reduce the significance of these impacts.
- 6) Determination of residual Project-related impacts to cultural heritage sites and values by assessing the significance of a potential impact after the implementation of recommended avoidance and management measures.

4.2.2. Cultural heritage significance

The assessment of cultural heritage significance is a fundamental component of cultural heritage management. Such assessments can assist in determining which items, sites, places, values, landscapes and even environments are of sufficient cultural importance that they require preservation, and if this is not possible, they can inform the development of appropriate management measures to mitigate

impacts. Significance assessment establishes the assessment criteria and significance ratings to be applied to each cultural heritage site or value, both tangible and intangible.

A statement regarding the significance of each cultural heritage site or value is an essential step in the process of developing appropriate cultural heritage management recommendations. Although it may seem self-evident, it is important to state that while all known cultural heritage sites and values have at least some level of ‘cultural heritage significance’, the preservation of all cultural heritage may not be possible. In this context, management is not necessarily synonymous with preservation, and may involve disturbance or destruction, or partial disturbance through controlled above-ground, ground surface and subsurface salvage investigations where archaeological material is present.

A process for establishing cultural significance is provided in the *Australia ICOMOS Charter for Places of Cultural Significance 2013*, otherwise known as ‘The Burra Charter’ (Australia ICOMOS 2013; Marquis-Kyle & Walker 2004). Article 1.2 of the Burra Charter states that:

- *Cultural significance* means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.
- Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.
- Places may demonstrate a range of these significance criteria for different individuals or groups.

Definitions of the criteria used in the assessment of cultural significance have been outlined by Australia ICOMOS in a Practise Note²; these are summarised in Table 5.

Table 5: Cultural heritage significance assessment criteria (Australia ICOMOS, November 2013)

Criterion	Description
Aesthetic	• Refers to the sensory and perceptual experience of a place—that is, how we respond to visual and non-visual aspects such as sounds, smells and other factors having a strong impact on human thoughts, feelings and attitudes (Kerr 1990:10). • Aesthetic qualities may include the concept of beauty and formal aesthetic ideals. • Expressions of aesthetics are culturally influenced. Despite the poorly defined nature of aesthetic significance, it remains one of the most important criteria for official registration of heritage sites in many parts of the world (e.g., Schapper 1993).
Historic	• Intended to encompass all aspects of history—for example, the history of aesthetics, art and architecture, science, spirituality and society. It therefore often underlies other values. • A place may have historic value because it has influenced, or has been influenced by, an historic event, phase, movement or activity, person or group of people. • For any place the significance will be greater where the evidence of the association or event survives at the place, or where the setting is substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of such change or absence of evidence.
Scientific	• Refers to the information content of a place, or its ability to reveal something about the past using scientific techniques such as archaeology.

² [Understanding and assessing cultural significance 8-10-13 \(icomos.org\)](#)

Criterion	Description
	- The relative scientific value of a place is likely to depend on the importance of the information or data involved, on its rarity, quality or representativeness, and its potential to contribute further important information about the place itself or a type or class of place or to address important research questions. - To establish potential, it may be necessary to carry out some form of testing or sampling. For example, in the case of an archaeological site, this could be established by a test excavation.
Social	- Refers to the associations that a place has for a particular community or cultural group and the social or cultural meanings that it holds for them. - Places of social significance are usually important in maintaining a community's integrity and <i>sense of place</i>; that is, a sense of belonging to a particular area as a distinctive cultural group (Hall and McArthur 1993:8). - For many peoples, Indigenous archaeological sites (e.g., burials) and European-Indigenous contact sites (e.g., missions, plantations) have strong social significance. - Archaeological sites with materials deemed to be markers of the prior presence of the cultural groups may also assume a strong social significance during land ownership disputes.
Spiritual	- Refers to the intangible values and meanings embodied in or evoked by a place which give it importance in the spiritual identity, or the traditional knowledge, art and practices of a cultural group. - Spiritual value may also be reflected in the intensity of aesthetic and emotional responses or community associations and be expressed through cultural practices and related places. - The qualities of the place may inspire a strong and/or spontaneous emotional or metaphysical response in people, expanding their understanding of their place, purpose and obligations in the world, particularly in relation to the spiritual realm.

For the purposes of this study, the cultural heritage significance of each site or value was assessed using four of these five criteria: the historic, scientific, social and spiritual values. The values of each cultural heritage site were individually assessed and rated as being either low, medium or high according to the criteria set out in Table 6, which incorporates specific criteria outlined in the Practice Note produced by Australia ICOMOS (2013: 3-4). An assessment of aesthetic value was not included in the significance assessment given its somewhat subjective nature and the lack of established criteria that could be applied to an independent assessment of this criterion with regard to cultural heritage sites and values in PNG.

Table 6: Cultural heritage significance criteria ratings (based on Australia ICOMOS 2013)

Criterion	Examples	Rating
Historic	The place or value may be associated with an important event or theme in history, or a particular person or cultural group important to the history of the local area, state or nation	Historical value was rated as follows: - Low (1) for places or values which are not associated with any known historical event, person or theme - Medium (2) for sites or values which are associated with a moderately significant historical event, person or theme at either the local and/or provincial and/or national level - High (3) for sites or values which are associated with a highly significant historical event, person or theme at either the local and/or provincial and/or national level.

Criterion	Examples	Rating
Scientific	Using scientific techniques such as archaeology, the place of (if relevant) value has the potential to reveal new information or understandings about people, places, processes or practices	Ratings for scientific value are mostly applied to archaeological sites, and consider: - Site contents (e.g., size and patterning of site where 0 = no materials remaining, 1 = small number of artefacts with limited diversity (0-10 artefacts), 2 = larger number but limited range of artefacts, 3 = large and diverse range of artefacts) - Site condition (0 = destroyed, 1 = deteriorated, 2 = fair to good, 3 = excellent) - Site representativeness (1 = common, 2 = occasional, 3 = rare). The rating for overall significance is calculated based on the cumulative score for site contents, site condition and site representativeness where: - cumulative score 1-3 = Low (1) - cumulative score 4-6 = Medium (2) - cumulative score 7 or greater = High (3)
Social	The place or value may be an important local marker or symbol or contribute to the identity of a particular cultural group	Social value was rated as follows: - Low (1) for places or values which do not appear to have any clear social connection at either the local and/or provincial and/or national level. - Medium (2) for places or values which have a moderately significant social connection for a cultural group at either the local and/or provincial and/or national level. - High (3) for places or values which have a highly significant social connection for a cultural group at either the local and/or provincial and/or national level.
Spiritual	The place or value may contribute to the spiritual identity or belief system of a cultural group and/or may be important to maintaining the spiritual health and wellbeing of a culture or group.	Spiritual value was rated as follows: - Low (1) for places or values which do not appear to have any clear spiritual connection with a cultural group at either the local and/or provincial and/or national level. - Medium (2) for places or values which have a moderately significant spiritual connection for a cultural group at either the local and/or provincial and/or national level. - High (3) for places or values which have a highly significant spiritual connection for a cultural group at either the local and/or provincial and/or national level.

Numeric values were assigned to objective criteria differentiating low (1), medium (2) and high (3) scientific value. These criteria included the contents of the site, the condition of preservation of the site, and the representativeness of the site in terms of the wider (regional) cultural heritage site inventory.

Criteria differentiating low, medium and high historic, social and spiritual value were based on professional experience and information obtained during community consultation. Each criterion was assigned a numerical rating (low (1), medium (2) or high (3)).

Equal weight was given to all four criteria when determining the overall significance of each cultural heritage site. The potential to variably weight the degree of contribution of each criterion was initially considered but not pursued owing to the subjective nature of the factors used to determine historic, social and spiritual sensitivity.

The overall significance rating determined for each cultural heritage site was derived as a cumulative score across the four cultural heritage criteria, according to the following classification system:

- ≤ 6 – Low significance
- 7-9 – Medium significance
- ≥ 10 – High significance

4.2.3. Impact magnitude

The magnitude of an impact on a cultural heritage site or value is an assessment of the geographical extent, duration and severity of the impact. The magnitude of the impact is determined before and after the application of management measures.

The impact magnitude criteria used in this cultural heritage technical report are presented in Table 7.

Given that the impact magnitude criteria identified above may not all apply equally in terms of their severity in any given instance, an overall impact magnitude rating was calculated based on the cumulative score for each criterion, as follows:

- Low (cumulative score ≤ 3)
- Medium (cumulative score between 4 and 6)
- High (cumulative score ≥ 7)

Table 7: Impact magnitude criteria and ratings

Criterion	Nil	Low (Rating 1)	Medium (Rating 2)	High (Rating 3)
Severity	No impact	Loss of up to one third of site contents. Site condition rating decreases by one rating point. Site representativeness rating unchanged. Minor impact to the site's scientific value. Minor community reaction; attracts stakeholder concern at a local level.	Loss of up to two thirds of site contents. Site condition rating changes by two rating points. Site representativeness rating decreases. Moderate impact to the site's scientific value. Substantial community reaction; results in stakeholder concern at local and provincial levels.	Loss of greater than two thirds of site contents. Site condition rating changes by three rating points. Site representativeness rating decreases. Major impact to the site's scientific value. Major community reaction; results in stakeholder concern at a national or international level (i.e., media, shareholder, government, international non-government organisation concern).
Extent	No impact	Impact damages less than one third of site. No loss of access to site.	Impact damages up to two thirds of site and/or access to site restricted.	Impact damages greater than two thirds of site and/or permanent loss of access to site.
Duration	No impact	Temporary or short-term impact or loss of access to site limited to Project construction phase.	Medium-term impact or loss of access to site that will alleviate within life of Project.	Long-term (extends beyond the life of the Project) or permanent impact.

4.2.4. Assessing impact significance

The matrix used to assess the significance of a Project-related impact on a cultural heritage site or value is presented in Table 8. The significance of an impact is determined by assessing the significance of a cultural heritage site or value in relation to the overall magnitude of the expected impact on it.

Characteristics for each impact significance rating are presented in Table 9.

Table 8: Impact significance assessment matrix

		Cultural Heritage Significance		
		High	Medium	Low
Impact Magnitude	High	Extreme	Major	Moderate
	Medium	Major	Moderate	Minor
	Low	Moderate	Minor	Negligible
	Nil	Nil	Nil	Nil

Table 9: Impact significance rating characteristics

Impact Significance	Characteristics
Extreme	• Likely to result in major widespread community and stakeholder concern at the local, provincial and/or national/international level. • Affects the majority of the people in the area of influence. • The effect is very intense with people experiencing a rapid rate of change. The effect is immediate and/or endures for, and beyond, the duration of the activity or Project phase. • The effect significantly disrupts a cultural group's spiritual connection to land and in turn their spiritual identity and/or spiritual health and wellbeing. • Archaeological site conditions are destroyed such that potential understandings about people, places, processes or practices associated with the Project area are irrevocably lost.
Major	• Likely to result in a strong community and stakeholder reaction at the local, provincial and/or national level. • Affects a large number of people in the area of influence. • The effect is intense with people experiencing a relatively rapid rate of change. • The effect starts in a short time and/or endures for, and potentially beyond, the duration of the activity or Project phase. • The effect disrupts a cultural group's spiritual connection to land and in turn their spiritual identity and/or spiritual health and wellbeing. • The effect disrupts a cultural group's social connection to land which contributes to their cultural identity. • Archaeological site condition is damaged such that the ability to derive potential understandings about people, places, processes or practices associated with the Project area is reduced.
Moderate	• Could attract community and stakeholder concern being voiced at the local and provincial level. • Affects a moderate number of people in the area of influence. • The effect is moderate with people experiencing a moderate rate of change. • The effect is gradual and/or endures for the duration of the activity or Project phase. • The impact affects a cultural group's spiritual connection to land and in turn their spiritual identity.

Impact Significance	Characteristics
	• The impact affects a cultural group's social connection to land which contributes to their cultural identity. • Archaeological site condition is damaged such that the ability to derive potential understandings about people, places, processes, or practices associated with the Project area is somewhat reduced.
Minor	• May result in community and stakeholder concern being voiced in a localised area. • Affects a small number of people in the area of influence. • The effect is not very intense with people experiencing a slow rate of change. • The effect is delayed, medium-term and/or confined to the duration of the activity or Project phase. • A cultural group's spiritual or social connection to the land, and therefore spiritual or cultural identity, is largely undisturbed or maintained. • Archaeological site condition is largely undisturbed resulting in little effect on the ability to derive understandings about people, places, processes or practices.
Negligible	• Unlikely to create any concern in the community and among Project stakeholders. • Affects a very small number of people in the area of influence. • The effect is not intense with people experiencing a very slow rate of change. • The effect is immediate or delayed, short-term and/or confined to the duration of the activity or Project phase. • A cultural group's spiritual or social connection to the land is preserved resulting in little effect or maintenance of their spiritual or cultural identity. • Archaeological site condition is preserved resulting in little effect on the ability to derive understandings about people, places, processes or practices.

5. Baseline Assessment

The following baseline assessment draws extensively on information presented in the Environmental Impact Statement (EIS) prepared by Coffey Natural Systems for the PNG LNG Project in 2009 (Coffey Natural Systems 2009), and a series of technical reports prepared by Monash University during the period 2008-2011 as part of the EIA supporting the preparation of the EIS and subsequent archaeological salvage program at the LNG Plant site (also summarised in a series of papers edited by Richards et al. 2016). Unless otherwise referenced, the EIS document (particularly chapters 12 (Receiving Onshore Environment: LNG Facilities) and 16 (Cultural Heritage Environment: LNG and Marine Facilities)) and the EIA baseline assessment prepared by David et al. (2009) are here acknowledged as the source of much of the following information.

5.1. Environmental Context

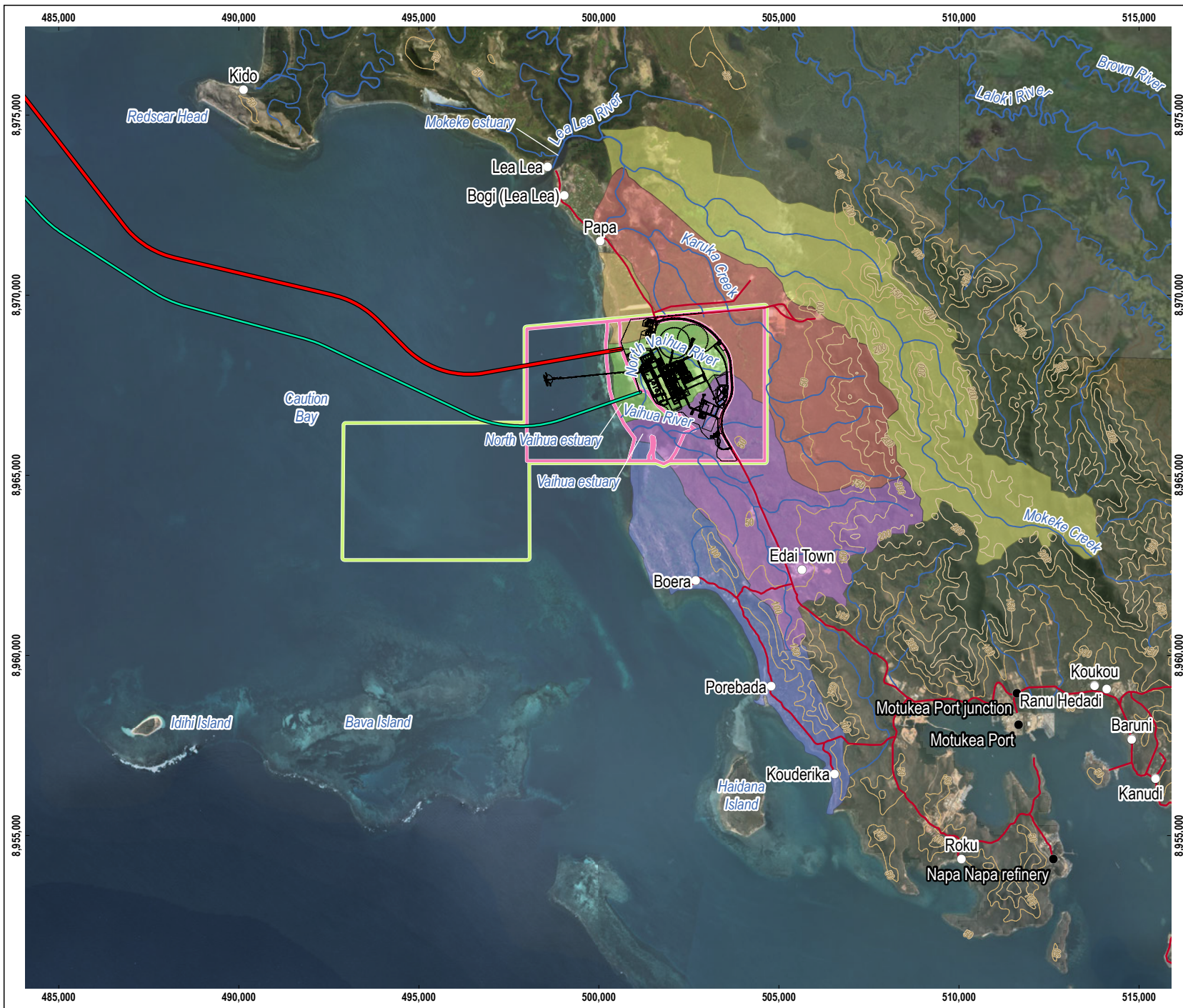
The LNG Plant site was vacant land 20 km northwest of Port Moresby prior to construction which took place from 2010 to 2013 when the first train was built.

The landform is a coastal plain with low hills of predominantly savanna and grassland, sloping gently seaward. It was largely cleared of vegetation in the early 20th Century for agricultural purposes (mainly cattle grazing). Most of the area remains substantially modified: frequent grassfires during the dry season have restricted the recovery of the eucalypt woodland typical of the unmodified surrounding area. A coastal strip of mangroves exists on the shoreline, which includes beach ridges that support forest patches and grassland. Behind (to landward) of the mangroves and beach ridges are open mudflats that receive intermittent tidal inundation during extreme spring high tides via the Vaihua River and tidal creeks, but when not inundated, become dried saltflats. Behind the swamps and mudflats, the land rises gently into savanna grassland vegetation that has been invaded by weeds. Further inland, open eucalypt *Melaleuca* woodland occurs on low-lying hills, and patches of riparian forest and grassland occupy riverine areas. The Vaihua River, North Vaihua River and Karuka Creek are located within the LNG Plant site and discharge to the sea via the Vaihua and the North Vaihua estuaries. Karuka Creek flows to Mokeke Creek and then to Mokeke Creek estuary (see Figure 6).

Prior to construction of the LNG Plant, the area was used by local people from the coastal villages for gardening and fishing along the coast, as well as firewood and mud crab collection along the mangrove coastal strip.

Other remnant vegetation includes areas of riparian forest that persist along the river between the mangroves and Lea Lea Road and isolated pandanus (*Pandanus* sp.) and low trees on shallow drainage lines.

A variety of distinct habitats occurs but with few fauna recorded at the LNG Plant site, probably due to the disturbed overall habitat quality. However, the estuarine, freshwater and terrestrial habitats of the Vaihua River are exceptions, providing a seasonal habitat for a wide variety of waterbirds, including migratory shorebird species. In 2008 the estuaries supported a higher abundance and diversity of aquatic fauna than any other habitat on the site.



LEGEND

- Village
- Point of interest
- Road
- Watercourse
- Contour (50 m interval)
- PNG LNG pipeline
- Proposed Papua LNG pipelines route
- Existing and proposed plant layout
- PPFL2 boundary
- APPFL boundary
- Catchment area
 - Karuka Creek catchment
 - Moreke Creek catchment
 - North Vahua River catchment
 - Vahua River catchment
 - Minor coastal catchment
 - Series of minor coastal catchments

SOURCE
Catchments, contours, infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from ArcGIS Online and Planet Labs.



0 1 2 3 km
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PROJECTION: WGS 1984 UTM Zone 55S

EXXONMOBIL PNG ANTELOPE LIMITED
PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 6

River catchments at the LNG Plant and surrounds



5.1.1. Geology and landforms

The LNG Plant site lies within the Southern Plains and Lowlands Region of Papua New Guinea that extends from the south coast, north to the foothills of the Central Ranges. Most of the region is dominated by very poorly drained or swampy alluvial plains. These plains are traversed by meandering river channels with off-channel waterbodies such as oxbow lakes and swamps on the floodplain. There are extensive tidal flats interspersed with narrow bands of beach ridges and swales near the coast. Mangrove swamps form part of these tidal flats.

The LNG Plant site and surrounding area is characterised by three distinct land systems (Figure 7):

- The Coastal Papa System consists of tidal flats, salt flats, estuarine mudflats, dunes and beach ridges on grey clayey or sandy peats to brown sticky clays. It is vegetated with mangroves, other salt-tolerant communities and grassland.
- The Boroko System lies inland from the Papa system and comprises alluvial plains with cracking grey soils and floodplains with olive silty clays. It is largely cleared (hilly terrain with weak or no structural control).
- The Fairfax System covers the eastward (inland) and southern parts of the LNG Plant site. It consists of low plateaus and hills with undulating plains with brown clay soils and is dominated by open eucalypt savanna with narrow strips of riparian forest along the seasonal waterways (hilly terrain with weak or no structural control leading onto mountains and hills with weak or no structural control).

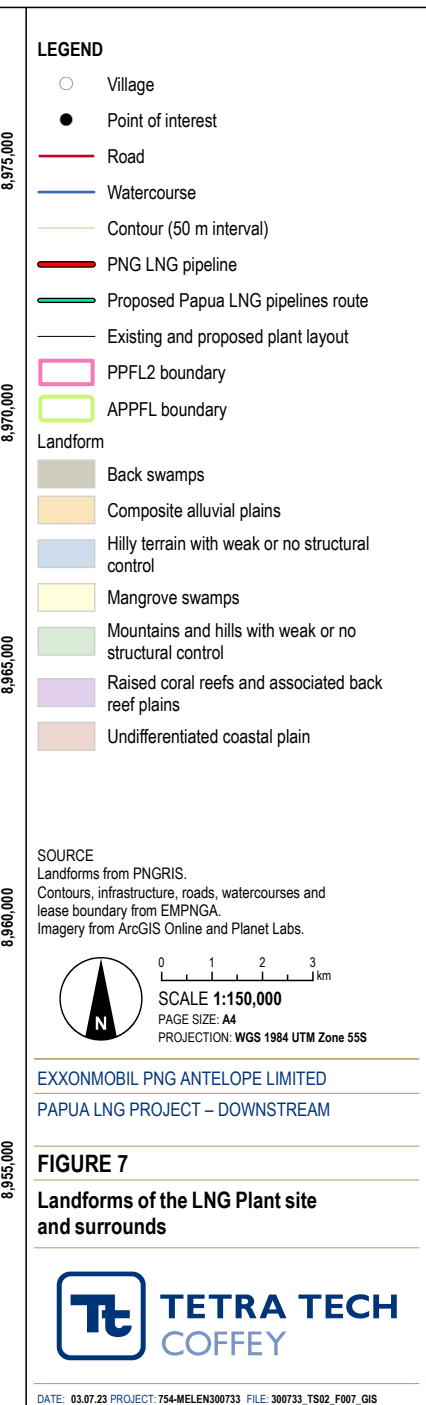
Coastlines have locally prograded throughout the course of the mid to late Holocene (7,000 to 1,000 years ago), with the current coastline being further out to sea than in the past. On this basis older remanent coastlines will be situated inland of the present coastline, and ancestral village settlements based around a coastal exploitation strategy would now be situated inland on these remnant coastlines.

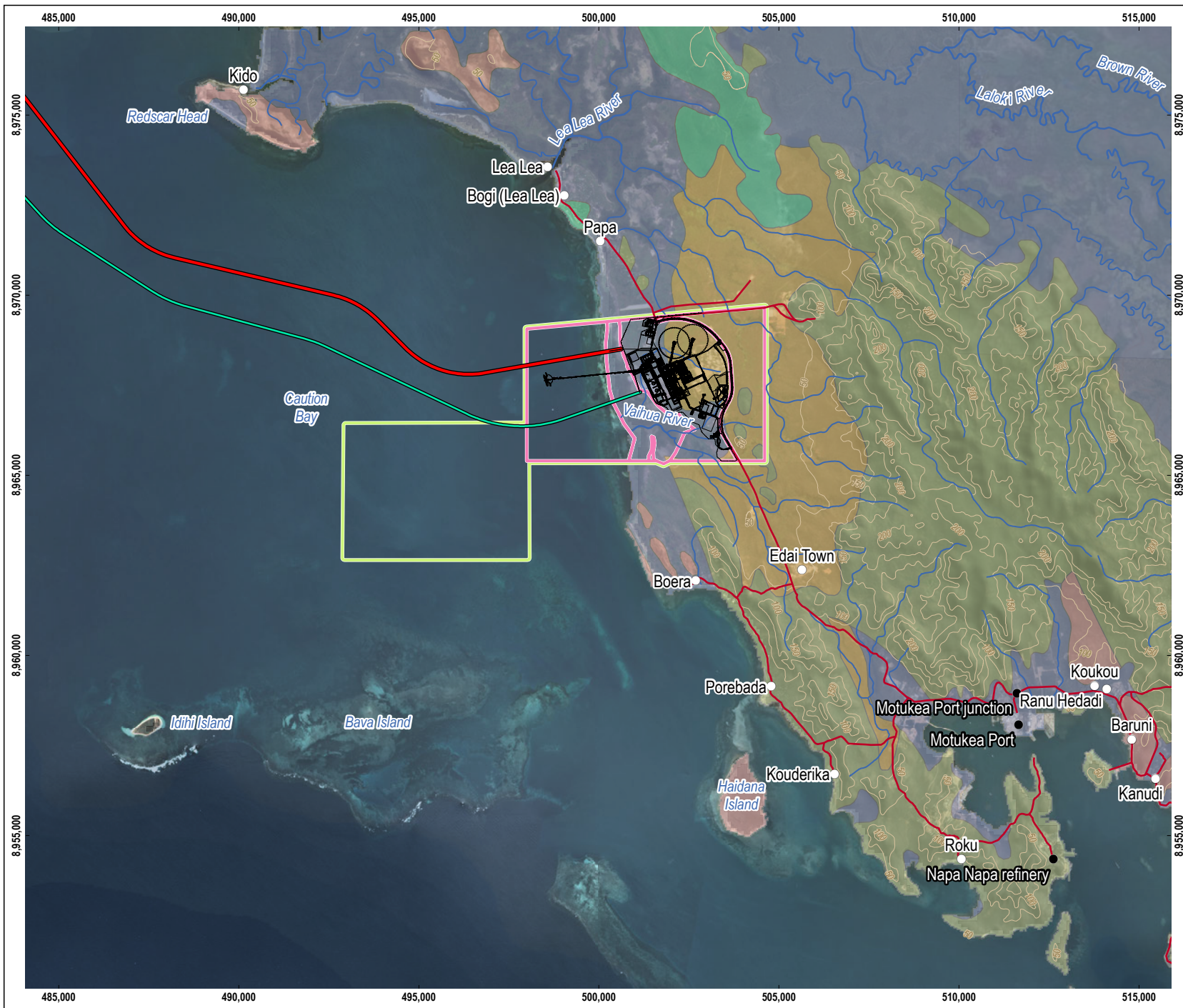
The geology of the LNG Plant site is illustrated in Figure 8.

Southeast Papua New Guinea is geologically complex, containing not only metamorphosed sedimentary rocks (course and fine grained) of Cretaceous and Jurassic age but also many basic igneous Tertiary rocks. The hills and bedrock in the region generally comprise siliceous argillites, cherts, calcarenites, mudstones, basalts and tuffs, as well as gabbro intrusive in some areas. Alluvial deposits up to 25 m in depth have formed within the valleys and depressions in the region of the LNG Plant site. Estuarine deposits dominate the area around Lea Lea and Papa, including the coastal strip of the LNG Plant site and along river mouths of the Vaihua and North Vaihua rivers, which discharge to Caution Bay. Colluvial and talus deposits exist at the base of the hills, and these deposits inter-finger with alluvial clays on the coastal plain (Rooke, 1988b).

Reef flats fringe the coast at Caution Bay. Fine grey sediments accumulate on the surface of the reef and muds are captured within the mangroves.

The Boera Hills to the south of the LNG Plant site comprise Cretaceous chert, limestone, siltstone and tuff that can also contain volcanic flows. Although these limestone ridges do not outcrop within the study area, it is possible that they may be present at depth beneath the Holocene and Pleistocene reef and seabed sediments fringing the site





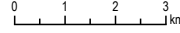
LEGEND

- Village
- Point of interest
- Road
- Watercourse
- Contour (50 m interval)
- PNG LNG pipeline
- Proposed Papua LNG pipelines route
- Existing and proposed plant layout
- PPFL2 boundary
- APPFL boundary

Lithology and geology

- Mixed or undifferentiated sedimentary
- Mixed sedimentary and limestone
- Limestone
- Basic to intermediate volcanic
- Alluvial deposits

SOURCE
 Geology from PNGRIS.
 Contours, infrastructure, roads, watercourses and
 lease boundary from EMPNGA.
 Imagery from ArcGIS Online and Planet Labs.

 
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FIGURE 8
**Geology of the LNG Plant site
 and surrounds**



5.1.2. Climate

The climate of the Port Moresby region is sufficiently representative of climate conditions at the LNG Plant site:

- The climate of the Port Moresby area is seasonal, with a dry southeast trade winds season from May to October and a wet northwest monsoon season from December to March. April and November are the transition periods.
- Monsoon surges with strong northwest winds have been observed in the region of Port Moresby. Tropical cyclone frequency in the low latitudes decreases westward towards the PNG mainland.
- The wind patterns in PNG are consistent. Strong wind speeds are rarely destructive and tropical cyclones with surface winds of greater than 34kt (62km/h) rarely occur
- The coolest months are July and August when the mean daily maximum and minimum are 28°C and 23°C respectively. The warmest months are December and January when the mean daily maximum and minimum are 32°C and 24°C respectively.
- Port Moresby has a mean annual rainfall of around 1,200 mm, which can drop below 1,000 mm in a drought year.

5.1.3. Vegetation

Prior to construction of the LNG Plant, vegetation and habitats that would have intersected the portion of the study area located within the security fence included grassland and open woodland (35%), savanna with small patches of gallery forest (57%), mangroves (6%) and subcoastal wetlands/mudflats (2%) in addition to oceans and coastal marine habitats (Figure 9). Although it is likely that most of these species are no longer present within the security fence due to construction of the LNG Plant, the grassland/open woodland and savanna habitats characterise the vegetation likely to be found in the laydown study zone outside the security fence.

Much of the study area consisted of grassland (mainly kangaroo grass (*Themeda australis*) and *kunai* (*Imperata cylindrica*)), with eucalypt (*Eucalyptus sp.*) savannah occurring further inland and extensive but narrow stretches of mangrove along the coast. There is some debate as to whether the grasslands are the result of natural or anthropogenic processes, or possibly both.

5.1.4. Fauna

A range of faunal species has previously been recorded at the LNG Plant site, including:

- non-volant mammals (grassland melomys (*Melomys lutillus*), the introduced house mouse (*Mus musculus*) and agile wallaby (*Macropus agilis*); local residents also recognised the southern common cuscus (*Phalanger intercastellanus*), Cape York rat (*Rattus leucopus*) and introduced black rat (*Rattus rattus*)
- potentially 23 bat species
- seventy bird species
- three frog and eight reptile species including skinks and snakes
- four freshwater and 30 estuarine fish species
- two freshwater and five estuarine crustacean species
- numerous benthic macroinvertebrate (shellfish) species.



5.2. Cultural Groups

The four villages closest to the LNG Plant site comprise two main cultural groups –the Motu³ and the Koita (also called Koitabu by the Motu) – and are categorised as follows:

- Porebada: Western Motu
- Boera: Motu (more closely linked to Western Motu than Eastern Motu)
- Papa: Koita
- Lea Lea: Western Motu.

Motu and Koita peoples recount their ancestors' places of origin, tell stories of routes taken to arrive at present locations, and identify previous village sites as valued cultural places. During the 19th century, at least twenty-five Koita and Western Motu settlements were observed between Bootless Inlet and Galley Reach and inland to the Laloki River (Figure 10).

Linguistic studies identify the Koita and Koiari (speaking non-Austronesian languages) as being closely related historically and as having a common linguistic ancestry that is different to that of the Austronesian-speaking Motu⁴. Based on genealogical evidence, it is likely that the Koita began to move away from the Koiari toward the coast approximately 200 years ago, possibly due to incursions by the Koiari into Koita-held territory.

Western Motu origin stories tell of the coming of people from the east, although some stories also tell of Motuans coming with pottery from the west and settling in villages to the immediate west of Port Moresby, including Lea Lea.

The Motu were mostly confined to a narrow strip between the hills and the sea while the Koita held rights to large areas of land which extended inland as far as the Laloki River (Figure 10). The Koita often acted as middlemen in trade between the Motu and the people of the mountains, exchanging Motu pottery, coconuts, fish and shell for meat, feathers, stone implements, garden produce and other commodities. The Western Motu annually relied on their Koita neighbours for food during times of drought and famine in particular, for while the Motu obtained marine resources such as fish, crabs and shellfish, and to some degree produced yams, bananas and other garden produce, invariably the wet season brought resource shortages necessitating importation of foods through trade. Long-term survival was thus achieved through short-distance exchanges with Koita and other neighbouring groups for garden and meat produce, as well as through annual long-distance maritime *hiri* expeditions that brought back large quantities of sago from the Gulf Province. Ceramics, along with shell valuables and marine products such as fish, were the principal trade goods enabling the Motu to obtain such food resources. Through chains of connection, these ceramics and other trade products would find their way throughout the coastal and hinterland regions of the Central and Gulf Provinces and beyond.

³ The Motu are often subdivided into Western and Eastern Motu, the former containing the ethnographic villages of Manumanu, Lea Lea, Porebada, Hanuabada and Pari, with three other Motu-speaking villages, Boera, Tatana and Vabukori, considered to be different from either Motu group. Eastern Motu villages were built completely in the sea, while Western Motu villages were constructed on the intertidal zone or on beaches.

⁴ Austronesia, in historical terms, refers to the homeland of the people who speak Austronesian languages, to which Malay, Filipino, Indonesian, Maori, Malagasy, native Hawaiian, the Fijian language and around a thousand other languages belong.

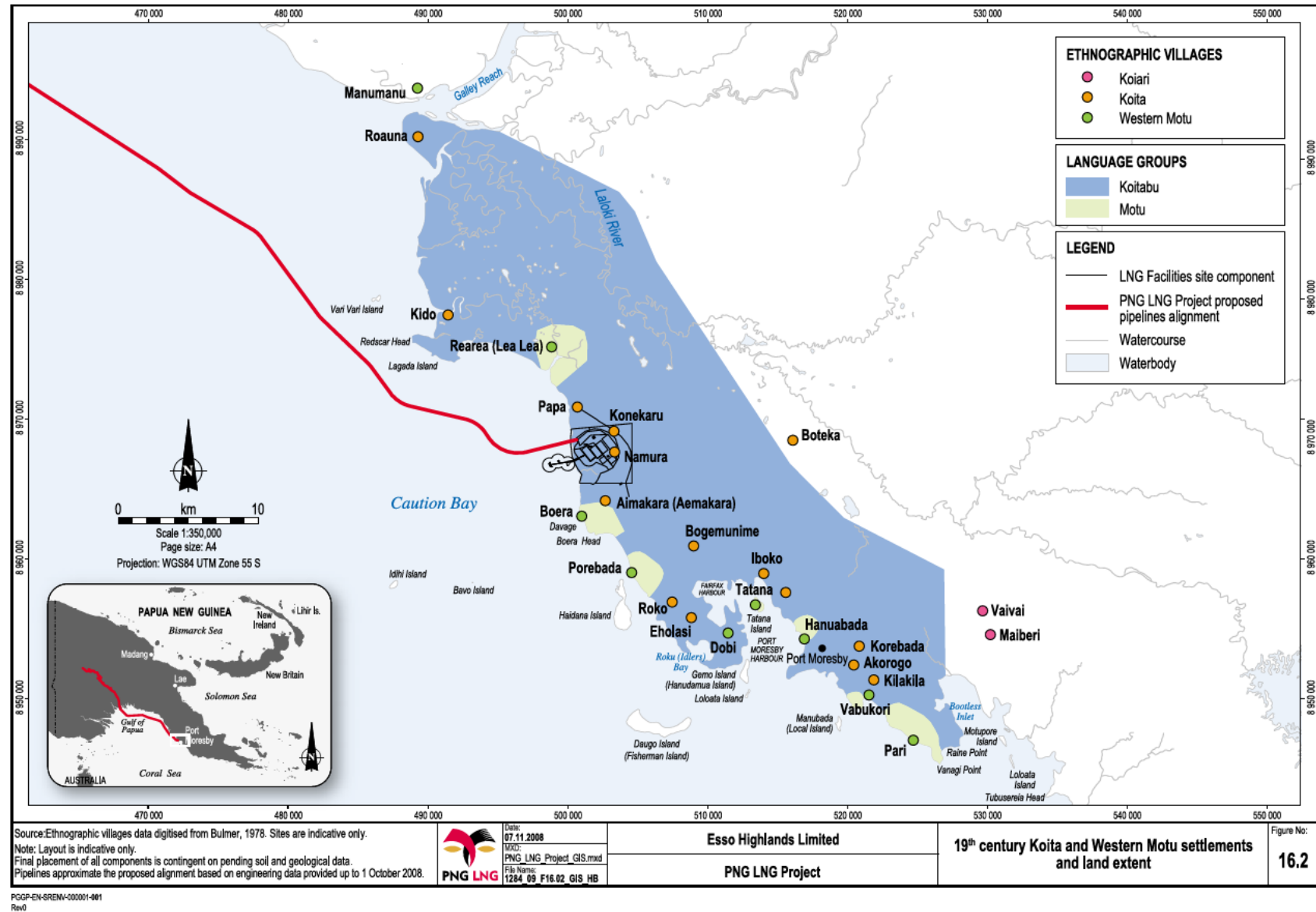


Figure 10: 19th century Koita and Western Motu settlements and land extent (source: Coffey Natural Systems 2009: Chapter 16, Figure 16.2)

The Koita initially established small inland hamlets, while the Motu built houses on stilts over the sea. Over time, the Koita moved towards the coast and came to share coastal villages with the Western Motu.

Western Motu houses were located along the beach and intertidal zones (Plate 1). Houses were erected in lines according to *iduhu*⁵ groupings (social sections), on piles at an approximate height of 3 m above the ground for the shoreward houses. Special activity sites were used contemporaneously with these settlements, including fishing and travellers' camps on offshore islands, hunting camps inland, and garden camps in valleys in the coastal hills. Motu villages were spaced out along the coast at approximately 15 km intervals, with an extra distance between the eastern villages and the western villages. Separate Koita settlements were located either in between Motu villages or on elevated land inland from a Motu village.



Plate 1: Stilt houses at Hanuabada, date unknown (source: David et al. 2009: 117, Figure 7.11)

Three ethnographically documented ancestral Koita villages have been noted in the vicinity of the study area (David et al. 2016a): Namura (also known as Dirora), Aemakara and Konekaru.

- According to Seligmann (1910: 41), Namura 'stood between Boera and Lea Lea in the bush, a short distance from the coast'. Although early mapping of ethnographically recorded villages suggests that Namura is located within the security fence surrounding the LNG Plant site (see Figure 10Figure 10), David et al (2016a: 113) note that Namura lies outside their survey area

⁵ *Iduhu* is a social unit within a village. It consists of one or more lines of houses and is inhabited by people who give themselves an *iduhu* name. The basis of the *iduhu* is the patrilineage descendents of a common ancestor, plus unmarried females. Women normally join the *iduhu* of their husband, living with his group.

which included the area eastward from the coast up to and including the security fence. The Namura clan consider Dirora to be an extremely important Koita cultural heritage site.

- Aemakara was established inland of Boera close to the southern boundary of the LNG Plant site.
- Konekaru was occupied at the time of initial European contact. It is an important ancestral place that formed a gateway to the coast for the Koita and that enabled Koita and Motu fishers to coordinate fishing and sailing activities. Konekaru and its associated beach are located immediately to the north of the LNG Plant site.

Given the significance of Aemakara and Konekaru for local Motu and Koita communities and their close proximity to land originally identified as available for construction of the LNG Plant, care was taken to ensure that disturbance at these two locations was avoided through the establishment of cultural heritage exclusion zones (mapped in Figure 4).

Both Koita and Motu villages had burial sites within the village precinct and a social structure predominantly based on *iduhu* descent groups. Descent-group headmen shared authority with ‘big-men’ who achieved renown through their economic and political exploits. These chiefs supervised *iduhu* activities, such as gardening, resolving marital problems and land tenure. A chief was the owner, or *tauna*, of the right front post of the ceremonial platform (*dubu*).

The *Hiri* Trade

The main ethnohistorical feature of the broader Caution Bay area is its role at the centre of the *hiri* trade. Motu (and to a lesser extent Koita) artisans manufactured tens of thousands of ceramic pots, which were traded over long distances around the coast of Gulf Province⁶.

The *hiri* is an ethnographically reported trade system involving Austronesian-speaking (principally Western Motu) ceramic pot manufacturers and traders sailing annually to villages in the Gulf of Papua (Plate 2) (David et al. 2016b). The *hiri* trade journeys are well documented in the late 19th and early 20th century literature. Trade voyagers set off in fleets of (typically around 20) multi-hulled sailing ships (*lagatoi*) from the Port Moresby area of Bootless Inlet and Caution Bay (including Boera, Papa and Lea Lea) when the southeast trade winds blew, typically in October or November, and returned with the monsoons around January. These trading expeditions brought ceramic pots and shell artefacts to the western Gulf Province villages, in return for sago and canoe hulls that would be strapped to the ships for the return voyage. Estimates of the size of these trading expeditions range from 20,000-30,000 pots outbound and 150-600 tons of sago inbound annually. Motu traders regularly travelled to the Gulf Province coastal villages as far west as Baimuru along the Purari River delta, more than 300 km away, and there are suggestions in local oral traditions that the Motu trade expeditions sometimes went further west. These villages then served as redistribution centres for inland villages and villages further to the west (e.g., those of the Kikori River and nearby river systems). The finding of a rock painting of a large, *lagatoi*-like crab-claw canoe on Dauan in northern Torres Strait suggests that at least on rare occasions *hiri* traders may have ventured even further west to northern Torres Strait, whether by accident or design.

⁶ Muke et al. (2018) have raised the possibility that pots were also traded inland within Gulf Province, based on the discovery of a single ceramic sherd on the Upper Purari River at Djobo.

The pottery manufacturing villages along the coastline from Boera to Lea Lea date back to at least 1,200 years (with earlier sites considered likely to exist). At the centre of the ceramics industry were the ancestral villages of Davage, Ava Garau just to the north of Boera and neighbouring sites located approximately 3 km to the south of the LNG Plant site. They also included Aemakara and Konekaru.



Plate 2: *Lagatoi* on Port Moresby Harbour, date unknown (source: David et al. 2009: 128, Figure 7.15)

5.3. Cultural Heritage Site Types

Cultural heritage is often considered in terms of both the tangible and intangible ways that people create, express and preserve that heritage. As would be expected, tangible and intangible heritage varies from culture to culture. For the purposes of the present study, tangible and intangible heritage are defined as follows:

- Tangible heritage includes moveable or immovable objects, property, sites, structures or groups of structures, which have archaeological, paleontological, historical, cultural, artistic or religious values.
- Tangible heritage also includes unique natural features or tangible objects that embody cultural values, such as lakes, ponds, outcrops, rocks and waterfalls.
- Intangible forms of culture heritage include (but are not limited to) knowledge, innovations, religious ceremonies, values, beliefs, and the continuing practice of traditional lifestyles.

Previous studies investigating the potential for extractive industry projects to impact on cultural heritage in Papua New Guinea typically distinguish between two classes of tangible cultural heritage: oral tradition sites and archaeological sites.

5.3.1. Oral tradition sites in Papua New Guinea

Oral tradition sites are places of intrinsic contemporary cultural significance or are associated with specific forms of contemporary cultural knowledge (this aspect being tangible). They are identified primarily on the basis that people alive today possess knowledge of these places (including their location, the stories behind them and the reasons why they are considered to be of cultural importance), and that the places exist as physical entities in the landscape.

While some of these places may contain physical (i.e., tangible) evidence of the human behaviours that relate to them, it is not an essential requirement in order for the place to be identified as a cultural heritage site – the fact that people have an extant oral tradition that identifies the place as being associated with a cultural activity or belief (i.e., intangible heritage) is sufficient. In Papua New Guinea, these may include (but are not limited to) the following:

- places associated with ceremonial or ritual activities
- places where spirits dwell, both ancestral (*tumbuna*) and spirit (*masalai*)
- hunting camps, former settlements and clan origin places
- burials and cemeteries
- sites associated with warfare
- places where people lived or undertook important social or economic activities.

5.3.2. Archaeological sites in Papua New Guinea

An archaeological site is a place (or group of physical sites) in which evidence of prehistoric, historic or contemporary human activity is preserved, and which has been, or may be, investigated using the discipline of archaeology. Archaeological sites may range from those with few or no remains visible above ground, to buildings and other structures still in use. In Papua New Guinea, many archaeological sites typically include a range of manufactured materials such as pottery and stone or wooden artefacts, or evidence for human intervention in the landscape (e.g., fortifications, drainage ditches or mounded gardens). Archaeological site types in Papua New Guinea include (but are not limited to):

- artefact scatters
- occupation sites, including open settlement sites and caves or rockshelters
- economic sites, including stone quarries, former gardens and sago processing sites
- ossuary sites and marked graves and cemeteries.

Some archaeological sites still have significance for local people. For example, a rockshelter or cave used as an ossuary will usually have continuing cultural significance to members of the clans which used them, or in rare cases continue to visit them. Simultaneously, these sites are of archaeological interest in terms of understanding traditional mortuary practices, as well as contemporary conceptions of those places and practices.

In other instances, ancient archaeological sites may be encountered that have no contemporary cultural significance for local people, i.e., a cave or open site that bears evidence of past human occupation, but which has no associated contemporary oral tradition. Following discovery, the site may acquire a new cultural significance to local communities because it now needs a place within their worldview (Hitchcock 2012). For example, a site with evidence of thousands of years of human occupation may become a source of pride for local people.

5.3.3. EIA cultural heritage study site types and categories

For the purposes of the present study, the terms ‘cultural heritage’ and ‘cultural heritage sites’ will be used to collectively refer to both oral tradition sites and archaeological sites. However, the criteria outlined above differentiating these two site classes should be borne in mind with regard to the following review of previous studies, and the methodologies used to investigate these site classes.

The original cultural heritage investigation undertaken in support of the LNG Plant component of the PNG LNG Project EIA (David et al. 2009) identified the following cultural heritage site types as either being present or likely to be present within or near the LNG Plant site:

Oral Tradition Sites:

- ethnographically known villages
- human burials/cemeteries
- sacred sites
- traditional story sites.

Archaeological Sites (precontact):

- stone artefacts, occurring either singly (isolated stone artefacts) or as scatters
- pottery, occurring as either single pottery sherds (isolated sherds) or as scatters
- midden shell, occurring as either single shells (isolated shells) or as scatters
- artefact scatters including stone and pottery, stone and midden shell, pottery and midden shell or all three
- animal bones, only occurring as components of scatters that also include stone, pottery and midden.

Archaeological Sites (postcontact)

Ground surfaces within the LNG Plant site may have been subjected to varying degrees of disturbance associated with the colonial (postcontact) period including:

- early sites associated with the London Missionary Society
- sisal production (early 1900s)
- military defence during WWII (1940s)
- Fairfax Cattle Station (1950s-1980s).

These cultural heritage site categories and types were also identified during subsequent investigations at the LNG Plant site between 2009 and 2011 (see Section 5.4 for further details) and have therefore been adopted for the purposes of the present study.

5.4. Previous Studies

5.4.1. 1967-2008

David et al. (2009: 105-186) provide a detailed summary of archaeological investigations along Papua New Guinea’s south coast and hinterland in Central Province and Gulf Province that were completed in the 40 years leading up to the PNG LNG Project ESIA (Allen 1972, 1977a, 1977b, 1978, 1984; Allen and

Rye 1982; Bulmer 1969, 1971, 1978, 1982; David, 2008; Frankel et al. 1994; Pretty 1967; Rhoads 1980, 1994; Swadling 1976, 1977, 1980; Swadling and Kaiku 1980). They describe a series of studies largely focused on local and regional ceramic decorative styles and their implications for the origins and subsequent expansion of the Motu *hiri* trade and earlier long-distance maritime trade networks which involved the manufacture of large quantities of trade ceramics over some 2,000 years or more.

Key findings that emerged from their review relating to archaeological site patterning across the broader Port Moresby region (including Caution Bay) indicate that:

- A range of site types can be expected, including village sites, clay, ochre and stone artefact sources, freshwater wells, hunting camps and gardens.
- Village sites can be expected along or near the coast (due to the maritime orientations of the Motu) as well as on hilltops (due to the defensive positioning of ancient Koita settlements). Coastal village sites will almost certainly be stilt villages, possibly with the presence of *dubu* (ceremonial platform).
- Large village sites are likely to occur on the coast, with smaller hamlet-type settlements further inland. However, migrating coastlines through time may mean that at in the past coastal villages were located further inland than today's coastline would indicate.
- The inter-tidal zone and near-shore environment is likely to contain the remains of past settlements.
- Garden sites are likely to occur in the hinterland.
- Archaeological sites could be buried deeply below the present ground surface.
- Burials are likely to be found within any village site, as well as in some caves and rockshelters.
- Customary spiritual/story places will occur.
- Most of the archaeological sites are likely to occur on land or in the inter-tidal zone, but *lagatoi* or canoe wrecks and spiritual/story places are also present at underwater locations in the general region.

They also note (somewhat prophetically) that these comparatively recent ceramic traditions must have their origins in an earlier settlement of the Port Moresby area (including Caution Bay) by Austronesian maritime colonisers at least 2,000 years ago or perhaps earlier (David et al. 2009: 138-139), based on evidence indicating that Austronesian speakers came into Torres Strait from the east around 2,600-2,400 years ago (McNiven et al. 2006). They anticipated that ceramic sites of similar antiquity would one day be found along the ancient southern Papua New Guinea coastline (located along the inland plains just north of the present of the coastline).

5.4.2. PNG LNG Project EIA

Cultural heritage field surveys supporting the preparation of the PNG LNG Project EIA were undertaken within, and in the vicinity of, the LNG Plant site in January 2008 and again in April-May 2008 (David et al. 2009). These surveys focused on the northern area within the proposed location of the LNG Plant site security fence. Cultural heritage sites situated outside the security fence but known from the literature and through interviews with locals were also surveyed.

The surveys identified the following sites located within and near the LNG Plant site lease boundary (Figure 11):

- 120 archaeological sites
- three traditional resource sites
- five traditional story/sacred sites known from oral traditions (excluding the traditional village sites below that are also story and/or sacred sites)
- 12 traditional village sites known from oral traditions
- three *lagatoi* wrecks
- two early missionary sites
- three World War II defence facilities
- 11 World War II aircraft crash sites
- one World War II shipwreck
- two other colonial period infrastructure sites

Seventy-eight archaeological sites and one oral tradition site (Konekaru) were located within (63 sites) or near the security fence:

- 20 small sites comprised of isolated or small sets of four or less unstratified cultural items, lying on the ground surface (<1 m²)
- 11 small stratified sites 1-25 m²)
- 12 medium-sized sites (26-100 m²)
- 19 large sites (101-1,000 m²)
- 16 very large sites (>1,000 m²).

Unexploded ordnance within the lease boundary curtailed the spatial coverage of the survey work at the time, but an extrapolation from the surveyed area suggested that the entire area inside the security fence would contain approximately 364 archaeological sites. Notwithstanding the large number of sites, the ESIA cultural heritage study noted that the LNG Plant site is located in a zone between the most important regional cultural heritage (including oral tradition) sites:

- Konekaru to the northwest of the security fence (but managed through avoidance that included erection of an exclusion fence)
- Aemakara to the south (also avoided and cordoned off using an exclusion fence)
- Davage to the southwest (but far enough away from the security fence not to be affected by PNG LNG Project activities).

Interviews in the four villages of Porebada, Boera, Papa and Lea Lea did not uncover any important oral tradition sites within the security fence.

5.4.2.1. *Ethnographically known villages*

Aemakara and Konekaru were initially identified within the security fence alignment defined for the LNG Plant during the initial 2008-2009 surveys. These sites were subsequently avoided during construction of the LNG Plant by the delineation of cultural heritage exclusions zones that were demarcated on the ground by exclusion fences (Figure 12).

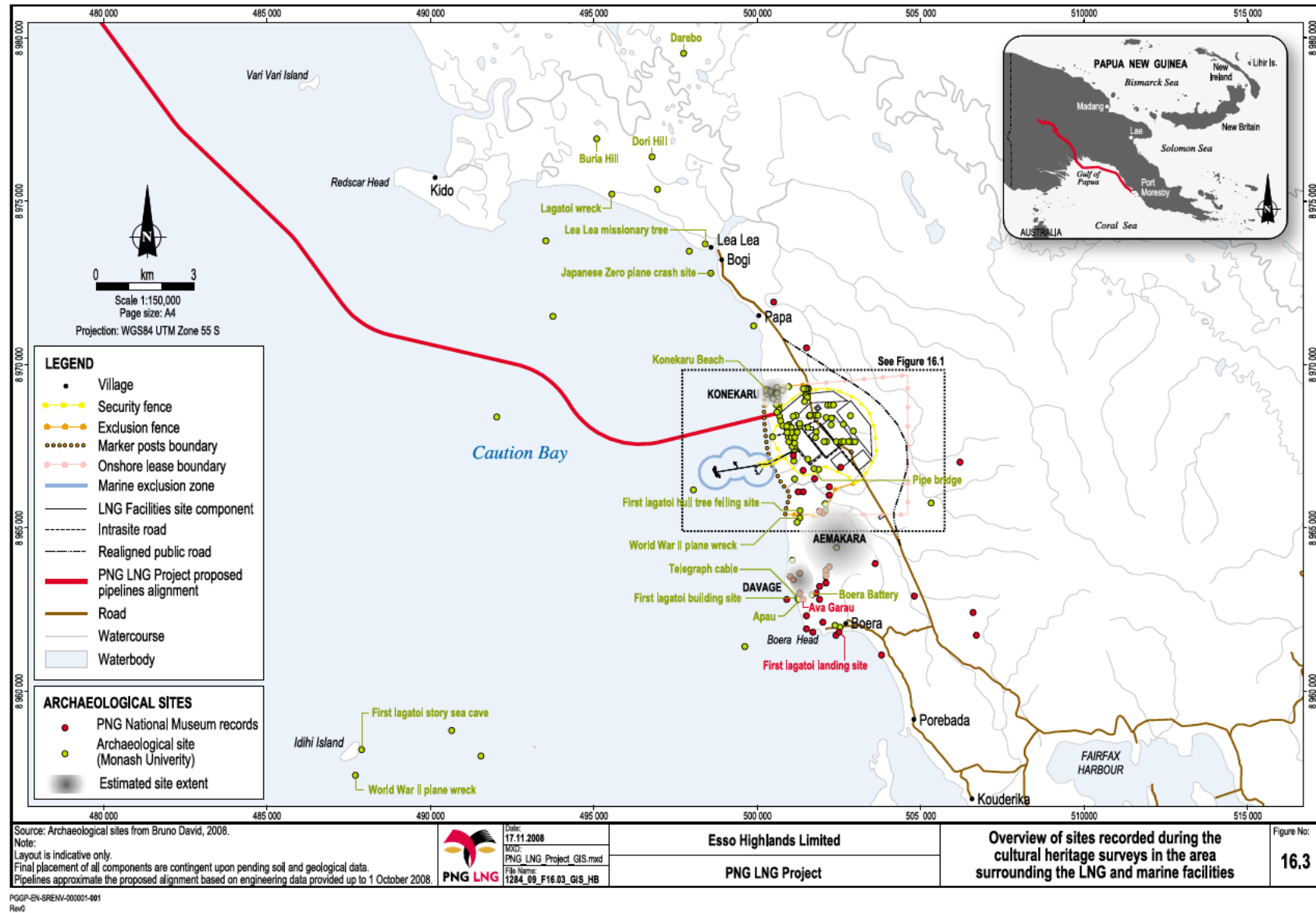


Figure 11: Site locations recorded during the ESIA LNG Plant cultural heritage surveys, 2008 (source: Coffey Natural Systems 2009: Chapter 16, Figure 16.3)

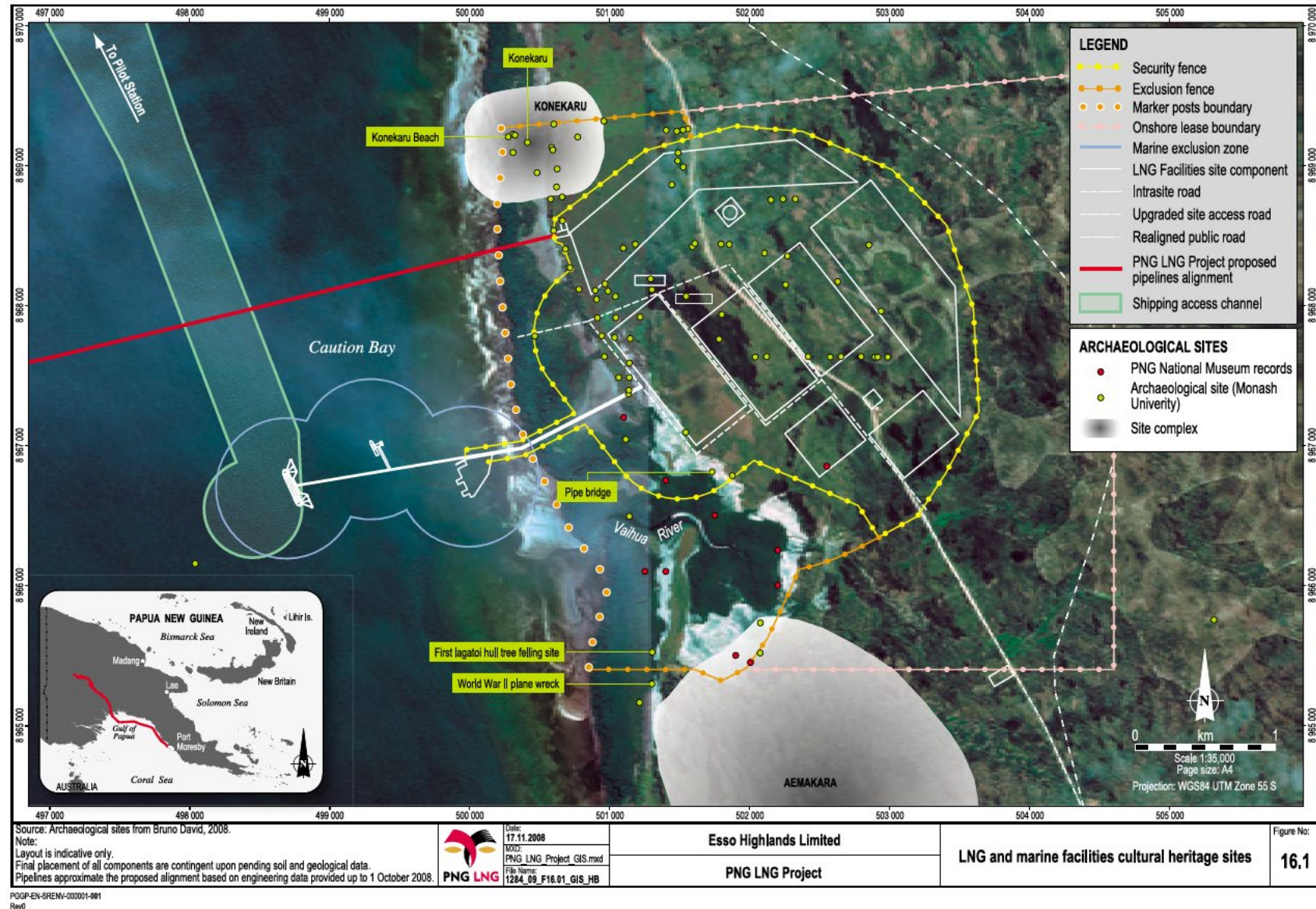


Figure 12: Cultural heritage sites recorded within and near the LNG Plant site during the 2008 ESIA cultural heritage surveys (source: Coffey Natural Systems 2009: Chapter 16, Figure 16.1)

Other old village sites, known from oral traditions and historical records, recorded near the LNG Plant site included:

- a historical village and cultural complex at Buria Hill, near Lea Lea, some 10 km to the northwest of the site.
- the traditional ancient village of Darebo located 11 km northwest of the LNG Plant site
- Dori Hill located 8.5 km to the northwest of the site.

5.4.2.2. *Burial sites*

Prior to the PNG LNG Project salvage program, there was no evidence of human burials or cemeteries in or around the LNG Plant site. However, based on previous research which identified human remains in every archaeologically excavated village site reported in the Port Moresby region (David, Duncan and Levesley 2009: 218), the likelihood of human remains at the Konekaru village site within the lease boundary (but outside the security fence) is high, as is the likelihood of burials at other large sites recorded during the field surveys but not identified during interviews (e.g., Apau Village).

5.4.2.3. *Sacred sites and traditional story sites*

Four traditional sites related to the story of the ancestral hero Edai Siabo and his first *lagatoi* (see David et al. 2009: 130-133 for further details) were identified outside the LNG onshore and marine facilities areas, two on land and two in shallow water.

It is believed that the first *lagatoi* was built at one of these traditional sites, known locally as Davage, which is situated in the first small bay to the north of Boera Head, some 3.6 km south of the LNG Plant site (see Figure 11). The site is marked by a modern timber platform under a shade tree and at the time of the cultural heritage survey was being used to build a dugout canoe.

At the second site (outside the LNG Facilities site) between Boera and the Vaihua River, a fisherman from Boera village says that stone flakes from the axes that carved the first canoe south of Vaihua River can be seen during the dry season. The story tells of trees being felled and the trunks roughly shaped here before the canoe was transported through the mangroves to a village near Davage, where Edai Siabo lived.

Some of the villages known through oral tradition are also sacred sites that host ancestral spirits; these include Buria and Apau. Apau predates the current village of Boera, and is located to the north of Boera Head, some 3.8 km to the south of the LNG Plant site. Wooden posts and ceramics marking the site of the old Apau stilt village were reported to be evident during the dry season.

5.4.2.4. *Archaeological sites*

Seventy-seven archaeological sites were recorded in and around the LNG Plant site:

- scatters of pottery, stone artefacts and midden shell: 22 sites
- scatters of pottery, stone artefacts, midden shell and animal bones: 2 sites
- scatters of pottery and stone artefacts: 8 sites
- scatters of pottery and midden shell: 11 sites
- scatters of pottery: 5 sites
- scatters of stone artefacts and midden shell: 3 sites
- scatters of stone artefact: 7 sites

- scatters of midden shell: 7 sites
- isolated stone artefacts exposed on the ground surface: 2 sites
- isolated pottery shards exposed on the ground surface: 2 sites
- isolated shells exposed on the ground surface: 8 sites.

The most prevalent archaeological site type in the surveyed area contained pottery, stone artefacts and midden shell material. Most of these sites were concentrated along a north-south strip of land between the eastern shoreline of the saltflats that is the southern arm of the tidal inlet and the North Vaihua River (locally known as Ruisasi Creek) (David et al. 2009: 220). The largest of these sites are in the vicinity of Konekaru.

A site prediction model for the LNG Plant site developed by David et al. (2009: 234-237) noted that large, dense archaeological deposits are situated near the present-day coastline while numerous, significantly smaller sites occurred further inland. This observation was quantified comparing site size categories with distances from the coastline as per the dataset presented in Table 10. The results can be summarised as follows:

- 69% of the largest sites (>1,000 m²) occur within 1 km of the coast, and all are located no more than 1.5 km from the coast.
- If the two largest size categories are combined, more than 75% are found within 1 km of the coast.
- The inverse pattern is apparent for sites at the smaller end of the range (<1 m² and 1-25 m²) – 11% of isolated artefacts are found within 1 km of the coast, and 67% are found more than 1.5 km from the coast.

This is consistent with a predominantly coastal settlement pattern, especially stilt villages built over the shallow marine environment or on a sandy beach (David et al. (2009: 237). The large coastal sites recorded by David et al. (2009) mostly correspond with the presence of sandy substrates.

Table 10: Archaeological site patterning at the LNG Plant site (source: David et al. 2009: 236, Table 8.5)

Site Size (m ²)	Distance from the coast					
	<1.0 km		1.0-1.5 km		>1.5 km	
	N	%	N	%	N	%
<1	2	12	3	18	12	71
1-25	5	36	4	29	5	36
26-100	7	58	1	8	4	33
100-1,000	16	84	2	11	1	5
>1,000	11	69	5	31	0	0

David et al. also commented on site densities and their relative distributions across the landscape (2009: 265-266):

- Inland sites tend to have very low artefact densities, typically <1-3 m².

- Sites close to the coast usually have very high artefact densities, often measured in the hundreds or more per m².

This was interpreted as an indication that people often used the hinterland for travel, gardening, hunting, short-term camps, etc., but that within the area of the LNG Plant site settlements were almost exclusively established along the coast, which is consistent with the ethnographic evidence presented in Section 5.2 (David et al. 2009: 266).

5.4.2.5. Postcontact historical sites

A memorial commemorates the landing of Reverend William Lawes⁷ at Boera, where the first church in this area was subsequently built. The London Missionary Society built churches in Boera, Papa and Lea Lea and has played a large role in village life. A large tree planted by the first missionary on the banks of Lea Lea Creek inside Lea Lea village is considered locally important for its associations with the London Missionary Society.

Coastal batteries were established during World War II at and around Port Moresby, including at Paga Point, Gemo Island, Idlers Bay and Boera. The Boera battery was constructed by the 8th Army Troops Company, Royal Australian Engineers, in July 1943 and is one of two World War II defence sites recorded during the field surveys (Plate 3). The range-finding station, gun pits, magazines, ammunition cupboards and the rear sections of the cast iron gun carriages are still intact.



Plate 3: Boera battery: no. 1 gun in 1944 (L) and Boera battery: gun pit no. 2 in 2008 (source: Coffey Natural Systems 2009: Chapter 16, Plates 16.7 and 16.8)

The gun pits were placed to defend the northern and western entrances to Caution Bay and to repel any land attack. The 155 mm field guns had a range of up to 14 km away and up to 40 rounds were fired during artillery practice sessions. There was also an anti-aircraft gun emplacement at the rear (eastern side) of the battery. Unexploded ordnances were therefore to be expected within a 14-km radius of the battery (but excluding the general direction of Boera village some 500 m to the south).

⁷ Reverend William George Lawes transferred to Papua New Guinea in 1874 until his retirement in 1906. Lawes was a pioneer missionary photographer, and the first permanent non-indigenous resident of Papua New Guinea. He created the first photographic images of the islands and its peoples as well as images of missionary work, which were distributed commercially through Henry King of Sydney. Lawes' knowledge of, and role in, Papuan life was also of paramount importance to other photographers, particularly those of colonial government and expeditionary parties.

A second World War II defence site recorded during the field surveys was a fuel dump north of Lea Lea Village. A telephone cable and 'fuel hideout' (fuel dump) were reported to the northwest of the village and are thought to be associated with the telegraph line shown on a 1944 military engineer's map.

5.4.3. Additional PNG LNG Project cultural heritage surveys

The results of additional cultural heritage surveys undertaken in 2008, 2009 and 2011 by David, Skelly and Araho (2009), David, Ash, Skelly and Araho (2009), Paterson, David and Richards (2009) and Paterson et al. (2009) as part of the PNG LNG Project EIA are summarised in Table 11. A further 875 archaeological sites were added to the project database during this period at infrastructure locations inside the security fence and between the security fence and the perimeter fence (640 sites); along the perimeter fence (98 sites); along a proposed heavy haul road right of way (ROW) alignment south of the LNG Plant (45 sites); and along a bypass road immediately adjacent to the eastern boundary of the security fence (92 sites).

5.4.4. PNG LNG Project archaeological salvage program

An archaeological salvage program was completed at the LNG Plant site and nearby locations during 2009 (David et al. 2010; David et al. 2011; Richards et al. 2011). The salvage program, which included the collection of surface artefacts and formal excavations at selected sites, was undertaken in response to the findings of the original ESIA cultural heritage investigations and the cultural heritage management and mitigation measures recommended in the project EIS.

Early results from the salvage program based on fieldwork completed in January-March 2009 at Konekaru 1, Bogi 1 (ABEN⁸) and Bogi 2 (ABEO), Nadi 1 (ABEP) and Nadi 2 (ABEQ) and Line 11 Mound (ABES), all located on a coastal dune system, were reported by David et al. (2011). Significant results included in the report are summarised below:

- Konekaru 1 – three 1 m² excavations. The results indicate that although Konekaru 1 was not part of the main Konekaru village complex, cultural deposits at Konekaru 1 were probably laid down immediately prior to and during occupation of the main village complex.
- Bogi 1 – two 1 m² excavations that were extended during the main salvage program in October 2009-March 2010 (Richards et al. 2011; see below). Five stratigraphic units were excavated, all sandy, with the deepest deposits containing pottery dating to 2,300-2,400 years BP (at the time of reporting making it the oldest confirmed evidence of pottery from anywhere in mainland Papua New Guinea). Other significant finds included pig and dog remains from levels dated to 2,100-2,000 years BP.
- Bogi 2 – one 1 m² excavation indicating the presence of ceramics dating back to 2,400 years BP. Together with Bogi 1, these findings indicated that the dune system on which the two sites are located includes an expansive sequence of cultural deposits including unexcavated ceramic levels that are at least 2,400 years old, followed by even denser cultural levels dating to approximately 2,000 years.

⁸ Four letter acronyms beginning with the letter 'A' denote cultural heritage sites included on a cultural heritage site register managed by the NMAG, known as the National Site File.

Table 11: Summary data on additional archaeological surveys at the LNG Plant site, 2008-2011

Fieldwork Dates	Reference	Study areas included in report	No of sites recorded	Summary
Sep 2009	Paterson, David, Richards and Collins 2009	Heavy haul road ROW south of the LNG Plant site	45	- Alignment situated on average approximately 3 km inland. - Archaeological materials included stone artefacts, shell and ceramic sherds; 26 sites (57%) contain pottery sherds exposed on the ground surface; 24 sites (53%) contain shells, and 9 sites (20%) contain stone artefacts. - All sites were rated as being low density sites; 96% of sites were rated as small-medium in size. - All sites were rated as being either of Low or Medium significance at the Local or Provincial level.
Dec 2008	David, Skelly and Araho 2009	Bypass road immediately adjacent to eastern security fence	92	- Three sites were grouped in one site complex and six in another; the remaining 83 sites were considered to represent discrete archaeological sites. 61% of sites were small, 35% were medium and 4% were large in size. - Archaeological materials included stone artefacts, shell and (to a lesser extent) vertebrate remains; all sites contained exposed ceramic sherds. - All sites rated as being either of Low or Medium significance at the Local or Provincial level. 13 sites were identified as having a potential to retain stratified subsurface deposits.
Jan 2008 – April 2009	David, Ash, Skelly and Araho 2009	All areas inside the security fence and limited areas between security fence and perimeter fence, LNG Plant site	640	458 archaeological sites identified inside the security fence, and two oral tradition sites and 180 archaeological sites identified in limited survey areas between the security fence and the perimeter fence. - Of the 458 archaeological sites within the security fence, 57% are small, 34% are medium and 9% are large in size. Of these, nine small sites, 23 medium sites and 11 large sites contain artefact densities of 20 or more artefacts/m², and in many cases over 100 artefacts/m². Sixteen of these dense sites are over 500m² in area and are likely to represent ancient village sites. Large/dense sites are located within 2.1km of the coast. 149 sites (32%) within the security fence are stratified sites containing significant buried archaeological deposits. - Of the 180 archaeological sites between the Security Fence and the Boundary Fence, 53% are small, 33% are medium and 14% are large in size. Of these, 11 medium sites and 15 large sites contain artefact densities of 20 or more artefacts/m². Seventeen of these dense sites are over 500m² in area and are likely to represent ancient village sites. Large/dense sites are located within 2.1km of the coast. - Archaeological materials included ceramic sherd, stone artefacts, shell and (to a lesser extent) vertebrate remains. - All sites rated as having some degree of significance at the Local Level; 41 sites were rated as having either Medium to Very High levels of Provincial/National scientific, historical and educational significance because they contain stratified subsurface deposits, and many are likely to represent ancient villages.

Fieldwork Dates	Reference	Study areas included in report	No of sites recorded	Summary
				- Of the 458 archaeological sites within the Security Fence, 149 were identified as having a potential to retain stratified subsurface deposits. - Of the 180 archaeological sites between the security fence and the perimeter fence, 76 were identified as having a potential to retain stratified subsurface deposits.
Sep 2009	Paterson, David and Richards 2009	Perimeter fence at LNG Plant site	98	88 sites within the fence corridor, and 10 sites a short distance outside the corridor. 14% of sites were isolated artefacts, and 86% of sites were artefact scatters. 38% of sites were small, 43% were medium and 19% were large in size; all sites were rated as being of low-medium density. - Archaeological materials included ceramic sherds, stone artefacts, shell and (to a lesser extent) vertebrate remains. - All sites rated as having some degree of significance at the Local Level; 27 sites were rated as having either Medium or High levels of Provincial scientific, historical and educational significance because they contain stratified subsurface deposits.

- Nadi 1 and Nadi 2 – two 1 m² excavations on the coastal dune containing cultural deposits dated to 2,000-1,800 years BP.

The main archaeological salvage program at the LNG Plant site and adjacent bypass road corridor was completed during the period September 2009 to March 2010 (Richards et al. 2011).

5.4.4.1. Bypass road corridor

Evidence from 13 excavated sites covering a total of 27 m² suggests that human occupation of the corridor (some 1-2 km inland) by pottery-bearing people spans the period 2,600-1,900 years ago and represents domestic occupation sites where people subsisted on a mix of marine and terrestrial resources including domesticated pig, and maintained far-reaching exchange contacts as represented by the presence of obsidian, which originated from distant sources.

One human burial was excavated in the Bypass Road Corridor (site AK Road 3) in sediments dating to 1,900BP.

5.4.4.2. LNG Plant site

A total of 174m² was excavated across 107 archaeological sites within the security fence defining the boundary of the LNG Plant site. These excavations documented a long cultural sequence starting at approximately 4,500 years ago in a pre-ceramic period, with Lapita pottery first appearing at around 2,900 years ago. There are no major occupation gaps for the period 2,900 to 1,500 years ago, with cultural materials present in every century during this period. However, occupational evidence is then sporadic from 1,500 years ago into the ethnographic period.

5.4.4.3. Lapita

Lapita cultural deposits were identified during the salvage program at sites JD17, JD6, Bogi 1 (ABEN), RS87, AH15, RS63, JA1 (AAVM) and AK Road 3. The sand dune including JD17, JD6 and Bogi 1 was identified as being rich in Lapita sites and representing a buried Lapita landscape.

Pottery was one of the most commonly occurring materials observed across the area and included Lapita and post-Lapita ware. Flaked stone artefacts were also relatively common in the cultural deposits, made from fine-grained chert with some chalcedony, quartz and obsidian also present. Numerous ground edge axes and adze blades manufactured from volcanic raw materials were found in deposits throughout the cultural sequence. The assemblages also contained hammerstones, anvils and a possible *lagatoi* anchor-stone.

In addition to the distinctive incised decorated Lapita ware (Plate 4), the Lapita sites contained a variety of shell artefacts including ground, narrow rings made from cone shell or clam shell.

A diverse faunal assemblage included over 130 species of bivalves and gastropods, sea urchins and crabs, marine fish (including parrotfish and wrasse), dugong and sea turtle, agile wallaby and domesticated pig and dog (between 2,000 and 2,250 years ago).

One pre-Lapita human burial was excavated in aceramic deposits below identified Lapita ceramics at Bogi 1 (ABEN).



Plate 4: Lapita sherds from site JD6 (source: David et al. 2010: xxiv, Figure 6)

Richards et al. (2011) concluded that inland sites were first occupied, probably at least in part by expanding coastal populations or by populations in close interaction with inland groups, at the very end of the Late Lapita period and the start of the post-Lapita period around 2,500 to 2,600 years ago. The earliest pottery found in the inland sites was generally of immediate post-Lapita character with some Late Lapita examples, however at least one notable inland hilltop locality was occupied by people using Late Lapita pottery. In general, the inland sites were occupied from around 2,600 to 1,900 years ago, with only sporadic occupation evidence thereafter, suggesting that the regional population shift noted for the coastal dunes also included the immediate hinterland.

These results represent:

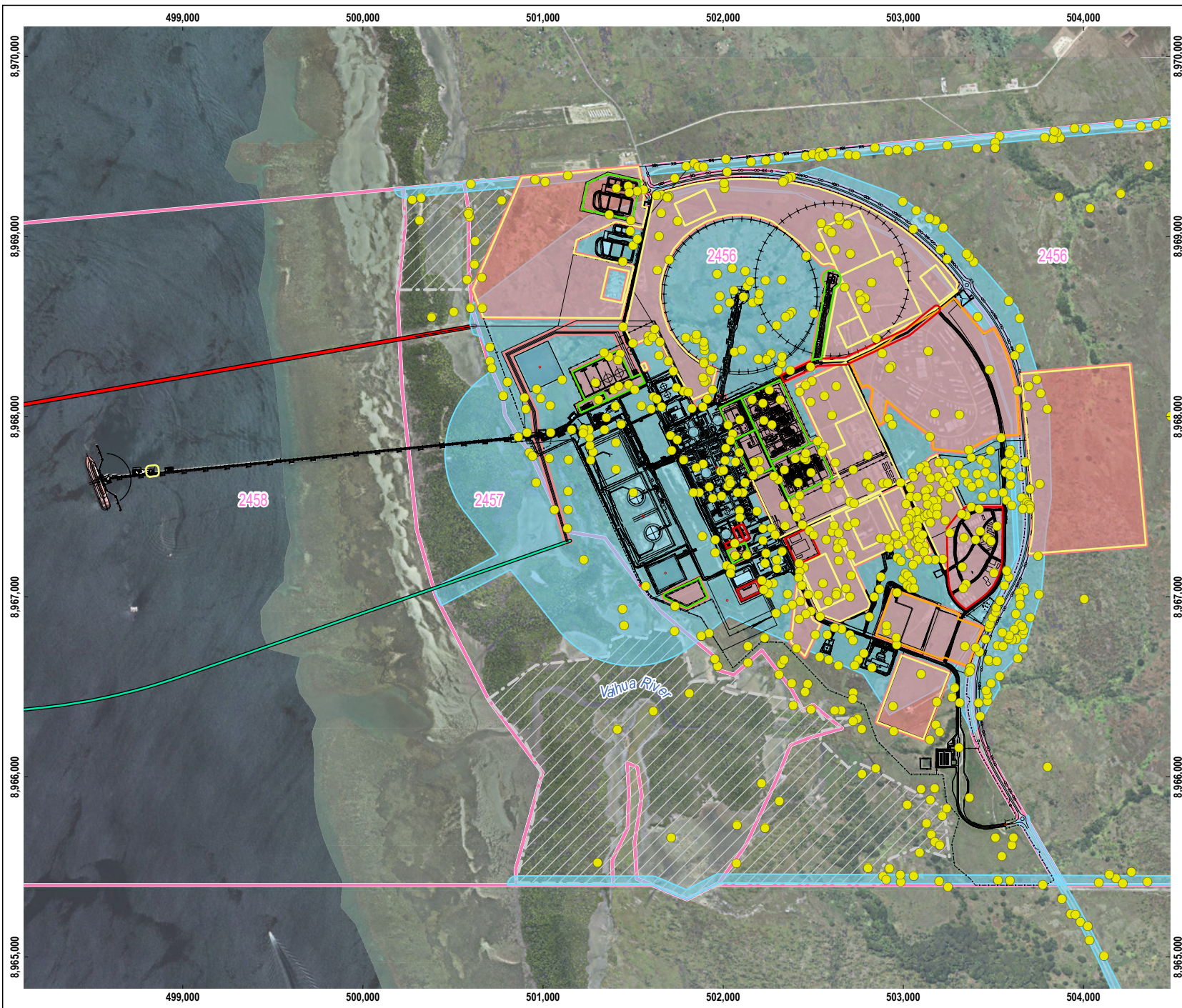
- the earliest evidence for occupation in the broader Port Moresby region
- the earliest confirmed evidence of pottery on the island of New Guinea; and
- the earliest evidence for both pigs and dogs on the island of New Guinea.

5.4.5. Previously recorded cultural heritage sites intersecting the Project study area

Two hundred and forty-three previously recorded cultural heritage sites are situated in the study area (Figure 13). The sites are widespread across the study area and occur within all project components. Archaeological site types present within the study area include isolated stone, pottery and shell artefacts, and scatters of stone, pottery and shell in varying combinations. Pottery and shell are the dominant cultural materials represented in the assemblage.

Three cultural heritage sites dating to the historical period are located in the study area (see David, Ash, Skelly and Araho 2009 for further details):

- Ak138/AK139: a site containing metal and glass
- JA102 (AASR): a WWII airstrip
- JA044 (AARL): a cattle water trough associated with the Fairfax Cattle Station.



- LEGEND**
- Previously recorded cultural heritage site
 - PNG LNG pipeline
 - Proposed Papua LNG pipelines route
 - Existing and proposed plant layout
 - Proposed new facility
 - Proposed expanded/upgraded facility
 - Temporary construction area
 - Temporary camp
 - PPFL2 boundary
 - Cultural heritage restricted area
 - Cultural heritage study area
 - Previously cultural heritage study area (2009-2010)

SOURCE
 Cultural heritage study area and data from ELA.
 Infrastructure, historical cultural heritage and lease boundary from EMPNGA.
 Imagery from EMPNGA and Google Earth.



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FIGURE 13
 Previously recorded cultural heritage sites mapped in relation to the Project study area



Site sizes and site densities were scaled in accordance with the criteria used in previous cultural heritage assessments of the LNG Plant site by Monash University (e.g., Paterson, David and Richards 2009: 19, 25; David et al. 2016a):

- small site: $\leq 25 \text{ m}^2$
- medium-sized site: 25 m^2 to 1000 m^2
- large site: $\geq 1000 \text{ m}^2$
- low density site – < 20 cultural items/ m^2
- medium density site – 21-50 cultural items/ m^2
- high density site – > 50 cultural items/ m^2

A breakdown of archaeological site sizes and densities within the study area is presented in Table 12. Small sites comprise 59% of the overall assemblage, and medium-sized sites comprise 31%. Low density sites comprise an overwhelming 97% of the assemblage.

Table 12: Archaeological site sizes and densities within the study area

Site Size	Site Density				Total
	Low	Medium	High	Unknown	
Small	141	0	1	1	143
Medium	73	3	0	0	76
Large	22	0	2	0	24
Total	236	3	3	1	243

The baseline characterisation of cultural heritage sites within the project study area as a whole is heavily influenced by post-EIS activities approved by the NMAG under arrangement with EMPNG. Activities including surface artefact collection, salvage excavation and the subsequent construction and operation of the LNG Plant, have already impacted recorded cultural heritage places within the study area, with the exception of the laydown study zone. The summary description presented above provides a useful context against which the cultural heritage values recorded during the 2019 field program in the laydown study zone (see Section 5.5) can be assessed. Furthermore, several archaeological sites recorded during the 2008-2010 PNG LNG Project EIS field program are situated in the laydown study zone, and for this reason they have been summarised separately (see Table 13).

Seven previously recorded sites are located in the laydown study zone. These include:

- six medium-sized sites of which five are low density and one is of unknown density
- one small site of unknown density.

Table 13: Summary data on previously recorded cultural heritage sites intersecting the laydown study zone

PNG LNG Project Site Code	Max Length (m)	Max Width (m)	Size (m ²)	Size Category	Density Category	Cultural Material Scatter			
						Stone	Pottery	Shell	Vertebrate Fauna
AK Road 1	30	20	600	Medium	Low		•	•	
AK Road 2	18	15	270	Medium	Low		•		
NA/AK 05	10	10	100	Medium	Low		•		
NA/AK 06	15	5	75	Medium	Low		•	•	•
NA/AK 07	10	10	100	Medium	Low		•		
NA/AK 08.2	0	0	0	Small	Unknown	•	•		
NA/AK 08.3	30	30	900	Medium	Unknown	•	•		

5.5. 2019 Cultural Heritage Field Program

5.5.1. Objectives

The purpose of the 2019 cultural heritage field program was to:

- identify, describe and map cultural heritage values (Indigenous and historic) within the 61 ha laydown study zone, situated immediately adjacent to the eastern boundary of the LNG Plant site between the security fence and the perimeter fence
- assess the potential, actual and perceived negative impacts of the project and inform the cultural heritage impact assessment to be included in the Project EIS
- inform the development of recommendations regarding avoidance, management and mitigation measures (including additional pre-construction archaeological surveys or salvage programs as required) to minimise impacts on cultural heritage during Project construction and operations.

5.5.2. Fieldwork Schedule and Team

The field program, which commenced on 18 July and concluded on 16 August 2019, was developed and managed by Dr John Muke, Director at the Social Research Institute (SRI) based in Port Moresby. Dr Muke also participated in the field program, along with John Sepe and Les Muke, both Senior Specialists at SRI. Community consultation undertaken during the field program was facilitated by Unage Maraga, Community Affairs Officer, EMPNG.

The field team was accommodated onsite by EMPNG at the LNG Plant facility for the duration of the field program.

5.5.3. Community Interviews

John Sepe (SRI), with assistance from Unage Maraga (EMPNG), conducted an interview with Chief Nao Nao of Papa Village on 13 August 2019. The purpose of the interview was to determine whether there are any oral traditions specifically associated with the study area. A transcript of the interview is attached at Appendix C.

5.5.4. Survey Coverage and Ground Surface Visibility

Phase 1 of the survey (selected polygon surveys) initially mapped out and inspected 17 survey sample areas. Surveys at these locations were completed within time, permitting a more intensive effort during Phase 2 and significantly increasing the overall survey coverage.

All pedestrian survey tracks mapped during the archaeological field survey are presented in Figure 14. Approximately 90% of the total study area was subject to a formal archaeological survey using the methods outlined in Section 4.1.1.3 above.

Ground surface visibility was assessed as excellent (80-90%) on burned ground surfaces⁹ (Plate 5), moderate to good (40-70%) on slashed surfaces (Plate 6 and Plate 7), and very poor (0-5%) on vegetated surfaces (Plate 8).



Plate 5: Burned ground surface, excellent ground surface visibility

⁹Areas in the northern section of the laydown study zone were independently burned by local villagers.



LEGEND

-  Survey track point
-  Existing and proposed plant layout
-  Temporary construction area
-  PPFL2 boundary

SOURCE
Cultural heritage study area and data from ELA.
Infrastructure, historical cultural heritage and lease boundary from EMPNGA.
Imagery from Google Earth (capture date 21/08/2019).



0 100 200
m
SCALE 1:7,500
PAGE SIZE: A4
PROJECTION: WGS 1984 UTM Zone 55S

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FIGURE 14

Archaeological pedestrian transect survey coverage





Plate 6: Slashed ground surface, good ground surface visibility



Plate 7: Slashed ground surface along survey transect, moderate ground surface visibility



Plate 8: Partially slashed ground surface, very poor ground surface visibility

5.5.5. Results

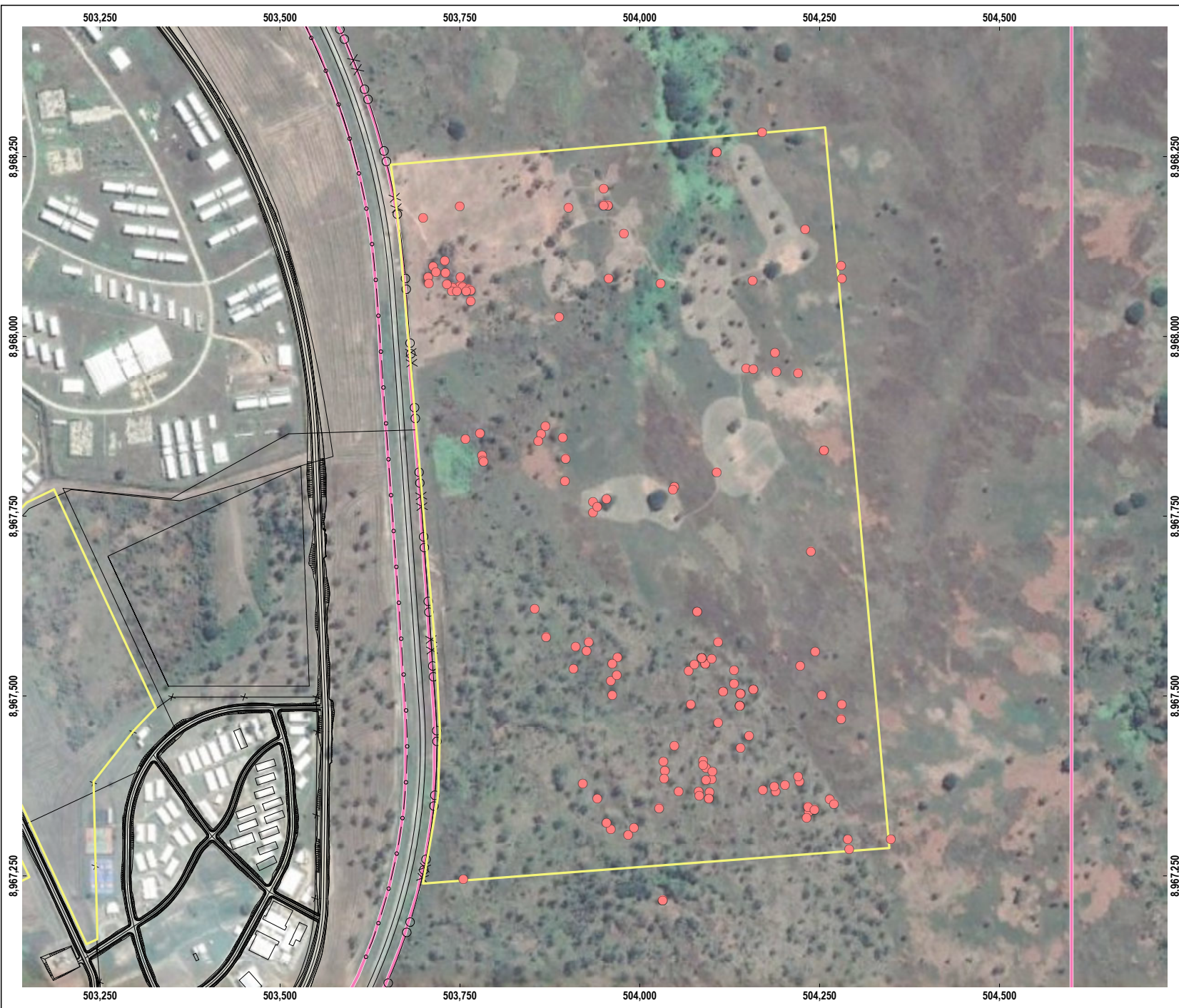
5.5.5.1. Phase 1 and Phase 2

A total of 131 exposures containing archaeological materials were identified and recorded during Phases 1 and 2 of the laydown study zone ground survey. The locations of these exposures are mapped in Figure 15, and summary information on the nature, contents, size and location of each exposure is presented in Table 14.

Cultural material recorded during the Phase 1 and Phase 2 surveys included plain and decorated pottery fragments (e.g., Plate 9 and Plate 10), flaked stone artefacts (mostly manufactured using chert) (e.g., Plate 11 and Plate 12), and whole shells and shell fragments including gastropods and bivalves (e.g., Plate 13 to Plate 15). Culturally worked basalt fragments and a ground-edge basalt axe-adze (Plate 16) were also identified in EX121.

A total of 754 artefacts were identified during the Phase 1 and Phase 2 surveys. Of these:

- 166 artefacts (22%) were identified at 42 exposures in the north-western portion of the study area
- 87 artefacts (11%) were identified at 16 exposures in the north-eastern portion of the study area; and
- 501 artefacts (67%) were identified at 73 exposures in the southern portion of the study area.



LEGEND

- Archaeological exposure location
- Existing and proposed plant layout
- Temporary construction area
- PPFL2 boundary

SOURCE
 Cultural heritage study area and data from ELA.
 Infrastructure, historical cultural heritage and lease boundary from EMPNGA.
 Imagery from Google Earth (capture date 21/08/2019).



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 SCALE 1:7,500
 PAGE SIZE: A4
 PROJECTION: WGS 1984 UTM Zone 55S

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 PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 15

Archaeological exposure locations mapped during the laydown study zone ground survey



Table 14: Summary data on cultural material exposures identified during the 2019 laydown study zone field survey

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX01	Pottery	6	x		Brown	Body	6			x			Individual - 2169-2175; Cluster - 2160-2168 (wide north face)	1-Aug-19	All pottery sherds are heavily weathered, and plain.
EX02	Pottery	3	x		Brown	Body	3			x			Individual - 2184-2190; Cluster - 2176-2183 (wide eastern face)	1-Aug-19	All pottery sherds are heavily weathered, and plain.
EX03	Pottery	9	x		Very Pale Orange - 10YR 8/2	Body	x			x			01013-01033	23-Jul-19	Nine pieces of pottery fragments clustered in an area 1m ² . Highly weathered with a grainy texture.
EX04	Chert flake	1	n/a		Dark Yellowish Orange - 10YR 6/6	Body	x			x			01042-01074	24-Jul-19	A chert flake
EX05	Pottery	11	x		Orange - Brown	Body	11			x			Individual - 2232-2240; Cluster - 2225-2231 (wide north-western face)	1-Aug-19	All pottery sherds are heavily weathered, and plain.
EX06	Pottery	9		x	Dark Yellowish Orange - 10YR 6/6	Body, Neck & Lip	x			x			01076-01119	24-Jul-19	Nine pottery fragments, two lip pieces with decorations, one neck with decorations and five body pieces.
EX07	Pottery	1	x		Moderate Reddish Brown - 10YR 4/6	Body	x			x			01042-01074	24-Jul-19	A single pottery fragment
EX08	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01120-01136	24-Jul-19	A single pottery fragment, highly weathered with a grainy texture.
EX09	Pottery	3	x		Brown	Body	3			x			Individual - 2219-2224; Cluster - 2211-2218 (wide south-east face)	1-Aug-19	All pottery sherds are heavily weathered, and plain.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX10	Pottery	2	x		Orange - Brown	Body	2			x			Individual - 2321-2329; Cluster - 2314-2320 (wide south-western face)	2-Aug-19	All pottery sherds are heavily weathered, and plain.
EX11	Pottery	1	x		Very Pale Orange - 10YR 8/2	Lip	x			x			0965-0968	21-Jul-19	A single pottery fragment, lip piece.
EX12	Pottery	20	x		Very Pale Orange - 10YR 8/2	Body & Lip	x				x		0929-0955	21-Jul-19	Twenty pieces of a single pot, two pieces are lip section, clustered in 1m ²
EX13	Pottery	2	x		Dark Yellowish Orange - 10YR 6/6	Body & Rim	x			x			01609-1618	28-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² , one fragment is a rim, highly weathered with a grainy texture.
EX14	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body		x		x			0759-0771	21-Jul-19	A single pottery fragment (larger piece)
EX15	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			0583-0597	19-Jul-19	A single pottery fragment, highly weathered with a grainy texture.
EX16	Pottery	3	x		Very Pale Orange - 10YR 8/2	Body & Neck	x			x			0804-0915	21-Jul-19	Three pieces of pottery fragments clustered in an area 1m ² , one neck piece.
EX17	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			0816-0928	22-Jul-19	A single pottery fragment
EX18	Pottery	27	x		Brown	Rim, Body	27		x	x			Individual - 2200-2210; Cluster - 2191-2198 (wide south-eastern face)	1-Aug-19	Rim piece is >5cm (measuring 6cm x 3cm x 1.5cm). All other pieces are plain, heavily weathered.
EX19	Pottery	2	x		Very Pale Orange - 10YR 8/2	Body & Lip	x			x			0888-0903	21-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² , on is a lip piece.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX20	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			0792-0804	21-Jul-19	A single pottery fragment
EX21	Pottery	7	x		Very Pale Orange - 10YR 8/2	Body	x				x		0805-0825	21-Jul-19	Seven pieces of pottery fragments clustered in an area 3-2m ²
EX22	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			0774-0791	21-Jul-19	A single pottery fragment
EX23	Pottery	2	x		Very Pale Orange - 10YR 8/2	Body	x			x			0982-0993	22-Jul-19	Two pottery fragments, highly weathered with a grainy texture.
EX24	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			0969-0981	22-Jul-19	A single pottery fragment, highly weathered with a grainy texture.
EX25	Pottery	3	x		Very Pale Orange - 10YR 8/2	Body	x				x		0849-0864	21-Jul-19	Three pieces of pottery fragments clustered in an area 3-2m ²
EX26	Pottery	4	x		Very Pale Orange - 10YR 8/2	Body	x				x		0826-0848	21-Jul-19	Four pieces of pottery fragments clustered in an area 3-2m ²
EX27	Pottery	3	x		Very Pale Orange - 10YR 8/2	Body	x				x		0865-0881	21-Jul-19	Three pieces of pottery fragments clustered in an area 3-2m ²
EX28	Pottery	1	x		Pale Yellowish Brown - 10YR 6/2	Body	x			x			0603-0624	19-Jul-19	A single pottery fragment
EX29	Pottery	1	x		Pale Yellowish Brown - 10YR 6/2	Body	x			x			0627-0643	20-Jul-19	A single pottery fragment
EX30	Pottery	1	x		Moderate Reddish Brown - 10YR 4/6	Shoulder	x			x			0646-0663	20-Jul-19	A single pottery fragment (shoulder piece)
EX31	Pottery	1	x		Pale Yellowish Brown - 10YR 6/2	Body	x			x			0664-0682	20-Jul-19	A single pottery fragment
EX32	Pottery	1	x		Dark Yellowish Orange - 10YR 6/6	Body		x		x			0683-0708	20-Jul-19	A single pottery fragment (larger piece)
EX33	Pottery	1	x		Very Pale Orange - 10YR 8/2	Rim		x		x			01264-01281	27-Jul-19	A single pottery fragment, large rim.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX34	Pottery	1	x		Very Pale Orange - 10YR 8/2	Rim		x		x			01241-01260	26-Jul-19	A single pottery fragment, large rim.
EX35	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01620-1633	29-Jul-19	A single pottery fragment
EX36	Pottery	5	x		Dark Yellowish Orange - 10YR 6/6	Body & Rim	x				x		01393-1413	27-Jul-19	Pottery fragments, 5 pieces scattered within 3-2m ² . One piece is a rim fragments, the rest are body fragments.
EX37	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01282-1296	27-Jul-19	A single pottery fragment
EX38	Pottery	1	x		Very Pale Orange - 10YR 8/2	Rim		x		x			01297-1312	27-Jul-19	A single pottery fragment, large rim.
EX39	Pottery	1	x		Very Pale Orange - 10YR 8/2	Rim	x			x			01313-1321	27-Jul-19	A single pottery fragment, rim.
EX40	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01231-01240	26-Jul-19	A single pottery fragment
EX41	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01328-1341	27-Jul-19	A single pottery fragment
EX42	Pottery	22	x		Very Pale Orange - 10YR 8/2	Body & Rim	x				x		01342-1392	27-Jul-19	Pottery fragments, 22 pieces scattered within 3-2m ² . The pieces compose of two different pots. Four pieces are rim fragments, the rest are body fragments.
EX43	Pottery	7	x		Orange - Brown	Rim, Body	7			x			Individual - 2515-2523; Cluster - 2507-2514 (wide south-western face)	6-Aug-19	A single rim piece, and 7 pottery fragments. All weathered and plain.
EX44	Shell	15	n/a		White	n/a	15	x	x		x		Individual -(a) 2741-2751; (b) 2752-2758; (c) 2759-2768; Cluster	7-Aug-19	The site is situated 5 meters north of huge gum tree. NW 3 meters is a patch of Pandanus Trees. Found

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
													- 2719-2740 (wide south- western face)		surface scatter of shells and pottery 15 meters from the raintree.
EX44	Pottery	16	x		Orange - Brown	Body	16				x		Individual -(a) 2741-2751; (b) 2752-2758; (c) 2759-2768; Cluster - 2719-2740 (wide south- western face)		
EX45	Pottery	2	x		Orange - Brown	Body	2			x			Individual - 2356-2363; Cluster - 2349-2355 (wide western face)	3-Aug-19	
EX46	Pottery	3	x		Orange - Brown	Body	3			x			Individual - 2564-2571; Cluster - 2556-2563 (wide south-eastern face)	6-Aug-19	3 pottery sherds all weathered and plain.
EX47	Pottery	10	x	2x	Orange - Brown	Body	10			x			Individual - (a) 2579-2587; (b) 2588-2598; Cluster - 2572-2578 (wide south- eastern face)	6-Aug-19	There are 10 pottery sherds in total. (3) Rims and (2) decorated pieces. All weathered.
EX48	Pottery	6	x		Orange - Brown	Body	6			x			Individual - 2531-2538; Cluster - 2524-2530 (wide south-western face)	6-Aug-19	Pottery fragments are heavily weathered. The area which they are located seems to have been ploughed for farming (farming occurred in the area during the 1970s). Evident on a large cement trough built as a water source for the cattle and had names of the labourers who built the trough with the date it was built).
EX49	Pottery	2	x		Red	Body	2			x			Individual - 2338-2343; Cluster - 2330-	2-Aug-19	All pottery sherds are heavily weathered, and plain.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
													2338 (wide north-western face)		
EX50	Pottery	2	x		Orange - Brown	Body	2			x			Individual - 2427-2433; Cluster - 2419-2426 (wide southern face)	4-Aug-19	Area is clustered by trees, making systematic field walking more difficult in certain areas of the survey polygon area between SPA-D and SPA-E.
EX51	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			X			01164-01179	26-Jul-19	A single pottery fragment, highly weathered with a grainy texture.
EX52	Pottery	2	x		Orange - Brown	Body	2			X			Individual - 2464-2473; Cluster - 2456-2463 (wide south-eastern face)	5-Aug-19	Pottery sherds are heavily weathered, plain and situated directly on the water catchment area.
EX53	Pottery	2	x		Orange - Brown	Body	2			x			Individual - 2622-2626; Cluster - 2614-2621 (wide south-eastern face)	6-Aug-19	Pottery is weathered and plain.
EX54	Pottery	2	x		Orange - Brown	Body	2			x			Individual - 2392-2395; Cluster - 2365-2369 (wide north-western face)	3-Aug-19	All pottery sherds are heavily weathered, and plain.
EX54	Shells	7	n/a		Orange - Brown	n/a	7			x			Individual - 2374-2391; Cluster - 2365-2369 (wide north-western face)	3-Aug-19	All pottery sherds are heavily weathered, and plain.
EX55	Pottery	1	x		Brown	Body	x			x			Individual - 2676-2678; Cluster - 2658-2663 (wide southern face)	6-Aug-19	Pottery is weathered and plain.
EX55	Shells	2	n/a		White	n/a			2	x			Individual - (shell 1) 2664-2668; (shell 2) 2669-2675; Cluster		Shell pieces look like cowrie shells.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
													- 2658-2663 (wide southern face)		
EX56	Pottery	3	x		Very Pale Orange - 10YR 8/2	Body & Lip	x			x			01180-01192	26-Jul-19	Three pieces of pottery fragments clustered in an area 3-2m ² , one is a lip piece.
EX57	Pottery	2	x		Very Pale Orange - 10YR 8/2	Body	x			x			01199-01113	26-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² .
EX58	Pottery	2		x	Orange - Brown	Rim, Body	2			x			Individual - 2687-2696; Cluster - 2679-2686 (wide north-western face)	6-Aug-19	Pottery is weathered. One rim decorated.
EX59	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01428-1444	27-Jul-19	A single pottery fragment
EX60	Pottery	25	x		Brown	Body	24		1	x			100-9781-9787	30-Jul-19	All pottery sherds are heavily weathered, and plain.
EX61	Pottery	3	x		Brown	Body	3			x			Individual - 2151-2159; Cluster - 2143-2150 (wide NW face)	1-Aug-19	All pottery sherds are heavily weathered, and plain.
EX62	Pottery	2	x		Brown	Body	2			x			100-2084-2091	30-Jul-19	All pottery sherds are heavily weathered, and plain.
EX63	Pottery	9	8x	x	Brown	lip, body	8	1		x			Individual - 100-2109-2115; Cluster - 100-2100-2108	30-Jul-19	8 pottery sherds are plain, whilst 1 is decorated. A total of 9 pottery sherds are slightly weathered. Wide shot angle facing Northwards.
EX64	Pottery	2	x		Brown	Body	2			x			Individual - 2137-2142; Cluster - 2121-2136 (wide west face)	1-Aug-19	All pottery sherds are heavily weathered, and plain.
EX65	Pottery	2	x		Brown	Body	2			x			100-2065-2077; 100-2078 -2083	30-Jul-19	All pottery sherds are heavily weathered, and plain.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX66	Pottery	5	x		Brown	Body	5			x			100-9878-9881	30-Jul-19	All pottery sherds are heavily weathered, and plain.
EX67	Pottery	55	x		Orange - Brown	Body	55	x		x			9762-9764	30-Jul-19	All artefacts have been identified and classed according to its length and area size it is found within.
EX68	Pottery	9	x		Brown	Body	9			x			100-9819-9825	30-Jul-19	All pottery sherds are heavily weathered, and plain.
EX69	Pottery	22	x		Brown	Body	22			x			100-9853-9862	30-Jul-19	All pottery sherds are heavily weathered, and plain.
EX70	Pottery	44		2x	Brown	Rim, Body	42		2	x			9769-9778 - Decorated Piece; 9779-9780 Decorated Piece; Cluster 9715 - 9768	30-Jul-19	The (2) pieces >5cm are decorated pieces.
EX71	Pottery	5	x		Brown	Body	5			x			100-9788-9791	30-Jul-19	All pottery sherds are heavily weathered, and plain.
EX72	Pottery	1	x		Orange - Brown	Body	x			x			100 - 9754 - 9761	28-Jul-19	Pottery sherd, heavily weathered
EX73	Pottery	1	x		Orange - Brown	lip			x	x			100-9541-9547	29-Jul-19	Pottery lip is heavily weathered.
EX74	Pottery	1	x		Brown	Body	x			x			100-9590-9595	29-Jul-19	All pottery is weathered and plain.
	Pottery	1	x		Brown	Body	x			x			100-9596-9600	30-Jul-19	All pottery is weathered and plain.
	Pottery	1	x		Brown	Body	x			x			100-9601-9603	31-Jul-19	All pottery is weathered and plain.
	Chert	1	n/a		Maroon	n/a	x			x			100-9604-9605	1-Aug-19	Chert chip
EX75	Pottery	1	x		Brown	Body	x			x			100-9581-9585	29-Jul-19	Pottery plain and heavily weathered. Located on western boundary of survey polygon.
EX76	Pottery	1	x		Orange - Brown	Body	x			x			100-9548-9554	29-Jul-19	Pottery is heavily weathered and plain

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
	Pottery	1	x		Orange - Brown	Body	x			x			100-9555-9558	29-Jul-19	Pottery is heavily weathered and plain
	Pottery	1	x		Orange - Brown	Body	x			x			100-9559-9564	29-Jul-19	Pottery is heavily weathered and plain
	Chert	1	n/a		Red	n/a	x			x			100-9565-9567	29-Jul-19	Chert chip
	Chert	1	n/a		Red	n/a	x			x			100-9568-9571	29-Jul-19	Chert chip
EX77	Pottery	1	x		Brown	Body	x			x			100-9572-9580	29-Jul-19	Pottery plain and heavily weathered.
EX78	Pottery	1	x		Orange - Brown	Body	x			x			100-9608-9614	29-Jul-19	Isolated find, weathered and no decoration.
EX79	Pottery	1	x		Orange - Brown	Body	x			x			100-9621-9626	29-Jul-19	Isolated find, weathered and no decoration.
EX80	Chert	1	n/a		Maroon	n/a	x			x			100-9627-9633	29-Jul-19	Isolated find, dark red and very glass smooth.
EX81	Chert	1	n/a		Maroon	n/a	x			x			100-9648-9654	29-Jul-19	Isolated find, silky smooth
EX82	Pottery	1	x		Orange - Brown	Body	x			x			100-9634-9640	29-Jul-19	Pottery is heavily weathered and plain
	Pottery	1	x		Orange - Brown	Body	x			x			100-9641-9647	29-Jul-19	Pottery is heavily weathered and plain
EX83	Pottery	1	x		Orange - Brown	Body			x	x			100-9655-9662	29-Jul-19	Pottery is heavily weathered and plain
	Pottery	1		x	Orange - Brown	rim	x			x			100-9663-9670	29-Jul-19	Pottery is heavily weathered and decorated, rim section (imprint ??)
	Pottery	1	x		Orange - Brown	Body	x			x			100-9671-9676	29-Jul-19	Pottery is plain and heavily weathered
EX84	Chert	1	n/a		Brown	n/a	x			x			100-9680-9682	29-Jul-19	All chert pieces are chips, all are crimson brown
	Chert	1	n/a		Brown	n/a	x			x			100-9683-9686	30-Jul-19	All chert pieces are chips, all are crimson brown

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
	Chert	1	n/a		Brown	n/a	x			x			100-9687-9689	31-Jul-19	All chert pieces are chips, all are crimson brown
EX85	Pottery	1	x		Orange - Brown	Body	x			x			100 - 9745 - 9753	28-Jul-19	Pottery sherd, heavily weathered
EX86	Pottery	9	x		Orange - Brown	Body	9			x			Individual - 2974-2981; Cluster - 2965-2973 (wide western face)	10-Aug-19	A total of 9 pot sherds. All were weathered and plain.
EX87	Pottery	1	x		Orange - Brown	Body	x			x			100 - 9739 - 9745	28-Jul-19	Pottery sherd, heavily weathered
EX88	Pottery	1	x		Brownish Grey - 5YR 4/1	Body	x						02025-2042	31-Jul-19	A single pottery fragment slightly weathered.
EX89	Chert	1	n/a		Maroon	n/a	x			x			100 - 9732 - 9738	28-Jul-19	Chert chip, crimson on top layer and red on the bottom
EX90	Pottery	1	x		Orange - Brown	Body	x			x			100-9693-9695	29-Jul-19	All sherds identified were plain and heavily weathered
	Pottery	1	x		Orange - Brown	Body	x			x			100-9695-9698	30-Jul-19	All sherds identified were plain and heavily weathered
	Pottery	1	x		Orange - Brown	Body	x			x			100-9702-9704	31-Jul-19	All sherds identified were plain and heavily weathered
	Pottery	1	x		Orange - Brown	Body	x			x			100-9699-9701	1-Aug-19	All sherds identified were plain and heavily weathered
	Pottery	1	x		Orange - Brown	Body	x			x			100-9705-9707	2-Aug-19	All sherds identified were plain and heavily weathered
EX91	Pottery	1	x		Orange - Brown	rim	x			x			100-9708-9715	29-Jul-19	Pottery sherd is plain and heavily weathered, most likely rim section
EX92	Chert-Chip	1	n/a		Maroon	n/a	x			x			100-9716-9723	29-Jul-19	Chert chip is an isolated find.
EX93	Pottery	1	x		Very Pale Orange - 10YR 8/2	Rim		x		x			01446-1470	28-Jul-19	A single pottery fragment, large rim.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX94	Pottery	6		x	Dark Yellowish Orange - 10YR 6/6	Body & Rim	x				x		01767-1784	29-Jul-19	Six pieces of pottery fragments clustered in an area 3-2m ² , three is a rim piece, one rim has marks, highly weathered with a grainy texture.
EX95	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01739-1750	29-Jul-19	A single pottery fragment
EX96	Pottery	12	x		Dark Yellowish Orange - 10YR 6/6	Body	x				x		01785-1800	28-Jul-19	Twelve pieces of pottery fragments clustered in an area 3-2m ² , weathered with a grainy texture and a distinct orange brown colour.
EX97	Pottery	3	x		Dark Yellowish Orange - 10YR 6/6	Body & Rim	x				x		01486-1503	28-Jul-19	Three pieces of pottery fragments clustered in an area 3-2m ² , one is a rim piece, highly weathered with a grainy texture.
EX98	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01723-1738	29-Jul-19	A single pottery fragment
EX99	Pottery	34	x		Orange - Brown	Body, Lip & Rim	34				x		Individual - 2915-2921; Cluster - 2907-2914 (wide north-western face)	10-Aug-19	Out of the 34 pottery pieces, 3 were rims, 8 were lips and 23 were fragments. All weathered as well as plain and were located 15 m south-west from the southern boundary.
EX100	Pottery	2	x		Very Pale Orange - 10YR 8/2	Body	x			x			01709-1722	29-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² .
EX101	Pottery	3	x		Moderate Reddish Brown - 10YR 4/6	Body				x			01507-1521	28-Jul-19	Three pieces of pottery fragments clustered in an area 3-2m ² , one is a rim piece, highly weathered with a grainy texture.
EX102	Pottery	1	x		Very Pale Orange - 10YR 8/2	Body	x			x			01635-1652	29-Jul-19	A single pottery fragment

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX103	Pottery	2	x		Very Pale Orange - 10YR 8/2	Body	x			x			01670-1682	29-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² , one fragment is a rim.
EX104	Pottery	2	x		Dark Yellowish Orange - 10YR 6/6	Body	x				x		01659-1669	28-Jul-19	Two pieces of pottery fragments clustered in an area 3-2m ² , highly weathered with a grainy texture.
EX105	Pottery	45	x		Dark Yellowish Orange - 10YR 6/6	Body & Rim	x	x			x		01530-1608	28-Jul-19	Pottery fragments, 45pieces scattered within 3-2m ² . Eight pieces are rim fragments, the rest are body fragments. Some fragments are highly weathered with a grainy texture
EX106	Pottery	5	x		Orange - Brown	Body, Lip & Rim	5				x		Individual - 2955-2967; Cluster - 2948-2954 (north- western face)	10-Aug-19	All pottery sherds are heavily weathered, and plain. From the 5 pottery sherds; 1- rim, 2 lip and 2 were fragments.
EX107	Pottery	2	x		Very Pale Orange - 10YR 8/2	Body	x			x			01683-1708	29-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² , one fragment is a rim.
EX108	Pottery	6	x		Brownish Grey - 5YR 4/1	Body & Rim		x			x		01751-1756	29-Jul-19	Six pieces of pottery fragments clustered in an area 3-2m ² , the pieces are of a single pot, three rim pieces and three body fragments.
EX109	Pottery	1	x		Brownish Grey - 5YR 4/1	Rim		x			x		01814-1727	30-Jul-19	A single rim piece, thickness is 2cm and this is a distinct characteristic.
EX110	Pottery	20	x		Brownish Grey - 5YR 4/1	Body & Rim		x			x		01828-1841	30-Jul-19	Twenty pieces of four different pots, indicated by the 4 rim fragments and 16 body pieces. The pot pieces are clustered in an area 3-2m ² .
EX111	Pottery	13	x		Brownish Grey - 5YR 4/1	Body, lip & Rim		x			x		01842-1854	30-Jul-19	Thirteen pieces of four different pots, there are 3 lip fragments and

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
															one rim fragment. The pot pieces are clustered in an area 3-2m ² .
EX112	Chert-Flake	1	n/a		Brown	n/a	x			x			100-9724-9729	29-Jul-19	Chert flake is isolated find and brown in colour.
EX113	Pottery	1	x		Orange - Red	Body	x			x			2241-2255 (wide north- western face)	1-Aug-19	Pottery is plain and weathered.
EX114	Pottery	1	x		Red	Body	x			x			2296-2311 (wide south- eastern face)	2-Aug-19	Pottery is plain and weathered.
EX115	Pottery	1	x		Orange - Red	Body	x			x			2539-2555 (wide north- western face)	6-Aug-19	Pottery sherd lip section, plain and weathered.
EX116	Pottery	1	x		Light Brown	Body	x			x			2599-2613 (wide south- eastern face)	6-Aug-19	Heavily weathered and plain.
EX117	Pottery	6	x		Brownish Grey - 5YR 4/1	Body & Rim		x			x		01913-1927	30-Jul-19	Six pot fragments of a single pot, five rims and a body piece. Large rim is (L= 4.5 cm, W=4.4 cm, T= 1 cm)
EX118	Pottery	1	x		Orange - Brown	lip	x			x			2627-2642 (wide southern face)	6-Aug-19	Pottery sherd rim section, plain and weathered.
EX119	Pottery	3	x		Dark Yellowish Orange - 10YR 6/6	Body & Rim		x			x		01897-1912	30-Jul-19	Three fragments, two rims and a body piece. The large rim is (L= 6.7 cm, W=6.7 cm, T= 1cm). They are highly weathered with a grainy texture and fragments clustered in an area 2-3m ²
EX120	Pottery	1	x		Dark Yellowish Orange - 10YR 6/6	Rim		x			x		01844-1896	30-Jul-19	A single pottery fragment large rim (L= 4.9 cm, W=3.8 cm, T= 0.6 cm)
EX121	Stone	1	n/a		Greenish - Olive - 10Y 4/2	n/a	x			x			3319-3339	11-Aug-19	Fragment, indicating its polished groove marks identified under magnified lens x10 magnification. Its volcanic-basaltic in origin.

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
		1	n/a		Greenish - Olive - 10Y 4/2	n/a			x				3319-3340		Complete stone adze. Indicating polished grooves and angular blade. Has been worked, as indicated by its polished surface.
EX122	Pottery	6	x		Brownish Grey - 5YR 4/1	Body & Rim		x			x		01855-1870	30-Jul-19	Six pieces of two different pots, there are 3 rim fragments (2 rim pieces are of the same pot). The pot pieces are clustered in an area 3-2m ² .
EX123	Pottery	1	x		Very Pale Orange - 10YR 8/2	Rim		x			x		01871-1883	30-Jul-19	A single pottery fragment large rim (L= 6.4 cm, W=3.8 cm, T= 0.6 cm)
EX124	Pottery	2	x		Dark Yellowish Orange - 10YR 6/6	Rim	x			x			01968-1982	31-Jul-19	Two pieces of pottery fragments clustered in an area 1m ² . Both are rim pieces.
EX125	Pottery	51		x	Brownish Grey - 5YR 4/1 to Dark Yellowish Orange - 10YR 6/6	Body & Rim		x				x	01928-1949	30-Jul-19	This site contains the largest cluster, a total of 51 pottery fragments found in a 3-5m ² . The pottery fragments are from three different pots as indicated by the shape of three different rims, decorations and the colour of the pot. Some fragments are highly weathered with grainy texture, others have smooth surfaces with less weathering. The larger rim piece is L=3.7 cm, W=2.9 cm, T=0.9 cm.
EX126	Pottery	1	x		Brownish Grey - 5YR 4/1	Rim	x			x			01983-1997	31-Jul-19	A single pottery fragment rim, slightly weathered.
EX127	Pottery	1	x		Brownish Grey - 5YR 4/1	Body	x			x			01998-2009	31-Jul-19	A single pottery fragment slightly weathered.
EX128	Pottery	5	x		Brownish Grey - 5YR 4/1	Body	x			x			02010-2024	31-Jul-19	Five pieces of pottery fragments clustered in an area 1m ² .

Exposure No.	Type	Quantity	Attributes				Size (cm)			Cluster Area (m ²)			Photo No.	Date Recorded	Comments
			Plain	Decorated	Colour	Body/ Base/ Lip/ Rim/ Neck/ Collar/ Shoulder/ Carination	<5cm	5cm	5cm >	<1m ²	1-5m ²	>5m ²			
EX129	Pottery	1	x		Dull Brown	Body	x			x			2643-2657 (wide south- eastern face)	6-Aug-19	Pottery is plain and weathered.
EX130	Pottery	1	x		Orange - Brown	Body			x	x			2922-2941 (wide eastern face)	10-Aug-19	Pottery is plain and weathered.
	Shells	16	n/a		White	n/a	11	3	2				100-9882-9890	30-Jul-19	Saltwater molluscs (mangrove) 2 - bivalves, and 11 - smaller version of the five-finger sea snail
EX131	Pottery	9	x		Brownish Grey - 5YR 4/1	Body	9			x			Individual - 2974-2981; Cluster - 2965-2973 (wide western face)	10-Aug-19	A total of 9 pot sherds. All were weathered and plain.



Plate 9: Plain and decorated pottery fragments, EX47 (6Aug19, Les Muke)



Plate 10: Plain and decorated pottery fragments, EX63 (30Jul19, Les Muke)



Plate 11: Flakes stone artefact, chert, EX89 (28Jul19, Les Muke)



Plate 12: Flaked stone artefact, chert, EX92 (28Jul19, Les Muke)



Plate 13: Whole shells and shell fragments, gastropods and bivalves, EX44 (7Aug19, Les Muke)



Plate 14: Shell fragments, gastropods and bivalves, EX55 (6Aug19, Les Muke)



Plate 15: Whole shell, bivalve, EX130 (30Jul19, Les Muke)



Plate 16: Ground-edge adze, EX121 (11Aug19, Les Muke)

A more intensive survey of a dense scatter of ceramic fragments identified in the southern portion of the laydown study zone was carried out on 29-30 July 2019. Individual GPS coordinates were recorded for each artefact identified during the survey. The locations of artefacts identified during this more intensive component of the Phase 1 and Phase 2 survey program are mapped in Figure 16.

5.5.5.2. Phase 3

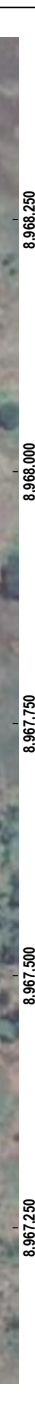
Systematic surveys of two gridded areas located within the dense artefact scatter in the southern portion of the laydown study zone identified during the Phase 1 and Phase 2 surveys were conducted on 14-16 August 2019 in accordance with the methods outlined in Section 5:

- Grid 1 (Plate 17) was a 5 m x 5 m (25 m²) grid overlapping EX67 and EX70. A total of 677 artefacts were identified during the survey, including 576 pottery fragments and 110 stone artefacts including flakes and cores (identified raw materials include chert (74 or 67%) and basalt (2 or 2%)).
- Grid 2 (Plate 18) was a 3 m x 3 m (9 m²) grid immediately adjacent to Grid 1. A total of 433 artefacts were identified during the survey, including 328 pottery fragments, 104 stone artefacts including flakes and cores (identified raw materials include chert (66 or 67%) and basalt (3 or 3%) and one unidentified artefact.

Summary information on the contents of Grid 1 is presented in Appendix D, and Grid 2 in Appendix E.



Plate 17: Grid 1 (14Aug19, Les Muke)



- Individual artefact location
- Existing and proposed plant layout
- Temporary construction area
- PPFL2 boundary



 SCALE 1:7,500
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 PROJECTION: WGS 1984 UTM Zone 55S

FIGURE 16

Laydown study zone, additional individual artefact locations recorded in the southern portion





Plate 18: Grid 2 (16Aug19, Les Muke)

5.5.5.3. Cultural heritage site definition within the laydown study zone

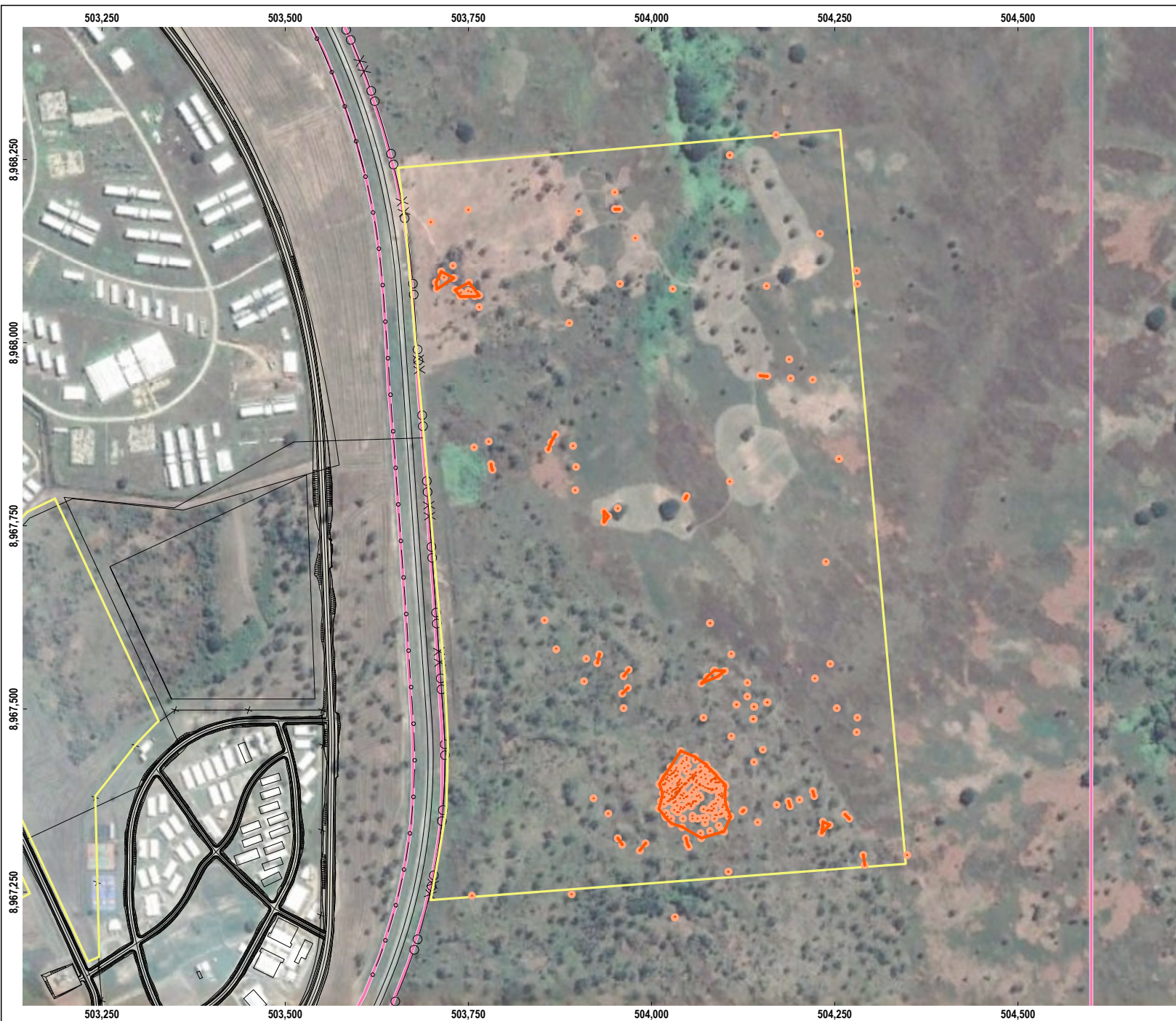
GPS coordinate data recorded for 131 artefact exposures identified across the laydown study zone and an additional 269 individual artefacts recorded in the southern portion of the study area were subjected to a GIS analysis, during which the 15 m cultural heritage site definition rule outlined in Section 4.1.1.3 was applied.

The analysis defined a total of 82 cultural heritage sites within the laydown study zone, which were identified as either points, lines or polygons. Summary data on these sites is presented in Table 16, and their locations are mapped in Figure 17. National Site File codes assigned by the NMAG's Prehistory Department to some of these sites during the period 2020-2022 are also included in Table 16.

Summary statistics on site size and density are presented in Table 15. Small, low-density sites comprise 90% of the assemblage. No high-density sites and only two medium-density sites (one small pottery scatter and one small pottery/shell scatter) were recorded within the laydown study zone.

Table 15: Summary statistics on cultural heritage site size and density, laydown study zone

	Site Density			
Site Size	Low	Medium	High	Total
Small	74 (92.5%)	2 (100%)	0 (0%)	76 (92.7%)
Medium	5 (6.25%)	0	0 (0%)	5 (6.01%)
Large	1 (1.25%)	0	0 (0%)	1 (1.22%)
Total	80 (97.96%)	2 (2.44%)	0 (0%)	82



LEGEND

- Existing and proposed plant layout
- Temporary construction area
- PPFL2 boundary
- Cultural heritage site
 - Cultural heritage point
 - Cultural heritage line
 - Cultural heritage area

SOURCE
Cultural heritage study area and data from ELA.
Infrastructure, historical cultural heritage and lease boundary from EMPNGA.
Imagery from Google Earth (capture date 21/08/2019).



0 100 200
m
SCALE 1:7,500
PAGE SIZE: A4
PROJECTION: WGS 1984 UTM Zone 55S

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FIGURE 17

Mapped cultural heritage sites within the laydown study zone identified during the 2019 field program



DATE: 03.07.23 PROJECT: 754-MELN300733 FILE: 300733_TS02_F017_GIS

Table 16: Summary data on cultural heritage sites recorded in the laydown study zone during the 2019 field program

DS Site Code	NSF Site Code	Max Length (m)	Max Width (m)	Size (m ²)	Size Category	Max Density of Cultural Items (items/m ²)	Density Category	Isolated Artefacts			Cultural Material Scatter		
								Stone	Pottery	Shell	Stone	Pottery	Shell
001		1	1	1	Small	7	Low					•	•
002		1	1	1	Small	11	Low						•
003		1	1	1	Small	1	Low		•				
004		1	1	1	Small	2	Low					•	
005		14	1	14	Small	3	Low					•	
006		1	1	1	Small	34	Medium					•	
007		13	1	13	Small	0.23	Low					•	
008		11	1	11	Small	0.54	Low					•	
009		13	1	13	Small	0.23	Low					•	
010		1	1	1	Small	1	Low		•				
011		10	7	70	Medium	0.05	Low					•	
012		8	1	8	Small	5.75	Low					•	
013		1	1	1	Small	1	Low		•				
014		3	1	3	Small	0.67	Low					•	
015		1	1	1	Small	3	Low					•	
016		7	1	7	Small	1	Low					•	
017		1	1	1	Small	6	Low					•	
018		1	1	1	Small	5	Low					•	
019		7	1	7	Small	2.14	Low					•	
020		1	1	1	Small	1	Low	•					
021		120	95	7,863	Large	0.21	Low				•	•	
022		1	1	1	Small	1	Low	•					
023		1	1	1	Small	1	Low		•				
024	BWD	1	1	1	Small	1	Low		•				
025	BWE	1	1	1	Small	5	Low					•	
026	BWF	1	1	1	Small	1	Low	•					
027	BWG	1	1	1	Small	1	Low	•					

DS Site Code	NSF Site Code	Max Length (m)	Max Width (m)	Size (m ²)	Size Category	Max Density of Cultural Items (items/m ²)	Density Category	Isolated Artefacts			Cultural Material Scatter		
								Stone	Pottery	Shell	Stone	Pottery	Shell
028	BWH	1	1	1	Small	2	Low					•	
029	BWI	1	1	1	Small	1	Low	•					
030	BWJ	1	1	1	Small	3	Low					•	
031	BWK	1	1	1	Small	1	Low					•	
032	BWL	1	1	1	Small	3	Low				•		
033	BWM	1	1	1	Small	1	Low	•					
034	BWN	11	1	11	Small	2	Low					•	
035	BWO	1	1	1	Small	1	Low		•				
036	BWP	1	1	1	Small	6	Low					•	
037	BWQ	1	1	1	Small	5	Low					•	
038	BWR	18	10	180	Medium	12	Low				•	•	
039	BWS	11	1	11	Small	0.45	Low					•	
040	BWT	1	1	1	Small	1	Low	•					
041	BWU	1	1	1	Small	3	Low					•	
042	BWV	12	1	12	Small	2.5	Low					•	
043	BWW	1	1	1	Small	1	Low		•				
044	BWX	1	1	1	Small	11	Low					•	
045	BWY	1	1	1	Small	18	Low					•	
046	BWZ	1	1	1	Small	1	Low		•				
047	BXA	1	1	1	Small	1	Low		•				
048	BXB	9	5	45	Medium	3.11	Low					•	
049	BXC	1	1	1	Small	1	Low		•				
050	BXD	5	1	5	Small	0.6	Low					•	
051	BXE	1	1	1	Small	1	Low		•				
052	BXF	1	1	1	Small	2	Low					•	
053	BXG	1	1	1	Small	1	Low		•				
054	BXH	8	1	8	Small	0.37	Low					•	
055	BXI	1	1	1	Small	3	Low					•	•

DS Site Code	NSF Site Code	Max Length (m)	Max Width (m)	Size (m ²)	Size Category	Max Density of Cultural Items (items/m ²)	Density Category	Isolated Artefacts			Cultural Material Scatter		
								Stone	Pottery	Shell	Stone	Pottery	Shell
056	BXJ	1	1	1	Small	1	Low		•				
057	BXK	1	1	1	Small	1	Low		•				
058	BXL	1	1	1	Small	1	Low		•				
059	BXM	23	1	23	Small	0.13	Low					•	
060	BXN	1	1	1	Small	1	Low		•				
061	ABXO	1	1	1	Small	2	Low					•	
062	ABXP	10	1	10	Small	0.4	Low					•	
063	ABXQ	1	1	1	Small	1	Low		•				
064	ABXR	1	1	1	Small	2	Low					•	
065	ABXS	1	1	1	Small	3	Low					•	
066	ABXT	1	1	1	Small	2	Low					•	
067	ABXU	1	1	1	Small	6	Low					•	
068	ABXV	1	1	1	Small	2	Low					•	
069	ABXW	1	1	1	Small	10	Low					•	
070	ABXX	37	10	370	Medium	0.07	Low					•	
071	ABXY	27	10	270	Medium	0.09	Low					•	
072	ABXZ	1	1	1	Small	3	Low					•	
073	ABYA	1	1	1	Small	1	Low		•				
074	ABYB	1	1	1	Small	1	Low		•				
075	ABYC	1	1	1	Small	1	Low		•				
076	ABYD	1	1	1	Small	1	Low		•				
077	ABYE	1	1	1	Small	9	Low					•	
078	ABYF	1	1	1	Small	2	Low					•	
079	ABYG	6	1	6	Small	0.5	Low				•	•	
080	ABYH	1	1	1	Small	9	Low					•	
081	ABYI	1	1	1	Small	31	Medium					•	•
082	ABYJ	1	1	1	Small	7	Low					•	

The break down for each site types are as follows:

- isolated stone artefacts: 7 sites
- isolated potsherds: 20 sites
- isolated shell: 0 sites
- stone artefact scatters: 1 site (small/low-density)
- pottery scatters: 48 sites (4 medium/low-density, 43 small/low-density and 1 small/medium density)
- shell scatters: 2 sites (both small/low-density)
- stone/pottery scatters: 3 sites (1 small/low-density, 1 medium/low-density and one large/low density)
- stone/shell scatters: 0 sites
- pottery/shell scatters: 2 sites (1 small/low density and 1 small/medium density)

Pottery scatters and isolated potsherds comprise 83% of sites recorded in the laydown study zone.

DS021 is the only large site recorded in the laydown study zone. The artefact density within DS021 is currently calculated as 0.2 artefacts/m² (1,632 artefacts over a 7,863 m² area), which classifies it as a low-density site (<20 cultural items/m²). However, it appears that artefact densities vary significantly across the site, given that at least 1,100 artefacts are located within a 34 m² area at Grid 1 and Grid 2 in the NE corner which provides an artefact density at of 32 artefacts/m², and therefore qualifies it as a medium density site at this location.

Further fieldwork is required to understand the full extent of the medium density concentration in the NE corner of DS021. If it is more extensive than currently recorded it may tip the overall density for the site as a whole into the medium range, which would have implications for its significance assessment and subsequent consideration of appropriate avoidance, management or mitigation measures (this will be discussed further in Section 6 below).

5.6. Cultural Heritage Values in the Study Area

The cultural heritage values identified within the Project cultural heritage study area during the baseline assessment comprise archaeological sites only. No oral tradition sites or other forms of intangible heritage value have been recorded in association with the study area to date.

In summary, the archaeological cultural heritage values located in the study area include 333 archaeological sites:

- 244 previously recorded sites located within the existing LNG Plant west of the security fence (i.e., excluding the laydown study zone) (Table 17)
- seven previously recorded sites located within the laydown study zone (Table 17)
- 82 newly recorded sites located within the laydown study zone (Table 16).

The size and density distributions of newly recorded sites located in the laydown study zone (see Table 15 for further details) are in keeping with site size and density distributions recorded for the general hinterland area inland from the coast (encompassing the laydown study zone) during the PNG LNG Project EIA fieldwork program (summarised in Section 5.4.2). The site prediction model generated

during the preparation of the 2009-2011 cultural heritage assessment indicated that archaeological sites in the vicinity of the laydown study zone are most likely to be isolated artefacts or small low-density artefact scatters. Of the 82 newly recorded sites identified in the laydown study zone during the 2019 field program, 74 or 90% are small low-density sites.

The location and contents of the seven previously recorded archaeological sites situated in the laydown study zone were compared with all newly recorded sites located within 15 m to determine if they may represent the same site(s). One previously recorded site, NA/AK 8.2 (a small cultural heritage scatter of unknown density containing stone and pottery) is situated 4.77 m north-northwest of newly recorded site DS076 (NSF site code ABYD; an isolated ceramic fragment). On this basis it is possible that the isolated artefact comprising DS076/ABYD was also recorded as part of the scatter represented by NA/AK 8.2, and for this reason DS076/ABYD should be subsumed with the NA/AK 8.2.

The total number of archaeological sites that will be included in the impact assessment is therefore reduced to 332, including 251 previously recorded sites and 81 newly recorded sites.

Table 17: Summary data on cultural heritage sites recorded during the PNG LNG Project ESIA cultural heritage program intersecting the Project study area

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
AK Road 1						•	•			Medium	Low	Surface Collection
AK Road 2						•				Medium	Low	Surface Collection
AK1	AAIX					•				Medium	Low	No Action
AK10	AAJH				•	•				Medium	Low	Salvage Excavation
AK100	AAMW		•							Small	Low	No Action
AK101	AAMX				•	•	•			Large	Low	Salvage Excavation
AK113	AANJ					•				Small	Low	No Action
AK114	AANK					•				Small	Low	No Action
AK115	AANL					•	•			Small	Low	No Action
AK116	AANM					•	•			Medium	Low	Salvage Excavation
AK117	AANN			•						Small	Low	No Action
AK118	AANO						•			Medium	Medium	Salvage Excavation
AK119	AANP		•							Small	Low	No Action
AK120	AANQ		•							Small	Low	No Action
AK121	AANR						•			Small	Low	Salvage Excavation
AK122	AANS					•	•			Small	Low	No Action
AK123	AANT						•			Small	Low	No Action
AK124	AANU					•				Small	Low	No Action
AK128	AANY					•				Medium	Low	No Action
AK129	AANZ					•	•			Small	Low	No Action
AK132	AAOC				•					Small	Low	No Action
AK135	AAOF				•					Medium	Low	No Action

¹⁰ Rows highlighted light green denote archaeological sites located in the laydown study zone

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
AK138+AK139	AAOI				•	•			Glass, metal	Large	High	Salvage Excavation
AK140	AAOK				•					Small	High	Surface Collection/Salvage Excavation
AK144	AAOO		•							Small	Low	No Action
AK149	AAOT					•				Medium	Medium	Salvage Excavation
AK166	AAPK					•	•			Small	Low	No Action
AK167	AAPL					•				Small	Low	No Action
AK170	AAPO					•	•			Medium	Low	No Action
AK172	AAPQ		•							Small	Low	No Action
AK173	AAPR				•	•	•		Glass	Medium	Low	Surface Collection
AK176	AAPU					•	•			Medium	Low	No Action
AK177	AAPV		•							Small	Low	No Action
AK179	AAPX			•						Small	Low	No Action
AK18	AAJP			•						Small	Low	No Action
AK180	AAPY		•							Small	Low	No Action
AK184	AAQC					•	•			Medium	Medium	Salvage Excavation
AK19	AAJQ					•				Medium	Medium	Salvage Excavation
AK2	AAIZ				•	•	•			Medium	Low	Salvage Excavation
AK20	AAJR		•							Small	Low	No Action
AK21	AAJS					•				Medium	Low	No Action
AK28	AAJZ					•				Medium	Low	No Action
AK29	AAKA		•							Small	Low	No Action
AK3	AAJA						•			Small	Low	No Action
AK30	AAKB					•				Small	Low	No Action
AK31	AAKC					•				Small	Low	No Action

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type										
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other	Size	Density	Impact Mitigation
AK32	AAKD					•				Medium	Low	Salvage Excavation
AK33	AAKE					•				Small	Low	No Action
AK36	AAKK					•				Medium	Low	No Action
AK37	AAKL					•				Small	Low	Salvage Excavation
AK38	AAKM					•	•			Medium	Low	Salvage Excavation
AK39	AAKN					•	•			Medium	Low	No Action
AK5	AAJC					•				Medium	Low	No Action
AK6	AAJD			•						Small	Low	No Action
AK64	AALM					•				Small	Low	No Action
AK65	AALN		•							Small	Low	No Action
AK75	AALX					•	•			Small	Low	No Action
AK76	AALY					•	•			Small	Low	No Action
AK77	AALZ					•	•			Small	Low	No Action
AK78	AAMA					•				Small	Low	No Action
AK79	AAMB				•	•	•			Medium	Low	No Action
AK80	AAMC					•	•			Small	Low	Salvage Excavation
AK81	AAMD					•				Small	Low	No Action
AK82	AAME				•	•				Medium	Low	Salvage Excavation
AK83	AAMF				•	•	•			Large	High	Salvage Excavation
HM/NA 10			•							Small	Low	No Action
HM/NA 11			•							Small	Low	No Action
HM/NA 3			•							Small	Low	Surface Collection
HM/NA 4			•							Small	Low	No Action
HM/NA 5			•							Small	Low	No Action
HM/NA 6						•				Small	Low	No Action
HM/NA 7			•							Small	Low	No Action

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
HM/NA 8			•							Small	Low	No Action
HM/NA 9			•							Small	Low	No Action
JA1	AAVM						•			Medium	Low	Salvage Excavation
JA100	AAST					•	•			Small	Low	No Action
JA101	AASS					•				Medium	Low	Salvage Excavation
JA102	AASR								WWII airstrip	Small	Low	Salvage Excavation
JA2	AAVL		•							Small	Low	No Action
JA21	AAUJ						•			Medium	Low	Salvage Excavation
JA25	AAUF					•	•			Small	Low	No Action
JA26	AAUE					•				Small	Low	No Action
JA27	AAUD		•							Small	Low	No Action
JA29	AAUB		•							Small	Low	No Action
JA3	AAVK					•	•			Small	Low	No Action
JA30	AAUA		•							Small	Low	No Action
JA31	AATZ						•			Small	Low	No Action
JA32	AATY			•						Small	Low	No Action
JA33	AATX					•				Small	Low	No Action
JA34	AATW			•						Small	Low	No Action
JA35	AATV					•				Small	Low	Salvage Excavation
JA36	AATU					•				Small	Low	No Action
JA37	AATT					•	•			Small	Low	No Action
JA38	AATS		•							Small	Low	No Action
JA39	AARQ		•							Small	Low	No Action
JA4	AAVJ	•								Small	Low	No Action
JA47	AARI		•							Small	Low	No Action
JA48	AARH		•							Small	Low	No Action

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type										
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other	Size	Density	Impact Mitigation
JA5	AAVI				•	•				Small	Low	No Action
JA51	AASC		•							Small	Low	No Action
JA52	AASB		•							Small	Low	No Action
JA54	AARZ					•	•			Medium	Low	No Action
JA55	AARY					•	•			Medium	Low	No Action
JA56	AARX			•						Small	Low	No Action
JA57	AARW					•	•			Small	Low	No Action
JA64	AASP					•	•			Large	Low	Salvage Excavation
JA65	AASO					•	•			Medium	Low	No Action
JA75	AASE					•	•			Large	Low	Salvage Excavation
JA77	AATQ					•	•			Small	Low	No Action
JA78	AATP				•	•	•			Medium	Low	Salvage Excavation
JA79	AATO				•		•			Medium	Low	No Action
JA84	AATJ				•	•	•			Medium	Low	No Action
JA85	AATI			•						Small	Low	No Action
JA86	AATH					•	•			Small	Low	No Action
JA88	AATF				•	•	•			Large	Low	Salvage Excavation
JA89	AATE					•	•			Small	Low	No Action
JA91	AATC						•			Medium	Low	No Action
JA92	AATB				•	•	•			Large	Low	Salvage Excavation
JA93	AATA				•	•	•			Large	Low	Salvage Excavation
JA94	AASZ					•	•			Medium	Low	No Action
JA95	AASY					•	•			Medium	Low	No Action
JA96	AASX				•	•	•			Medium	Low	No Action
JA97	AASW				•	•	•			Large	Low	Salvage Excavation
JA98	AASV						•			Small	Low	No Action

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
JDA10	AAHT	•								Small	Low	No Action
JDA11	AAHU				•	•				Small	Low	Salvage Excavation
JDA12	AAHV						•			Small	Low	Salvage Excavation
JDA2	AAHM				•	•	•			Large	Low	Salvage Excavation
JDA21	AAIE			•						Small	Low	No Action
JDA22	AAIF			•						Small	Low	No Action
JDA3	AAHN				•	•	•			Large	High	Salvage Excavation
JDA5	AAHO				•		•			Medium	Medium	Salvage Excavation
JDA6	AAHP						•			Medium	Low	Salvage Excavation
JDA7	AAHQ			•						Small	Low	No Action
JDA8	AAHR						•			Medium	Low	Salvage Excavation
JDA9	AAHS				•		•			Medium	Low	Salvage Excavation
LNG1						•				Small	Low	Salvage Excavation
LNG2						•				Medium	Low	Salvage Excavation
LNG3					•	•				Medium	Low	Salvage Excavation
ML1					•					Medium	Low	Salvage Excavation
ML10					•	•	•			Large	Low	Salvage Excavation
ML12					•	•				Medium	Low	Salvage Excavation
ML4					•	•	•			Small	Low	Salvage Excavation
MLA1	AAIG					•				Small	Low	Salvage Excavation
MLA6	AAIL			•						Small	Low	No Action
NA/AK 5						•				Medium	Low	No Action
NA/AK 6						•	•	•		Medium	Low	No Action
NA/AK 7						•				Medium	Low	No Action
NA/AK 8.2					•	•				Medium	Low	Salvage Excavation
NA/AK 8.3					•	•				Medium	Low	Salvage Excavation

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
PFML25						•	•			Small	Low	No Action
PFML26					•	•	•			Large	Low	No Action
PFML27					•					Small	Low	No Action
PFML28					•		•			Small	Low	No Action
PLLM1						•				Small	Low	No Action
RS1	AAVN			•						Small	Low	No Action
RS10	AAUP						•			Small	Low	No Action
RS100	AAYZ				•	•	•			Large	Low	Surface Collection
RS101	AAZD				•	•	•			Large	Low	Salvage Excavation
RS102	AAZE					•				Small	Low	No Action
RS104	AAZG					•	•			Small	Low	Salvage Excavation
RS105	AAZH					•	•			Medium	Low	No Action
RS106	AAZI					•	•			Medium	Low	No Action
RS107	AAZJ						•			Small	Low	No Action
RS108	AAZK				•	•	•			Large	Low	No Action
RS11	AAUQ					•	•			Small	Low	Salvage Excavation
RS110	AAZM					•	•			Large	Low	Salvage Excavation
RS111	AAZN					•	•			Large	Low	No Action
RS112	AAZO						•			Large	Low	No Action
RS113	AAZP				•	•	•			Medium	Low	No Action
RS118	AAZU						•			Small	Low	No Action
RS12	AAUR				•		•			Medium	Low	No Action
RS123	AAZZ						•			Small	Low	No Action
RS13	AAUS					•				Small	Low	No Action
RS14	AAUT	•								Small	Low	No Action
RS15	AAUU						•			Small	Low	No Action

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
RS16	AAXN					•				Small	Low	No Action
RS17	AAXO			•						Small	Low	No Action
RS2	AAVO						•			Small	Low	No Action
RS21	AAXS				•	•				Medium	Low	No Action
RS22	AAXT						•			Small	Low	No Action
RS23	AAXU	•								Small	Low	No Action
RS24	AAXV				•	•				Small	Low	No Action
RS25	AAXW		•							Small	Low	No Action
RS26	AAXX					•				Small	Low	No Action
RS28	AAXZ		•							Small	Low	No Action
RS29	AAYA					•				Small	Low	No Action
RS3	AAVP						•			Small	Low	No Action
RS30	AAYB					•	•			Small	Low	Salvage Excavation
RS31	AAYC					•				Small	Low	No Action
RS32	AAYD				•	•				Medium	Low	Salvage Excavation
RS33	AAYE			•						Small	Low	No Action
RS34	AAYF					•	•			Small	Low	No Action
RS35	AAYG	•								Small	Low	No Action
RS4	AAVQ						•			Small	Low	No Action
RS42	AAWZ					•				Small	Low	No Action
RS43	AAXA		•							Small	Low	No Action
RS44	AAXB					•				Medium	Low	No Action
RS45	AAXC		•							Small	Low	No Action
RS46	AAXD					•	•			Medium	Low	No Action
RS5	AAVR				•		•			Small	Low	No Action
RS51	AAXI		•							Small	Low	No Action

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type										
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other	Size	Density	Impact Mitigation
RS52	AAXJ			•						Small	Low	No Action
RS53	AAXK					•	•			Small	Low	Salvage Excavation
RS54	AAXL				•	•	•			Medium	Low	Salvage Excavation
RS55	AAXM					•	•			Small	Low	No Action
RS56	AAVT						•			Small	Low	No Action
RS57	AAVU					•	•			Small	Low	No Action
RS59	AAVW						•			Small	Low	No Action
RS6	AAVS						•			Small	Low	No Action
RS60	AAVX					•	•			Large	Low	Salvage Excavation
RS62	AAVZ					•	•			Medium	Low	Salvage Excavation
RS63	AAWA				•	•	•			Large	Low	Salvage Excavation
RS64	AAWB						•			Medium	Low	No Action
RS65	AAWC					•	•			Medium	Low	No Action
RS66	AAWD						•			Medium	Low	No Action
RS67	AAWE				•	•	•			Medium	Low	Salvage Excavation
RS68	AAWF	•								Small	Low	No Action
RS69	AAWG					•	•			Medium	Low	Salvage Excavation
RS7	AAUM			•						Small	Low	No Action
RS71	AAWI					•	•			Medium	Low	No Action
RS72	AAWJ				•	•	•			Medium	Low	Salvage Excavation
RS73	AAWK		•							Small	Low	No Action
RS74	AAWL			•						Small	Low	No Action
RS75	AAWM					•	•			Small	Low	No Action
RS76	AAWN					•	•			Large	Low	No Action
RS77	AAWO					•	•			Small	Low	No Action
RS78	AAWP						•			Small	Low	Salvage Excavation

PNG LNG ESIA Site Code ¹⁰	NSF Site Code	Site Type								Size	Density	Impact Mitigation
		Isolated Stone	Isolated Ceramic	Isolated Shell	Stone Scatter	Ceramic Scatter	Shell Scatter	Faunal Scatter	Other			
RS79	AAWQ						•			Small	Low	No Action
RS8	AAUN						•			Small	Low	No Action
RS80	AAWR					•	•			Medium	Low	Salvage Excavation
RS81	AAWS					•	•			Small	Low	No Action
RS82	AAYH						•			Small	Low	No Action
RS83	AAYI						•			Small	Low	No Action
RS84	AAYJ				•	•	•			Medium	Low	Salvage Excavation
RS85	AAYK		•							Small	Low	No Action
RS86	AAYL				•	•	•			Large	Low	Salvage Excavation
RS87	AAYM				•	•	•			Large	Low	Salvage Excavation
RS88	AAYN					•	•			Medium	Low	No Action
RS9	AAUO				•		•			Small	Low	Salvage Excavation
RS90	AAYP					•	•			Small	Low	No Action
RS91	AAYQ						•			Medium	Low	Salvage Excavation
RS92	AAYR					•	•			Medium	Low	No Action
RS93	AAYS					•	•			Small	Low	Salvage Excavation
RS94	AAYT				•	•	•			Medium	Low	No Action
RS95	AAYU				•	•	•			Large	Low	No Action
RS96	AAYV				•	•	•			Medium	Low	No Action
RS97	AAYW						•			Medium	Low	Salvage Excavation
RS98	AAWX					•	•			Medium	Low	No Action
RS99	AAYY				•	•	•			Large	Low	Salvage Excavation
SP1						•				Medium	Low	?

6. Impact Assessment

6.1. Potential Impacts to Cultural Heritage

Tangible (archaeological) cultural heritage sites identified within the Papua LNG Project – Downstream cultural heritage study area have the potential to be impacted by Project activities as a result of:

- direct disturbance of archaeological site locations due to on-ground works including vegetation clearance, topsoil stripping, subsoil excavation and construction
- direct disturbance of archaeological sites due to the movement of Project employees and contractors and their vehicles (e.g., erosion, unauthorised removal of artefacts)
- restricted physical access of communities to archaeological sites due to Project activities and operational requirements.

The impact assessment considered the outcomes of the baseline assessment presented in Section 5 and the potential for Project-related activities to directly impact cultural heritage sites within the study area defined in Section 3. The impact assessment determined that these activities have the potential to impact 324 cultural heritage sites, given that these sites either intersect the proposed Project disturbance footprint or are located within 10 m of the proposed Project disturbance footprint.

Direct impacts have the potential to affect cultural heritage sites in the following ways:

- loss of connection between people and their places of cultural value through the destruction or damage of a site
- loss of information which could otherwise be gained by conducting research today
- loss of the archaeological resource for future research using methods and addressing questions not available today; and
- permanent loss of the physical record.

It should be noted, however, that most (if not all) of the 251 archaeological sites identified during the preparation of the PNG LNG Project's EIA during the period 2008-2009 (see Section 5.4.2) and now situated in the proposed Project footprint west of the plant's perimeter security fence were either disturbed or destroyed during construction of the facility in 2010-2012. Appropriate cultural heritage management responses to impacts associated with construction were implemented in 2009 under the requirements of the approved PNG LNG Project CHMP (see Section 1.3.3), including the extensive archaeological salvage program outlined in Section 5.4.4 above.

On this basis, it is unlikely that the construction and operation of the Project will further impact the 244 archaeological sites situated within the Project impact footprint west of the perimeter security fence, and for this reason these sites have not been included in the impact assessment presented below.

6.2. Recorded Cultural Heritage Significance Assessment

The cultural heritage significance of each of the 88 archaeological sites included in the formal impact assessment was determined using the criteria and rating scales outlined in Section 4.2.2. The overall significance rating determined for each archaeological site was derived as a cumulative score across four cultural heritage criteria (historical, scientific, social and spiritual). The assessment of each criterion for

sites recorded during the 2021 field program was based on the information collected during fieldwork, which included community interviews and/or direct field inspection. The assessment of each criterion for sites recorded during the 2008-2011 PNG LNG Project EIA and salvage program was based solely on the information presented in Table 17.

In instances where there is insufficient information on which to form an assessment for any one cultural heritage criterion (including informed professional opinion), the criterion has been generically assessed as low.

6.2.1. Local community perspectives on cultural heritage significance

During an interview with Chief Nao Nao of Papa Village in 2019 (Appendix C), the study area was identified as a hunting ground that was used by the Koita in the past. The location may also have been the site of a temporary settlement used by the Koita as they transited between the coast and ancestral villages located in the ranges east of the study area.

No specific cultural values were identified in relation to the archaeological materials mentioned by SRI personnel during the interview as being present in the study area.

6.2.2. Individual site significance assessments

The results of the cultural heritage site significance assessment for the archaeological sites situated in the laydown study zone are presented in Table 18.

In determining the rating scores against each of the four assessment criteria, the following approach was adopted:

- With the exception of DS021, all archaeological sites were uniformly scored as 1 on the historical, social and spiritual criteria, based on the scheme outlined in Section 4.2.2:
 - As far as can be determined, none of the archaeological sites are associated with a specific historical, event, person, or theme.
 - Although the general area including the laydown study zone was identified by Chief Nao Nao (Papa Village) as an old hunting ground and possibly the site of a temporary settlement, except for DS021 none of the archaeological sites have a clear connection with either of these activities and the archaeological sites themselves were not identified by Chief Nao Nao as having any specific social or broader cultural significance.
 - None of the archaeological sites demonstrate a clear spiritual connection with a cultural group.
- With regard to the scientific criterion:
 - All of the archaeological sites included in the impact assessment were uniformly scored as 1 on condition (deteriorated), given they are surface sites without any overt indications of subsurface stratification.
 - All isolated artefacts were uniformly scored as 1 on content (small number of artefacts with limited diversity) and representativeness (common).
 - All medium-sized archaeological sites were scored as 2 (occasional) on representativeness, and large sites were scored as 3 (rare).

- Sites with 11 or more artefacts and more than one type of archaeological material present were scored as 2 (larger number but limited range of artefacts) on content.

All but one of the archaeological sites listed in Table 18 have been assessed as being of low cultural heritage significance. This result is not unexpected given the scoring approach outlined above. Except for DS021, the maximum cultural heritage significance rating any site can achieve is 6 (Low) based on a combined assessment of 1 for historical, 3 for scientific, 1 for social and 1 for spiritual.

As outlined in Section 5.5.5.3, DS021 is the only large site recorded in the laydown study zone. Average artefact density across the 0.78 ha site is currently calculated as 0.2 artefacts/m², but there are areas of higher concentration in the northern and north-eastern portions of the site with artefact densities as high as 32 artefacts/m², associated with a mix of artefact types including flaked (n=214) and ground edge (n=2) stone technologies, and more than 1,632 decorated and undecorated body, neck and rim ceramic fragments.

It is likely that DS021 represents a former settlement. However, further fieldwork is required to determine whether the settlement was a temporary or ephemeral encampment used by Koita transiting between the nearby coast and ancestral villages to the east (as posited by Chief Nao Nao), or possibly a more extensive long-term village site. Nonetheless, DS021 represents a substantial, tangible link to the actions and behaviours of ancestral Koita communities, and for this reason the site has been scored as 2 on historical (associated with a moderately significant historical event, person or theme at the local level), and 2 on social (moderately significant social connection for a cultural group at the local level).

6.3. Results

6.3.1. Impact assessment prior to management or mitigation

The significance of an impact on a cultural heritage site was determined according to the impact assessment matrix presented in Section 4.2.4, which assessed the:

- significance of an individual recorded cultural heritage site as a function of its historic, scientific, social and spiritual value
- magnitude of the impact of proposed Project activities on the site, considering the severity, extent and duration of the impact.

The initial impact assessment assumed that all cultural heritage sites located within the laydown study zone have a 100% chance of being impacted by unmanaged and/or unmitigated Project activities. Impact magnitude was assessed as being **High** in every instance based on a total and permanent loss of each archaeological site. This to be expected given the nature of the potential impacts as outlined in Section 6.1.

The results of the unmanaged/unmitigated impact assessment on the 88 cultural heritage sites included in the formal impact assessment are presented in Table 19. The potential for significant impacts to cultural heritage sites was assessed as **Moderate** in all instances except for DS021, which was assessed as being **Major**.

Table 18: Cultural heritage site significance assessment (laydown study zone)

Field Site CodeNSF Site CodeSizeDensity				Isolated Artefacts			Cultural Material Scatter			Significance Criteria								Cultural Heritage Significance Rating
										Scientific								
				Stone	Pottery	Shell	Stone	Pottery	Shell	Historical	Cont	Cond	Rep	Total	Score	Social	Spiritual	
AK Road 1		Medium	Low					●	●	1	2	1	2	4	2	1	1	5 (Low)
AK Road 2		Medium	Low					●		1	1	1	2	4	2	1	1	5 (Low)
NA/AK 5		Medium	Low					●		1	1	1	2	4	2	1	1	5 (Low)
NA/AK 6		Medium	Low					●	●	1	2	1	2	5	2	1	1	5 (Low)
NA/AK 7		Medium	Low					●		1	1	1	2	4	2	1	1	5 (Low)
NA/AK 8.2		Medium	Low				●	●		1	2	1	2	5	2	1	1	5 (Low)
NA/AK 8.3		Medium	Low				●	●		1	2	1	2	5	2	1	1	5 (Low)
DS001		Small	Low					●	●	1	1	1	1	3	1	1	1	4 (Low)
DS002		Small	Low						●	1	2	1	1	4	2	1	1	5 (Low)
DS003		Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS004		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS005		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS006		Small	Medium					●		1	2	1	2	5	2	1	1	5 (Low)
DS007		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS008		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS009		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS010		Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS011		Medium	Low					●		1	1	1	2	4	2	1	1	5 (Low)
DS012		Small	Low					●		1	2	1	1	4	2	1	1	5 (Low)
DS013		Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS014		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS015		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS016		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS017		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS018		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS019		Small	Low					●		1	2	1	1	4	2	2	1	6 (Low)
DS020		Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS021		Large	Low				●	●		2	3	1	3	7	3	2	1	8 (Medium)

Field Site CodeNSF Site CodeSizeDensity				Isolated Artefacts			Cultural Material Scatter			Significance Criteria								Cultural Heritage Significance Rating
										Scientific								
				Stone	Pottery	Shell	Stone	Pottery	Shell	Historical	Cont	Cond	Rep	Total	Score	Social	Spiritual	
DS022	BWD BWE BWF BWG BWH BWI BWJ BWK BWL BWM BWN BWO BWP BWQ BWR	Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS023		Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS024		Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS025		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS026		Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS027		Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS028		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS029		Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS030		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS031		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS032		Small	Low				●			1	1	1	1	3	1	1	1	4 (Low)
DS033		Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS034		Small	Low					●		1	2	1	1	4	2	1	1	5 (Low)
DS035		Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS036		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS037		Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS038		Medium	Low				●	●		1	2	1	2	5	2	1	1	5 (Low)
DS039		BWS	Small	Low					●		1	1	1	1	3	1	1	1
DS040	BWT	Small	Low	●						1	1	1	1	3	1	1	1	4 (Low)
DS041	BWU	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS042	BWV	Small	Low					●		1	2	1	1	4	2	1	1	5 (Low)
DS043	BWW	Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS044	BWX	Small	Low					●		1	2	1	1	4	2	1	1	5 (Low)
DS045	BWY	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS046	BWZ	Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS047	BXA	Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS048	BXB	Medium	Low					●		1	2	1	2	5	2	1	1	5 (Low)
DS049	BXC	Small	Low			●				1	1	1	1	3	1	1	1	4 (Low)
DS050	BXD	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)

Field Site Code	NSF Site Code	Size	Density	Isolated Artefacts			Cultural Material Scatter			Significance Criteria								Cultural Heritage Significance Rating
				Stone	Pottery	Shell	Stone	Pottery	Shell	Historical	Scientific					Social	Spiritual	
											Cont	Cond	Rep	Total	Score			
DS051	BXE	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS052	BXF	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS053	BXG	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS054	BXH	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS055	BXI	Small	Low					●	●	1	1	1	1	3	1	1	1	4 (Low)
DS056	BXJ	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS057	BXK	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS058	BXL	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS059	BXM	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS060	BXN	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS061	ABXO	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS062	ABXP	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS063	ABXQ	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS064	ABXR	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS065	ABXS	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS066	ABXT	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS067	ABXU	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS068	ABXV	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS069	ABXW	Small	Low					●		1	2	1	1	4	2	1	1	5 (Low)
DS070	ABXX	Medium	Low					●		1	2	1	2	5	2	1	1	5 (Low)
DS071	ABXY	Medium	Low					●		1	2	1	2	5	2	1	1	5 (Low)
DS072	ABXZ	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS073	ABYA	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS074	ABYB	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS075	ABYC	Small	Low		●					1	1	1	1	3	1	1	1	4 (Low)
DS077	ABYE	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS078	ABYF	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)
DS079	ABYG	Small	Low				●	●		1	2	1	1	4	2	1	1	5 (Low)
DS080	ABYH	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)

Field Site Code	NSF Site Code	Size Density		Isolated Artefacts			Cultural Material Scatter			Significance Criteria								Cultural Heritage Significance Rating
				Stone	Pottery	Shell	Stone	Pottery	Shell	Historical	Scientific					Social	Spiritual	
											Cont	Cond	Rep	Total	Score			
DS081	ABYI	Small	Medium					●	●	1	2	1	1	4	2	1	1	5 (Low)
DS082	ABYJ	Small	Low					●		1	1	1	1	3	1	1	1	4 (Low)

Table 19: Impact assessment prior to management/mitigation (laydown study zone)

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Nature of Impact	Cultural Heritage Significance	Impact Magnitude	Impact Significance
AK Road 1			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
AK Road 2			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
NA/AK 5			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
NA/AK 6			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
NA/AK 7			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
NA/AK 8.2			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
NA/AK 8.3			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS001			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS002			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS003		•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS004			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS005			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS006			•	Small	Medium	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS007			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS008			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS009			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS010		•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS011			•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS012			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS013		•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS014			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Nature of Impact	Cultural Heritage Significance	Impact Magnitude	Impact Significance
DS015			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS016			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS017			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS018			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS019			•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS020		•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS021			•	Large	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Medium	High	Major
DS022		•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS023		•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS024	BWD	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS025	BWE		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS026	BWF	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS027	BWG	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS028	BWH		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS029	BWI	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS030	BWJ		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS031	BWK		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS032	BWL		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS033	BWM	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS034	BWN		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS035	BWO	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS036	BWP		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS037	BWQ		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS038	BWR		•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS039	BWS		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS040	BWT	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS041	BWU		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS042	BWV		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS043	BWW	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS044	BWX		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Nature of Impact	Cultural Heritage Significance	Impact Magnitude	Impact Significance
DS045	BWY		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS046	BWZ	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS047	BXA	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS048	BXB		•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS049	BXC	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS050	BXD		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS051	BXE	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS052	BXF		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS053	BXG	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS054	BXH		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS055	BXI		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS056	BJX	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS057	BXK	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS058	BXL	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS059	BXM		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS060	BXN	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS061	ABXO		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS062	ABXP		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS063	ABXQ	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS064	ABXR		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS065	ABXS		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS066	ABXT		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS067	ABXU		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS068	ABXV		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS069	ABXW		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS070	ABXX		•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS071	ABXY		•	Medium	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS072	ABXZ		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS073	ABYA	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS074	ABYB	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Nature of Impact	Cultural Heritage Significance	Impact Magnitude	Impact Significance
DS075	ABYC	•		Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS077	ABYE	•	•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS078	ABYF		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS079	ABYG		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS080	ABYH		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS081	ABYI		•	Small	Medium	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate
DS082	ABYJ		•	Small	Low	Vegetation clearing; ground disturbance (surface and subsurface)	Low	High	Moderate

6.3.2. Managing impacts to cultural heritage

6.3.2.1. General

The assessment of cultural heritage significance is a fundamental component of heritage management. It informs which items, sites, places, landscapes and other features should be avoided or preserved. If avoidance/preservation is not possible due, for example, to engineering requirements or other technical constraints, appropriate management measures can then be developed that mitigate adverse impacts to the greatest extent practicable.

The significance assessment process underpins heritage site protection by establishing a structure within which various types (assessment criteria) and levels (significance ratings) of heritage value can be identified and allocated, as outlined in Section 4.2.2.

Based on the outcomes of the cultural heritage consultations and fieldwork and the subsequent significance assessment process reported in Section 6.2, the Project will develop a project-specific construction Cultural Heritage Management Plan that will:

- Ensure that all requirements of the PNG LNG Project CHMP have been implemented with regard to cultural heritage sites situated within the Project impact footprint within the perimeter security fence.
- Execute recommended avoidance, management and/or mitigation measures detailed in Section 6.3.2.2 below for recorded cultural heritage sites.
- Develop and implement a cultural awareness program for all employees and contractors.
- Specify salvage activities (whether it be surface artefact collections or subsurface archaeological excavations) where required, including but not limited to:
 - development of an appropriate salvage methodology to be implemented prior to ground disturbing Project activities commencing
 - establishing specific measures for the exhumation of any human remains that may be unearthed as chance finds or during cultural heritage salvage investigations.
- Require the implementation of the PNG LNG Project CHMP Chance Finds Protocol with clear processes for reporting, investigation and management of cultural heritage chance finds discovered during Project-related activities.
- Maintain a cultural heritage site database and update the database as new information becomes available. The database will inform further planning and design and will assist in the implementation of recommended management measures. It will include the precise locations of all sites, particularly those to be avoided.
- Require engagement with men and women in local communities regarding the:
 - content of the project-specific Cultural Heritage Management Plan, including the community engagement methods that will be employed in recognition of community values
 - development of culturally appropriate methods for the practical management of cultural heritage sites that are to be protected from impacts
 - development of appropriate management measures in relation to their oral tradition sites. Culturally appropriate responses to the management of sites and places that would be unavoidably impacted by Project-related activities may include avoidance,

exhumation/relocation of the site and traditional ceremonies (that should precede the commencement of Project-related activities).

6.3.2.2. Site-specific

The potential to avoid impacts to each of the recorded cultural heritage sites included in the impact assessment through infrastructure relocation or realignment was carefully considered. In each instance, the rated cultural heritage site significance and a consideration of the impact of the loss of each site to PNG's cultural heritage at the local, provincial and national level was assessed against the nature of the infrastructure or construction activity that would impact on it, and whether avoidance through infrastructure relocation or the relocation of construction support facilities such as stockpiles and laydowns was possible given technical, safety, environmental, terrain and economic constraints.

It is also important that site-specific impact avoidance, management or mitigation measures are consistent with the approach and practical recommendations included in the PNG LNG Project EIA and CHMP, especially regarding those archaeological sites identified during the preparation of the EIA and CHMP which are situated within the current Project impact footprint.

Table 17 in Section 5.6 lists the 251 previously recorded archaeological sites identified during the PNG LNG Project EIA that intersect the current Project impact footprint. It characterises each site in terms of its size and density, and includes impact management responses (no action, surface collection, salvage excavation or avoidance) for each site as recommended in the EIA and CHMP.

The results of an analysis of these impact management responses broken down by site size and density is presented in Table 20.

Table 20: Summary data on PNG LNG Project EIA/CHMP site impact management responses

Size/Density	Avoid	Salvage Excavation	Surface Collection	No Action	Unknown	Total
Small/Low	0	17	1	129	0	147 (58.5%)
Small/Medium	0	0	0	0	0	0
Small/High	0	1 ¹¹	0	0	0	1 (0.4%)
Medium/Low	0	29	3	39	1	72 (28.7%)
Medium/Medium	0	5	0	0	0	5 (2%)
Medium/High	0	0	0	0	0	0
Large/Low	0	16	1	6	0	23 (9.2%)
Large Medium	0	0	0	0	0	0
Large/High	0	3	0	0	0	3 (1.2%)
Total	0	71 (28.3)	5 (2%)	174 (69.3%)	1 (0.4%)	251 (100%)

¹¹ This figure records a combined surface collection/salvage excavation.

Taking the 251 archaeological sites included in Table 17 as reflecting a random sample of all the archaeological sites assessed in the PNG LNG Project EIA, the following trends can be identified:

- Avoidance was rarely used as an impact management response¹².
- Salvage or surface collection was recommended approximately 30% of the time.
- Salvage excavation was recommended in preference to surface collection.
- No action was recommended approximately 70% of the time.
- Salvage excavation was recommended in escalating frequencies for small (12%), medium (44%) and large sites (73%).
- Salvage excavation was recommended in escalating frequencies for low (26%), medium (100%) and high-density sites (100%).¹³

The site-specific management measures proposed in Table 21 have been developed drawing on the outcomes of the baseline assessment (including the 2019 cultural heritage field investigation program) described in Section 5.5, the results of the impact assessment reported in Section 6.3.1, and consideration of the impact management responses contained in the PNG LNG Project EIA and CHMP for sites relating to the Project study area (including the laydown study zone) as outlined above.

6.3.2.3. Salvage method

- Salvage works that are recommended prior to the commencement of construction-related activities within the laydown study zone must be agreed by NMAG for high significant sites.
- Representatives of local village communities should be engaged to assist the salvage program.
- Salvage excavation at a cultural heritage site must be supervised by a suitably qualified archaeologist and conducted in a manner consistent with good industry practice.
- Salvage excavation should commence with a 1 m² (i.e., a 1 m x 1 m) salvage pit. Excavation should continue to a culturally sterile depth or to the maximum depth of construction impacts at that location. This will be agreed and determined onsite by the archaeologist and EMPNGA in consultation with the affected community representative(s).
- Where an archaeological deposit uncovered or partially uncovered in the 1 m² salvage pit is determined to be of high significance due to content, condition and representativeness, the salvage excavation may be extended as agreed with Papua LNG co-venture participants and the NMAG.
- It may be necessary to determine the site extent. In this case, a site boundary establishment program shall be proposed by the archaeologist and undertaken subject to the agreement of the Papua LNG co-venture participants and the NMAG.
- Following the determination of site extent, if harm avoidance is achievable, no further salvage excavation is required.
- Guidance on custodianship of recovered materials will be determined by the NMAG.

¹² Despite the absence of avoidance as an impact management strategy in Table 20, the PNG LNG Project did recommend avoidance during construction of several highly significant cultural heritage places.

¹³ Note that the sample size for medium and high-density sites is n=3 and n=3 respectively

Table 21: Site-specific avoidance, management and mitigation measures (laydown study zone)

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance	Impact Significance	Avoidance/Management/Mitigation Measures ¹⁴
AK Road 1			•	Medium	Low	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.
AK Road 2			•	Medium	Low	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.
NA/AK 5			•	Medium	Low	Low	Moderate	No action required.
NA/AK 6			•	Medium	Low	Low	Moderate	No action required.
NA/AK 7			•	Medium	Low	Low	Moderate	No action required.
NA/AK 8.2			•	Medium	Low	Low	Moderate	Salvage excavation consistent with the method defined in Section 6.3.2.3 prior to construction.
NA/AK 8.3			•	Medium	Low	Low	Moderate	Salvage excavation consistent with the method defined in Section 6.3.2.3 prior to construction.
DS001			•	Small	Low	Low	Moderate	No action required.
DS002			•	Small	Low	Low	Moderate	No action required.
DS003		•		Small	Low	Low	Moderate	No action required.
DS004			•	Small	Low	Low	Moderate	No action required.
DS005			•	Small	Low	Low	Moderate	No action required.
DS006			•	Small	Medium	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.
DS007			•	Small	Low	Low	Moderate	No action required.
DS008			•	Small	Low	Low	Moderate	No action required.
DS009			•	Small	Low	Low	Moderate	No action required.
DS010		•		Small	Low	Low	Moderate	No action required.
DS011			•	Medium	Low	Low	Moderate	No action required.
DS012			•	Small	Low	Low	Moderate	No action required.
DS013		•		Small	Low	Low	Moderate	No action required.
DS014			•	Small	Low	Low	Moderate	No action required.
DS015			•	Small	Low	Low	Moderate	No action required.
DS016			•	Small	Low	Low	Moderate	No action required.

¹⁴ Measures relating to AK Road 1, AK Road 2, NA/AK 5, NA/AK 6, NA/AK 7, NA/AK 8.1 and NA/AK 8.2 are as specified in the original PNG LNG Project ESIA and CHMP

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance	Impact Significance	Avoidance/Management/Mitigation Measures ¹⁴
DS017			•	Small	Low	Low	Moderate	No action required.
DS018			•	Small	Low	Low	Moderate	No action required.
DS019			•	Small	Low	Low	Moderate	No action required.
DS020		•		Small	Low	Low	Moderate	No action required.
DS021			•	Large	Low	Medium	Major	Avoid; confirmation of the site's location and boundary by an archaeologist; erection of a suitable barrier or other measures such as cultural awareness training to prevent access by Project employees and contractors prior to works commencing; reference to this site protection strategy in daily toolbox meetings. If avoidance is not possible, salvage excavation consistent with the method defined in Section 6.3.2.3 prior to construction.
DS022		•		Small	Low	Low	Moderate	No action required.
DS023		•		Small	Low	Low	Moderate	No action required.
DS024	BWD	•		Small	Low	Low	Moderate	No action required.
DS025	BWE		•	Small	Low	Low	Moderate	No action required.
DS026	BWF	•		Small	Low	Low	Moderate	No action required.
DS027	BWG	•		Small	Low	Low	Moderate	No action required.
DS028	BWH		•	Small	Low	Low	Moderate	No action required.
DS029	BWI	•		Small	Low	Low	Moderate	No action required.
DS030	BWJ		•	Small	Low	Low	Moderate	No action required.
DS031	BWK		•	Small	Low	Low	Moderate	No action required.
DS032	BWL		•	Small	Low	Low	Moderate	No action required.
DS033	BWM	•		Small	Low	Low	Moderate	No action required.
DS034	BWN		•	Small	Low	Low	Moderate	No action required.
DS035	BWO	•		Small	Low	Low	Moderate	No action required.
DS036	BWP		•	Small	Low	Low	Moderate	No action required.
DS037	BWQ		•	Small	Low	Low	Moderate	No action required.
DS038	BWR		•	Medium	Low	Low	Moderate	No action required.
DS039	BWS		•	Small	Low	Low	Moderate	No action required.
DS040	BWT	•		Small	Low	Low	Moderate	No action required.
DS041	BWU		•	Small	Low	Low	Moderate	No action required.

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance	Impact Significance	Avoidance/Management/Mitigation Measures ¹⁴
DS042	BWV		•	Small	Low	Low	Moderate	No action required.
DS043	BWW	•		Small	Low	Low	Moderate	No action required.
DS044	BWX		•	Small	Low	Low	Moderate	No action required.
DS045	BWY		•	Small	Low	Low	Moderate	No action required.
DS046	BWZ	•		Small	Low	Low	Moderate	No action required.
DS047	BXA	•		Small	Low	Low	Moderate	No action required.
DS048	BXB		•	Medium	Low	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.
DS049	BXC	•		Small	Low	Low	Moderate	No action required.
DS050	BXD		•	Small	Low	Low	Moderate	No action required.
DS051	BXE	•		Small	Low	Low	Moderate	No action required.
DS052	BXF		•	Small	Low	Low	Moderate	No action required.
DS053	BXG	•		Small	Low	Low	Moderate	No action required.
DS054	BXH		•	Small	Low	Low	Moderate	No action required.
DS055	BXI		•	Small	Low	Low	Moderate	No action required.
DS056	BJ	•		Small	Low	Low	Moderate	No action required.
DS057	BXK	•		Small	Low	Low	Moderate	No action required.
DS058	BXL	•		Small	Low	Low	Moderate	No action required.
DS059	BXM		•	Small	Low	Low	Moderate	No action required.
DS060	BXN	•		Small	Low	Low	Moderate	No action required.
DS061	ABXO		•	Small	Low	Low	Moderate	No action required.
DS062	ABXP		•	Small	Low	Low	Moderate	No action required.
DS063	ABXQ	•		Small	Low	Low	Moderate	No action required.
DS064	ABXR		•	Small	Low	Low	Moderate	No action required.
DS065	ABXS		•	Small	Low	Low	Moderate	No action required.
DS066	ABXT		•	Small	Low	Low	Moderate	No action required.
DS067	ABXU		•	Small	Low	Low	Moderate	No action required.
DS068	ABXV		•	Small	Low	Low	Moderate	No action required.
DS069	ABXW		•	Small	Low	Low	Moderate	No action required.
DS070	ABXX		•	Medium	Low	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance	Impact Significance	Avoidance/Management/Mitigation Measures ¹⁴
DS071	ABXY		●	Medium	Low	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.
DS072	ABXZ		●	Small	Low	Low	Moderate	No action required.
DS073	ABYA	●		Small	Low	Low	Moderate	No action required.
DS074	ABYB	●		Small	Low	Low	Moderate	No action required.
DS075	ABYC	●		Small	Low	Low	Moderate	No action required.
DS077	ABYE	●	●	Small	Low	Low	Moderate	No action required.
DS078	ABYF		●	Small	Low	Low	Moderate	No action required.
DS079	ABYG		●	Small	Low	Low	Moderate	No action required.
DS080	ABYH		●	Small	Low	Low	Moderate	No action required.
DS081	ABYI		●	Small	Medium	Low	Moderate	Collection of surface artefacts by an archaeologist prior to construction.
DS082	ABYJ		●	Small	Low	Low	Moderate	No action required.

6.3.3. Residual impact assessment

Residual impacts are those potential impacts that remain after the successful application of the recommended management measures described above and is based on a review of the original impacts identified in the impact assessment.

The results of a residual impact assessment on each of the 88 recorded cultural heritage sites included in the laydown study zone impact assessment are presented in Table 22:

- The impact response for 78 sites (89%) is No Action given that these sites almost uniformly contain 10 or less artefacts and mostly comprise heavily weathered undecorated ceramic fragments. The impact significance for these sites remains unchanged.
- The impact significance for nine sites (10%) is reduced from **Moderate to Minor**.
- The impact significance for site DS021 is reduced from **Major to Nil**.

Table 22: Residual impact assessment (laydown study zone)

Field Site Code	NSF Site Code						Impact Response Measure	Unmitigated Impact Significance		Residual Impact Significance	
		Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance		Impact Magnitude	Impact Significance	Impact Magnitude	Impact Significance
AK Road 1			•	Medium	Low	Low	Surface collection	High	Moderate	Medium	Minor
AK Road 2			•	Medium	Low	Low	Surface collection	High	Moderate	Medium	Minor
NA/AK 5			•	Medium	Low	Low	No action	High	Moderate	High	Moderate
NA/AK 6			•	Medium	Low	Low	No action	High	Moderate	High	Moderate
NA/AK 7			•	Medium	Low	Low	No action	High	Moderate	High	Moderate
NA/AK 8.2			•	Medium	Low	Low	Salvage excavation	High	Moderate	Low	Moderate
NA/AK 8.3			•	Medium	Low	Low	Salvage excavation	High	Moderate	Low	Moderate
DS001			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS002			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS003		•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS004			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS005			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS006			•	Small	Medium	Low	Surface collection	High	Moderate	Medium	Minor
DS007			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS008			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS009			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS010		•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS011			•	Medium	Low	Low	No action	High	Moderate	High	Moderate
DS012			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS013		•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS014			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS015			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS016			•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS017			•	Small	Low	Low	No action	High	Moderate	High	Moderate

Field Site Code	NSF Site Code						Impact Response Measure	Unmitigated Impact Significance		Residual Impact Significance		
		Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance		Impact Magnitude	Impact Significance	Impact Magnitude	Impact Significance	
DS018	BWD	●	●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS019			●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS020			●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS021			●	Large	Low	Medium	Avoid	High	Major	Nil	Nil	
DS022		●	Small	Low	Low	No action	High	Moderate	High	Moderate		
DS023		●	Small	Low	Low	No action	High	Moderate	High	Moderate		
DS024		●	Small	Low	Low	No action	High	Moderate	High	Moderate		
DS025		BWE	●	●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS026		BWF		●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS027		BWG		●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS028		BWH		●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS029		BWI	●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS030		BWJ	●	●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS031		BWK		●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS032		BWL		●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS033		BWM		●	Small	Low	Low	No action	High	Moderate	High	Moderate
DS034	BWN	●	●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS035	BWO		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS036	BWP		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS037	BWQ		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS038	BWR		●	Medium	Low	Low	No action	High	Moderate	High	Moderate	
DS039	BWS		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS040	BWT		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS041	BWU		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS042	BWV		●	Small	Low	Low	No action	High	Moderate	High	Moderate	
DS043	BWW		●	Small	Low	Low	No action	High	Moderate	High	Moderate	

Field Site Code	NSF Site Code	Cultural Heritage					Impact Response Measure	Unmitigated Impact Significance		Residual Impact Significance	
								Impact Magnitude	Impact Significance	Impact Magnitude	Impact Significance
DS044	BWX		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS045	BWY		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS046	BWZ	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS047	BXA	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS048	BXB		•	Medium	Low	Low	Surface collection	High	Moderate	Medium	Minor
DS049	BXC	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS050	BXD		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS051	BXE	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS052	BXF		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS053	BXG	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS054	BXH		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS055	BXI		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS056	BXJ	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS057	BXK	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS058	BXL	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS059	BXM		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS060	BXN	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS061	ABXO		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS062	ABXP		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS063	ABXQ	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS064	ABXR		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS065	ABXS		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS066	ABXT		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS067	ABXU		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS068	ABXV		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS069	ABXW		•	Small	Low	Low	No action	High	Moderate	High	Moderate

Field Site Code	NSF Site Code	Isolated Artefact	Artefact Scatter	Size	Density	Cultural Heritage Significance	Impact Response Measure	Unmitigated Impact Significance		Residual Impact Significance	
								Impact Magnitude	Impact Significance	Impact Magnitude	Impact Significance
DS070	ABXX		•	Medium	Low	Low	Surface collection	High	Moderate	Medium	Minor
DS071	ABXY		•	Medium	Low	Low	Surface collection	High	Moderate	Medium	Minor
DS072	ABXZ		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS073	ABYA	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS074	ABYB	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS075	ABYC	•		Small	Low	Low	No action	High	Moderate	High	Moderate
DS077	ABYE	•	•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS078	ABYF		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS079	ABYG		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS080	ABYH		•	Small	Low	Low	No action	High	Moderate	High	Moderate
DS081	ABYI		•	Small	Medium	Low	Surface collection	High	Moderate	Medium	Minor
DS082	ABYJ		•	Small	Low	Low	No action	High	Moderate	High	Moderate

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8. Appendices

Appendix A PNG LNG Project Cultural Heritage Management Plan

Esso Highlands Limited



Papua New Guinea LNG Project

**Environmental and Social Management Plan
Appendix 13: Cultural Heritage
Management Plan**

PGGP-EH-SPENV-000018-015

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1.0 OBJECTIVES

Esso Highlands Limited (Company) has developed this Cultural Heritage Management Plan as part of its Environmental and Social Management Plan (ESMP).

The objectives of the Cultural Heritage Management Plan are to:

1. Avoid known cultural heritage sites (including both archaeological sites and oral tradition sites) where necessary and practicable
2. Where avoidance is not possible, manage cultural heritage sites in consultation with PNG Government and landowners.

This plan should be read in conjunction with the following Company plans:

- Ecological Management Plan
- Stakeholder Engagement Plan
- Community Engagement Plan.

2.0 LEGAL AND OTHER REQUIREMENTS

Legal and other requirements applicable to this plan are identified in Attachment 1.

3.0 CULTURAL HERITAGE INVESTIGATION

3.1 Cultural Heritage Surveys

A Cultural Heritage Survey will be undertaken of the pipeline Right of Way (RoW), new roads/access tracks, facility laydown areas and other environmentally undisturbed areas to identify cultural heritage (archaeological and oral tradition) sites.

The Cultural Heritage Survey will be conducted subsequent to community awareness being carried out by Land & Community Affairs as outlined in Attachment 2, Company's Cultural Heritage Investigation and Salvage Protocol.

Company's Cultural Heritage Survey will include surveys to identify cultural heritage (archaeological and oral tradition) sites, community consultation regarding the management of cultural heritage sites and preparation of any protocols required for ongoing consultation with community representatives as outlined in Company's Cultural Heritage Investigation and Salvage Protocol.

Landowner agreement for the management approach of individual cultural heritage sites will be sought via the measures outlined in Attachment 2, Company's Cultural Heritage Investigation and Salvage Protocol.

Outcomes of the Cultural Heritage Survey include:

- GPS registered cultural heritage constraints/sensitivities for avoidance
- Further research of appropriate archives, where relevant and required
- Consultation and liaison with the PNG National Museum and Art Gallery and National Cultural Commission (NCC), as required
- Landowner concurrence for cultural heritage management approach

3.2 Contractor Preconstruction Cultural Heritage Surveys

Contractor shall undertake a Cultural Heritage Survey of the pipeline RoW, new roads/access tracks, facility laydown areas and other environmentally undisturbed areas that will be utilized during construction. Contractor's Pre-construction Cultural Heritage Survey may be done in conjunction with other engineering surveys.

Contractor will utilise a team of qualified personnel that Company has approved to undertake the Pre-construction Cultural Heritage Survey and record the results.

The results of Contractor's Preconstruction Cultural Heritage Survey will be provided to Company in both report form and raw data.

Company may at its discretion provide specialty discipline personnel to join Contractor's Pre-construction Cultural Heritage Survey.

Ground disturbance will not commence until Contractor's Pre-construction Cultural Heritage Survey has been completed and Company has given clearance to proceed.

3.3 Site Specific Cultural Heritage Management Plan

Based on Company's Cultural Heritage Survey and Contractor's Pre-construction Cultural Heritage Survey, Contractor shall prepare a Site Specific Cultural Heritage Management Plan for each proposed disturbance area.

Contractor's Site Specific Cultural Heritage Management Plan shall be approved by Company. Contractor's Site Specific Cultural Heritage Management Plan shall incorporate management measures endorsed by the PNG National Museum and Art Gallery as required for individual cultural heritage sites.

4.0 MANAGEMENT AND MONITORING

Company's preferred management approach for known cultural heritage sites is avoidance.

For those sites that cannot practicably be avoided, the appropriate management measure(s) may include sample salvage-excavation and/or salvage through surface collections.

The requirements for implementing each of these management measures are presented in Attachment 2: Cultural Heritage Investigation and Salvage Protocol.

Company and Contractor will adhere to Company's Cultural Heritage Investigation and Salvage Protocol for all salvage activities as agreed with the PNG National Museum and Art Gallery.

Cultural heritage sites that are discovered as chance finds during construction will be managed appropriately in accordance with Attachment 3, Cultural Heritage Chance Finds Protocol.

Table 1 presents a summary of potential cultural heritage impacts, together with associated mitigation and management measures to avoid or reduce these impacts.

As per Section 3.3 Contractor shall develop a Site Specific Cultural Heritage Management Plan for each proposed disturbance area, which will, as a minimum, incorporate the requirements of Company's Cultural Heritage Management Plan. This plan shall also incorporate the measures described in Table 1, but shall not be limited to those measures.

Due to differing scopes of work and work locations, not all management and mitigation measures in the Cultural Heritage Management Plan are applicable to all Contractors. Company's Environmental and Social Mitigation Register defines which management and mitigation measures are applicable to each Contract scope of work.

In Table 1, any mitigation and management commitments that were contained in the PNG LNG Project Environmental Impact Statement (EIS) are identified by a code commencing with an 'M' in the 'Mitigation Item Reference Number' column. Some mitigation measures have been reworded to provide further clarity or more detailed information. In these instances, the code is displayed in italics, and these reworded measures supersede what is in the EIS.

Other mitigation and management commitments required by Company are identified in Table 1 with a code commencing with A.

Monitoring that will be undertaken in relation to the Cultural Heritage Management Plan is also described in Table 1.

Contractor shall develop site-specific procedures for the monitoring program, to be agreed by Company.

Table 1: Management and Monitoring

Table 1: Management and Monitoring						
Source of Impact	Potential Impact and Relevant Management Plan Objective[†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
On-ground works and movement of people and vehicles within the direct disturbance areas	Damage to, or destruction of, cultural heritage sites. Disconnection of communities from cultural heritage sites and loss of sites from oral tradition. (Objectives 1, 2)	Conduct Cultural Heritage Survey by systematically recording and mapping cultural heritage sites in all areas designated for disturbance during construction, including any areas that were characterised but not surveyed for the EIS.	M224, M225	N/A	Before Construction	Company and Contractor
		Conduct further research of appropriate archives as part of site pre-construction surveys, where relevant and required.	M229	N/A	Before Construction	Company and Contractor
		Conduct Cultural Heritage Survey on limestone hills in consultation with relevant community representatives and the PNG National Museum and Art Gallery where required before quarrying to determine whether the hills are culturally significant and to specify what site-specific measures, if any, are required.	M262	Verification	Ongoing	Company and Contractor
		Consult and liaise with the PNG National Museum and Art Gallery as required for surveys and check all surveys are supervised by appropriately-qualified archaeologists and cultural heritage specialists. Liaise with the National Cultural Commission (NCC) through the PNG National Museum and Art Gallery as appropriate.	M226	Verification	Ongoing	Company and Contractor
		Develop and have approved by PNG National Museum and Art Gallery a Cultural Heritage: Chance Finds Protocol for disturbance activities.	A93	N/A	Before Construction	Company
		Prepare a Site Specific Cultural Heritage Management Plan for each potential disturbance area which provides: Maps of disturbance areas showing the locations of cultural heritage sites and buffers around those sites requiring avoidance.	M230, M227, M241	Verification	Ongoing	Contractor

Table 1: Management and Monitoring

Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
		- The specific measures required for each known cultural heritage site – such as avoidance, salvage, community ritual, documentation, etc. – as specified by cultural heritage specialists based on EIS and Cultural Heritage Surveys. - Ensure significant cultural heritage findings are interpreted, documented and reported to the PNG National Museum and Art Gallery.				
		Consult with community representatives on matters concerning the management of cultural heritage sites to be impacted by activities. Develop protocols in consultation with the PNG National Museum and Art Gallery and ensure these are included in Contractor's Site Specific Cultural Heritage Management Plans.	M237	Verification	As required	Company
		Implement cultural awareness before activities commence to induct personnel in: - Importance of oral traditions and associated sites to communities in Papua New Guinea - Types of cultural heritage sites that exist within disturbance areas and that trigger the implementation of the Cultural Heritage Chance Finds Protocol, which includes measures for dealing with skeletal material (see Attachment 3). - Locations of known cultural heritage sites and requirement to avoid all sites not authorised for disturbance - Process for clearing and salvaging cultural heritage sites before undertaking activities - Protocols for responding to chance finds of	M235	N/A	Before Construction	Company and Contractor

Table 1: Management and Monitoring

Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
		cultural heritage sites, including skeletal material.				
		Establish a protocol for salvage (Cultural Heritage Investigation and Salvage Protocol) in consultation with the PNG National Museum and Art Gallery and ensure this protocol is detailed in Contractor's Site Specific Cultural Heritage Management Plans. The protocol is to cover the salvage of known sites prior to the commencement of works where required and the salvage of unknown sites, where required as part of the Cultural Heritage Chance Finds Protocol.	M236	N/A	Once off	Company
		Engage appropriately-qualified archaeologists and cultural heritage specialists to coordinate and direct salvage of known sites prior to disturbance – in consultation with the PNG National Museum and Art Gallery, as required – and to make sure that any previously unknown sites are treated appropriately and according to measures stipulated in the Cultural Heritage: Investigation and Salvage Protocol, Cultural Heritage: Chance Finds Protocol and Contractor's Site Specific Cultural Heritage Management Plans.	M232, M238	Verification	As required	Contractor
		For significant sites encountered during construction, consult with PNG National Museum and Art Gallery as described in Chance Finds Protocol.	M233	N/A	Ongoing	Contractor

Table 1: Management and Monitoring

Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
PGGP-EH-SPENV-000018-015		Identify on site plans and create buffer zones where necessary to avoid, where practicable and with Company approval, the following cultural heritage sites (the site numbers shown are those used in the project GIS) if activities are occurring near these locations: The two ossuary sites LK040 and LK041, which are located 1.4 km and 700 m southeast of the LNG Project gas pipeline, respectively. The myth site Sisibuitono (LK043), which is located approximately 2.7 km southeast of the LNG Project gas pipeline. The Mount Ru complex, which is located approximately 10 km east of the LNG Project gas pipeline and west of Kopi Shore Base. The small hill at Helipad 14 (KG125), located 8 km east of the LNG Project gas pipeline. The area located 10 km east of the LNG Project gas pipeline, between Utiti Creek in the north, the Kikori River western bank in the east, and an area 500 m to the south and to the west of the existing Kopi base camp. The ritual lake Iba Mabuli (HD011) and the associated ritual sites (HD037, HD009, HD010 and HD012), all located about 1 km north of the LNG Project gas pipeline. The Datore gebeanda ritual site (HD016), located about 2 km north of the LNG Project gas pipeline. The ritual site HD017, located about 4 km north of the LNG Project gas pipeline. The cultural sites at the north boundary of the alternative Hides Gas Conditioning Plant site (at Tipuripu), including sites HD225, HD209 and HD211.	M261	N/A	Before Construction	Contractor

Table 1: Management and Monitoring

Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
		Avoid rock art sites in the vicinity of Lake Kutubu (with particular attention to the avoidance of rock art sites and ossuaries; cultural heritage sites LK001 to LK037 and LK056 to LK063) in the relevant Site Specific Cultural Heritage Plans.	M260	N/A	Before Construction	Contractor
		(LNG Plant Site) Engage a social anthropologist to record the Koita and Motu place names and their oral traditions within the LNG Plant site lease boundary. This process will be undertaken in consultation with relevant community representatives.	M246	N/A	Once off	Company
		(LNG Plant Site) Cross-check the ARE, ARB and ARJ sites against previous sites formally recorded on the PNG National Museum and Art Gallery/University of PNG registers (sites AAIP, AAIO and AAIQ, respectively). This cross-check will be undertaken as part of future site archaeology salvage and management.	M247	N/A	Once off	Company
		(LNG Plant Site) Revisit the P-39 aircraft crash site (recorded site CB4) and the cultural pipe bridge structure site (recorded site CB3) during Cultural Heritage Surveys – these heritage sites lie outside the LNG Plant site security fence area but inside the lease boundary area. Identify location and salvage, if necessary.	M256	Verification	Before Construction	Company and Contractor
		(LNG Plant Site) Delineate the boundaries of the Konekaru site and avoid during construction.	M248	N/A	Once off	Company and Contractor
		(LNG Plant Site) Delineate the boundaries of the ancient village site complex known as Aemakara, and avoid during construction activities.	M245, M253	N/A	Once off	Company and Contractor

Table 1: Management and Monitoring

Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
		(LNG Plant Site) Avoid or salvage and record cultural heritage sites at the LNG Plant site, including salvage of the sites recorded as SC3 and SC5.	M252, M254	N/A	Once off	Company
		(LNG Plant Site) Salvage known significant cultural heritage sites, where appropriate.	M231	N/A	Once off	Company
		(LNG Plant Site) Implement the Cultural Heritage Chance Finds Protocol for the appropriate treatment of any potential archaeological sites (chance finds) identified during salvage works (for skeletal material) and construction activities.	M234	Verification	Ongoing	Contractor
Offshore works and movement of equipment within the direct disturbance areas.	Damage to, or destruction of, cultural heritage sites. Disconnection of communities from cultural heritage sites and loss of sites from oral tradition. (Objectives 1, 2)	(LNG Plant Site) Consult relevant community representatives and cultural heritage specialists to identify oral tradition sites during Cultural Heritage Surveys, and before obtaining community consent for the damage or destruction of cultural heritage sites.	M228	Verification	Ongoing	Company
		(LNG Plant Site) Mark known offshore cultural sites on nautical charts and add a GIS reference to site construction plans for avoidance where practicable.	M240	Verification	Ongoing	Contractor

Table 1: Management and Monitoring

Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
		(LNG Plant Site) Liaise with a marine archaeologist to review the detailed side-scan sonar data obtained for areas to be developed offshore of Caution Bay. (LNG Plant Site) Management and/or future survey of any credible anomalies of cultural heritage origin will be documented, including avoidance where practicable. The project will liaise with relevant PNG, Australian and international agencies involved in the recording and reporting of WWII war graves and artefacts as appropriate.	M243	Verification	Before Construction	Company
		(LNG Plant Site) Indicate on site construction maps, and avoid, where practicable, the general area of known Lagatoi wreck sites CB16, CB17 and CB18. If sunken Lagatoi remains are discovered during site construction activities, works will stop and remains will be managed and protected as appropriate in consultation with the PNG National Museum and Art Gallery.	M258	Verification	Ongoing	Contractor
Increase in person and vehicle traffic outside the direct disturbance areas	Damage to or destruction of cultural heritage sites. (Objective 1)	(LNG Plant Site) Implement cultural awareness before activities commence to induct personnel. Consider the Boera battery (recorded site CB30) when developing the cultural awareness program.	M259	N/A	Ongoing	Company and Contractor
		Limit the movement of employees and contractors to within project-defined areas and designated traffic and transport routes or locations. Detail specific authorised and unauthorised areas in the Site Specific Cultural Heritage Plans.	M244	N/A	Ongoing	Contractor

Table 1: Management and Monitoring						
Source of Impact	Potential Impact and Relevant Management Plan Objective [†]	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Monitoring Frequency	Responsibility
		(LNG Plant Site) Periodically inspect cultural heritage sites within the work sites to check if project personnel are disturbing sites marked for avoidance.	M239	Verification	Ongoing	Contractor
		(LNG Plant Site) Avoid important cultural heritage sites identified outside the LNG Facilities site, including Buria (recorded site CB10), Dirora, Darebo (recorded site CB11), Dori Hill (recorded site CB12), Daeroto, the four sites associated with Edai Siabo's first lagatoi story (recorded sites CB6, CB7, CB8 and ASM).	M251	N/A	Ongoing	Contractor
		(LNG Plant Site) Avoid ancestral oral tradition sites including Davage, Taubarau, Ava Garau and the associated archaeological sites. These sites are located more than 1.5 km south of the LNG Plant site near Boera and are of the highest level of cultural heritage significance.	M249	N/A	Ongoing	Contractor
		(LNG Plant Site) Avoid the aircraft crash site at Lea Lea (recorded site CB21), located outside the LNG Plant site lease area.	M257	N/A	Ongoing	Contractor

[†] See Section 1.

5.0 ROLES AND RESPONSIBILITIES

Contractor shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of the Cultural Heritage Management Plan.

Contractor's Site Specific Cultural Heritage Management Plan shall describe the resources allocated to and responsible for the execution of each task and requirement contained therein, and shall describe how roles and responsibilities are communicated to relevant personnel.

Company shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of Company's responsibilities in the Cultural Heritage Management Plan.

6.0 TRAINING, AWARENESS AND COMPETENCY

Contractor shall ensure that all personnel responsible for the execution of the tasks and requirements contained within the Site Specific Cultural Heritage Management Plans are competent on the basis of education, training and experience.

Contractor's Site Specific Cultural Heritage Management Plans shall describe the training and awareness requirements necessary for its effective implementation.

Contractor's training activity associated with the Site Specific Cultural Heritage Management Plans shall be appropriately documented by means of a training needs assessment, training matrix/plan and records of training undertaken.

Company shall ensure that all Company personnel responsible for the execution of Company's tasks and requirements in the Cultural Heritage Management Plan are competent on the basis of education, training and experience.

Company's training activity associated with the Cultural Heritage Management Plan shall be appropriately documented by means of a training needs assessment, training matrix/plan and records of training undertaken.

7.0 PERFORMANCE INDICATORS

Table 2 outlines the indicators for measuring and verifying performance in relation to the Cultural Heritage Management Plan.

Table 2: Performance Indicators

ID #	Performance Indicator	Measurement	Internal Auditing Frequency	Relevant Management Plan Objective [†]
1	Number of known cultural heritage sites disturbed without permission	Number of incidents	Quarterly	1, 2
2	Number of cultural heritage sites appropriately managed in accordance with this Cultural Heritage Management Plan and relevant Site-Specific Cultural Heritage Management Plans.	Number of sites appropriately managed	Quarterly	1, 2
Performance Indicators to be further developed and agreed between Contractor and Company				

[†] See Section 1.

8.0 REPORTING AND NOTIFICATION

8.1 Reporting of Company Cultural Heritage Surveys

Site Clearance Forms¹ will be completed for each cultural heritage site identified during Cultural Heritage Surveys, as provided in Attachment 2, the Cultural Heritage Investigation and Salvage Protocol. Information from the Site Clearance Form will be transferred to the Project GIS Cultural Heritage Site database.

The Cultural Heritage Survey teams will determine the nature and significance of individual sites with guidance from Annex 3 of Company's Cultural Heritage Investigation and Salvage Protocol, which provides background information on the cultural heritage sites within each affected region and in consultation with Land & Community Affairs staff and landowning communities.

All documentation will be supplied to the PNG National Museum and Art Gallery, through an annual summary report and a final report will be prepared once Company's archaeological salvage programs (including analyses) are complete.

8.2 Reporting of Contractor Cultural Heritage Surveys

Contractor shall report to Company the results of Contractor Cultural Heritage Surveys and integrate the results into Site Specific Cultural Heritage Management Plans, including:

- Cultural Heritage assessments
- Recording and mapping of cultural heritage sites and oral traditions and additions to GIS mapping database
- Further research of appropriate archives where relevant and required
- Engagement of specialists such as social anthropologists, archaeologists (including marine) and cultural heritage specialists
- Preparation of Site-Specific Cultural Heritage Plans for all proposed disturbance areas in consultation with PNG Museum, Art Gallery and NCC and relevant specialists, where necessary
- Implementation of the cultural awareness initiatives
- Implementation of Attachments 2 and 3, the Cultural Heritage Investigation and Salvage Protocol and Cultural Heritage Chance Finds Protocol, respectively.

Contractor's monthly construction environmental report to Company will include a summary of:

- Incidents of disturbance to known cultural heritage sites
- All cultural heritage sites identified through chance finds
- Management measures undertaken as a result of chance finds
- Number and results of verification inspections prescribed in Table 1
- Performance Indicators as applicable in the reporting period.

8.3 Reporting of Chance Finds

Contractor shall notify Company as per Attachment 3, the Chance Finds Protocol should any sites be discovered as a chance find.

Contractor shall notify Company immediately if any sites marked for preservation are disturbed.

¹ In lieu of PNG National Museum and Art Gallery's National Traditional and Prehistoric Site Survey Sheet.

All chance finds deemed by Contractor's archaeologist to be cultural heritage sites shall be reported by Contractor as part of Contractor's Monthly Environmental Construction Report, on the Chance Find Report Form provided as Annex 3 of the Cultural Heritage Chance Finds Protocol.

Contractor shall also provide an additional brief, plain language, written report on all chance finds within one month of receiving all analytical results to Company. Company shall transmit this information as part of the annual summary report to the PNG National Museum and Art Gallery.

Upon request Company shall make the report available to senior local community representatives via Land & Community Affairs.

Attachment 1: Legal and Other Requirements

LEGAL AND OTHER REQUIREMENTS

Contractor shall comply with applicable Papua New Guinea Laws and Regulations, applicable International Finance Institution (IFI) requirements and International Treaties and Conventions (where applicable).

Papua New Guinea Laws and Regulations

Environment Act 2000 (PNG)

The Environment Act 2000 contains numerous provisions that promote environmental protection, regulate environmental impacts associated with development activities, and safeguard the life supporting capacity of air, water land and ecosystems. In particular, Section 5 states:

“All persons exercising powers and functions under this Act shall recognise and provide for the following matters of national importance:-

- (a) the preservation of Papua New Guinea traditional social structures”

National Museum and Art Gallery Act 1992 (PNG)

Papua New Guinea recognises the importance of its cultural heritage, and has enacted legislation to protect this heritage. The *National Museum and Art Gallery Act 1992 (PNG)* established a national entity in the PNG Museum and Art Gallery responsible for preserving the country's unique cultural heritage, and to enforce and implement various pre-existing and subsequent legislative instruments. The *National Museum and Art Gallery Act 1992 (PNG)* requires the PNG National Museum and Art Gallery to maintain a register of cultural and archaeological sites.

National Cultural Property (Preservation) Act 1965 (PNG)

Section 9 of the *National Cultural Property (Preservation) Act 1965 (PNG)* requires that the PNG National Museum and Art Gallery ensure that cultural heritage sites are neither illegally damaged nor destroyed. Section 20(1) of the *National Cultural Property (Preservation) Act 1965 (PNG)* requires any person (or developer) discovering any of the following categories of cultural property to report the discovery to the PNG National Museum and Art Gallery:

- A cave or other place in which ancient remains, human or otherwise, are to be found;
- A carving, painting or other representation on rock or in a cave;
- A deposit of ancient pottery or historical remains;
- A place used in former times as a ceremonial or burying ground.

Cultural Heritage Permits

The PNG LNG Project has acquired three permits through the PNG National Museum and Art Gallery namely:

1. Permit for Cultural Heritage Management Plan, dated 26 August 2009
2. Permit for Investigation & Salvage Protocol, dated 26 August 2009 (and specific to work conducted at LNG Facility Site Lease Portion 2456)
3. Permit for salvage archaeology for the upstream scope of the PNG LNG Project, dated 30 September 2009

These permits enable the Project to manage archaeology in accordance with Company's Cultural Heritage Management Plan and its associated attachments.

Section 15 of the *National Cultural Property (Preservation) Act 1965 (PNG)* states the way in which cultural materials are to be exported from PNG and requires that the PNG National Museum and Art Gallery ensure that a person receives written consent prior to removal of any national cultural property from Papua New Guinea.

Coroners Act 1953 (PNG)

Section 9 of the *Coroners Act 1953* (PNG) requires that where a body is found with suspicious or unusual circumstances, immediate notice must be given to the nearest Coroner or commissioned officer of the Police Force, who must then give notice to the Coroner.

Cemeteries Act 1955 (PNG)

The *Cemeteries Act 1955* (PNG) allows for burials on private grounds to be considered cemeteries for the purposes of the Act. Section 29 of the Act requires authority prior to the exhumation of any burials. The Registration Officer holds the details of all registered cemeteries (including those on private grounds).

International Financial Institution Requirements

The Equator Principles

Current international best practice standards for the extractive industries are laid out in the World Bank/International Finance Corporation–sponsored Equator Principles (Equator Principles, 2006). The International Finance Corporation (IFC) standards that underpin the Equator Principles include Performance Standard 8 (Cultural Heritage), which recognises the importance of cultural heritage for current and future generations. Performance Standard 8 aims to protect irreplaceable cultural heritage and to guide IFC clients on ways they can protect cultural heritage in the course of their business operations. For the purposes of Performance Standard 8, cultural heritage is taken to include sites having archaeological values. Sites containing human skeletal remains are considered to fall into this category. Paragraph 6 of Performance Standard 8 states:

Chance Find procedures

The client is responsible for siting and designing the project to avoid significant damage to cultural heritage. When the proposed location of a project is in areas where cultural heritage is expected to be found, either during construction or operations, the client will implement chance find procedures established through the Social and Environmental Assessment. The client will not disturb any chance finds further until an Assessment by a competent specialist is made and actions consistent with the requirements of this Performance Standard are identified.

Consultation

Where a project may affect cultural heritage, the client will consult with affected communities within the host country who use, or have used within living memory, the cultural heritage for long-standing cultural purposes to identify cultural heritage of importance, and to incorporate into the client's decision-making process the views of the affected communities on such cultural heritage. Consultation will also involve the relevant national or local regulatory agencies that are entrusted with the protection of cultural heritage.

Paragraph 7 of Performance Standard 8 states:

Removal of Cultural Heritage

Most cultural heritage is protected by preservation in its place, since removal is likely to result in irreparable damage or destruction of the cultural heritage. The client will not remove any cultural heritage, unless the following conditions are met:

- There are no technically or financially feasible alternatives to removal.
- The overall benefits of the Project outweigh the anticipated cultural heritage loss from removal.
- Any removal of cultural heritage is conducted by the best available technique.

While the onus is on the developer to meet the intent of these standards, Performance Standard 8 also clearly stipulates that "...[i]n addition to complying with relevant national law on the protection of cultural heritage...the client will protect and support cultural heritage by undertaking internationally recognised practices for the protection, field-based study, and documentation of cultural heritage."

International Finance Corporation

IFC's Performance Standard 8 Cultural Heritage is the principal international guideline for cultural heritage. A summary of the key provisions is as follows:

- Include cultural heritage concerns in Project assessment process and management systems
- Integrate cultural heritage impacts into the Social and Environmental Assessment
- Include direct and indirect impacts and opportunities for enhancement to cultural heritage in the Assessment
- Consult with experts, government authorities, local communities, and Indigenous Peoples to identify cultural heritage resources
- Comply with PNG laws and any applicable treaties and conventions
- Design and site projects to avoid cultural heritage
- Use internationally recognized practices for the protection, field-based study, and documentation of cultural heritage
- Develop and implement Chance Finds Procedures for construction and operation
- Preserve sites in place unless there are no technically or financially feasible alternatives; and/or benefits from project outweigh any heritage losses
- Remove cultural heritage that cannot be avoided using the best available techniques

Attachment 2: Cultural Heritage Investigation & Salvage Protocol

See separate document

Attachment 3: Cultural Heritage Chance Finds Protocol

See separate document

Appendix B NMAG Permit for Archaeological Survey 0026



PNG NATIONAL MUSEUM AND ART GALLERY

P.O. BOX 5560, BOROKO, PAPUA NEW GUINEA
Telephone: 3252405 Fax: 3251779 Email: nationalmuseum@museumpng.gov.pg Webpage: www.museumpng.gov.pg

PERMIT FOR ARCHAEOLOGICAL SURVEY IN PAPUA NEW GUINEA

PERMIT 0026
☐ Extension

mission is granted to Mr JOHN MUIKE

acquired by the National Cultural Property Schedule for 18 May 1967) for survey only to document cultural heritage inclusive of archaeological, traditional, historical,
al sites both marine and terrestrial environments in/on/at LAYDOWN AREA (DEMARCATED ZONE)
EXXON MOBIL LNG PLANT SITE, CAUTION BAY, KAIRIKU-
HIRI DISTRICT

iding you agree to the following conditions:

Permit applicable only for archaeological survey for field site (s) covered in application and only for period specified in this permit document.
Undertake not to excavate a site and/or collect, move, relocate and modify, deface any cultural properties and/or content of a site.
Provide to NMAG a proposal specifying plans (including names of participating researchers) for documentation of archaeological surveys of
intangible and tangible cultural heritage.
Permit is issued under an individual's name and restricted to persons with background in archaeology and/or cultural heritage manage-
ment. No open permit to be issued to persons (including corporate persons) with no background in archaeology or cultural heritage manage-
ment.
Provide to the Curator of Prehistory resume of principle and lead investigators/researchers.
Provide material evidence of valid visa and work permit if you are participating in consultancy work.
Return to the Curator of Prehistory all completed cultural heritage site recording forms which may include map, sketches, photos and reports.
A report of your field activities and findings should be submitted to Curator of Prehistory within one month of completion of your fieldwork.
Subsequent publications, thesis, reports and a representative selection of black/white photographs and slides taken should
be sent as and when they become available. A copy of any unpublished formal lectures and seminars on your fieldwork and field findings should
also be sent.
Ensure impartial and independent reporting to NMAG upon discovery of cultural properties including the reporting of deliberate and/or accidental
damages to known (existing) or undocumented cultural heritage properties.
Unrestricted accessibility for inspection and monitoring by officers and/or agents of the NMAG.
Person (s) who breach conditions of a permit and/or who have been blacklisted will not be issued permit.
NMAG reserves the right to refuse, cancel or withdraw the permit at any time if the terms and conditions are abused or changed at
anytime.

idity period of Permit: 16th July to 30th October 2019

mission is granted by
AROUS KUASO
D/DIRECTOR SRC

Arrous Kuaso
te: 16/07/2019



I accept the above conditions

Ar John Muks
Address: Social Research Institute
P.O. Box 172
VNI P.O. DCD
PNG

[Signature]
Date: 16/7/2019
Koyas Printing Limited

Appendix C Interview Transcript, Chief Nao Nao, Papa Village, 13 August 2019

Interviewer: John Sepe, Senior Specialist, SRI

Interviewee: Chief Nao Nao, Papa Village

Location: Papa Village

Date: 13 August 2019

Time: 9:15 – 10:15am

Sepe: Good morning Chief Nao Nao, prior to me beginning the interview I have to briefly explain why I am here today to interview you. As you are aware (made aware by Mr. Maraga – Community & Land Affairs Officer) I am an archaeologist working at the PNG LNG Exxon Mobil site where artefacts have been found. Before we proceed into any worksite, we have to acquire permits that allow our type of work to be carried out.

Our permits are issued by NMAG and within the permit there are activities that we are allowed to carry out. We currently have 2 permits. The first permit is an archaeological permit; this permit allows us to have a look at artefacts, record information but not to move or transport and artefacts out of the worksite. The other permit is a cultural landscape mapping permit. This permit allows us to map culturally significant sites as well as oral history attached to those particular sites. This permit is the reason I am here today.

We have a site that has archaeological markers but no story attached to them. I hope you can shed some light on some of my questions.

Chief Nao Nao: I will try my best to answer as much as I can.

Sepe: Chief Nao Nao, please can you tell me a little bit about the history of your people.

Chief Nao Nao: Our Ancestors are Koitabuan, not Motuan. Motuan's and Koitabuan's are two different people that so many people get confused about. The Motuan's during ancestral times lived on the islands and not on the shorelines or on the stilt houses over water. During the interaction that occurred after the tribal warfare between the two parties were the Motuan's living on stilt houses on the water. They were still very much afraid of the Koitabuan's and their very savage nature that they built their houses over water to allow them easy access of escape.

We have three ancestral villages; (1). Irara, (2). Aemakara and (3). Mageto

Our ancestors were hunters and travelled this wide sparse areas hunting for protein. Their diets mainly consisted of wallaby, boar and bandicoot.

The area that you guys are currently working on used to be our hunting grounds till the 1970s when the land was used as a cattle rearing area.

The mountain range which lies at the very back of your work area is where one of our ancestral villages is located. The area where you guys are working might have been where our ancestors must have established some form of temporary settlement on their way to and from the sea.

You see during time when there started to be interaction between the Motuan's and Koitabuan's our ancestors might have travelled through the area resting for a while before heading to the sea to forage for shells and fish to supplement their high red meat protein diet.

Pottery was still used during those times, and so you have come across some pottery already.

Sepe: Yes we have

Could you explain a bit on your ancestral village up in the mountain range?

Chief Nao Nao: Yes during ancestral times our ancestors lived in the 3 main villages that I mentioned to you prior. From those 3 main villages they migrated out into new areas and settled. The old village up on the mountain was a big village as mentioned by my father.

To this day, no one has returned to this area as it is deemed sacred. Whoever enters this old village without offering a gift will end up being lost and confused by the ancestral spirits that still reside in their village to this day. We have had a couple of instances where young boys from the village have gone missing in the area while hunting. However, we have been so blessed to have found them after talking with our ancestors and offering them gifts to appease them.

Sepe: Can you tell me a little bit about the cattle ranch which was established there?

Chief Nao Nao: Yes I think the farm was established in 1970 or 1972. It was managed by an Australian, Mr. Gillard, who owned it for a while till Kenmore took over and started farming sorghum as a food source for its cattle to consume.

Sepe: Chief Nao Nao do you have anything else you want to mention that might be regarded as confidential and not known.

Chief Nao Nao: Yes I would only like to stress one very important thing to you. Please if you start disturbing the soil there and if you come across any human remains please call us and let us know as those are our ancestors and we would like them to be treated with respect and be buried properly. Also we would like to pay our respects to them culturally by way of ritual spirit repatriation.

Sepe: Chief Nao Nao, as you mentioned how you would like to pay your respects to your ancestors that is also what the law requires. When we (archaeologists) come across human remains we stop immediately and report directly to the L&CA Officers, then NMAG and finally the landowners, or custodians of the area with respect to their cultural beliefs. From there the chiefs and elders will discuss and proceed with a set of actions to follow.

We do consider and respect all cultural rituals and traditions of this nation.

I thank you once again for your time Chief Nao Nao.

Appendix D laydown study zone, Grid 1 (5 m x 5 m) Data Log

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
A1	<5cm	x lip		3035-3036
A1	<5cm	x		3035-3036
A1	<5cm	x lip		3035-3036
A1	<5cm	x		3035-3036
A1	<5cm		chert	3035-3036
A1	<5cm	x		3035-3036
A1	<5cm	x lip		3035-3036
A1	<5cm	x		3035-3036
A1	<5cm		chert	3035-3036
A1	<5cm	x lip		3035-3036
A1	5cm	x		3035-3036
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x		3037-3039
A2	<5cm	x	chert	3037-3039
A2	<5cm	x		3037-3039
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A3	<5cm	x		3040-3043
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x rim		3044-3055

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
A4	<5cm	x		3044-3055
A4	<5cm		x	3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A4	<5cm	x		3044-3055
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm		chert	3056-3058
A5	<5cm		chert	3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm		chert	3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm		chert	3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058
A5	<5cm		chert	3056-3058
A5	<5cm	x		3056-3058
A5	<5cm	x		3056-3058

[illegible]

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm	x		3129 - 3132
B3	<5cm		chert	3129 - 3132
B3	6cm	x		3129 - 3132
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm		chert	3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm		chert	3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B4	<5cm	x		3147 - 3150
B5	<5cm	x		3151 - 3154
B5	<5cm		chert	3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm		chert	3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm		chert	3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm	x		3151 - 3154
B5	<5cm		chert	3151 - 3154
B5	<5cm	x		3151 - 3154
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm		chert	3159 - 3161
C1	<5cm	x		3159 - 3161

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm		chert	3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm		chert	3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm		chert	3159 - 3161
C1	<5cm		chert	3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm		chert	3159 - 3161
C1	<5cm	x		3159 - 3161
C1	<5cm	x		3159 - 3161
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm	x		3163 - 3165
C2	<5cm		chert	3163 - 3165
C3	5cm x 7cm		basalt diorite flake	3167 - 3170
C3	<5cm	x		3167 - 3170

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm		x	3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm		x	3167 - 3170
C3	4cm x 4.5cm		basalt flake	3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm		chert flake	3167 - 3170
C3	<5cm	x		3167 - 3170
C3	<5cm	x		3167 - 3170
C4	<5cm	x		3173 - 3175
C4	<5cm	x	chert	3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x	chert	3173 - 3175
C4	<5cm	x	chert	3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x	x	3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x	x	3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x	x	3173 - 3175
C4	<5cm		chert	3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C4	<5cm	x		3173 - 3175
C5	5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C5	<5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		x	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		x	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		x	3176 - 3179
C5	<5cm		x	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm		chert	3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
C5	<5cm	x		3176 - 3179
D1	<5cm	x		3181 - 3184
D1	<5cm		x	3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm		x	3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D1	<5cm	x		3181 - 3184
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		x	3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		chert	3186 - 3189
D2	>5cm	x		3186 - 3189
D2	>5cm	x		3186 - 3189
D2	>5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		chert	3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		chert	3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		chert	3186 - 3189
D2	<5cm		chert	3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm	x		3186 - 3189

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
D2	<5cm		chert	3186 - 3189
D2	<5cm		chert	3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		x	3186 - 3189
D2	<5cm	x		3186 - 3189
D2	<5cm		x	3186 - 3189
D2	<5cm	x		3186 - 3189
D3	>5cm	x		3191 - 3193
D3	<5cm		x	3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm		x	3191 - 3193
D3	<5cm		x	3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D3	<5cm	x		3191 - 3193
D4	>5cm	x		3194 - 3197
D4	<5cm		chert	3194 - 3197
D4	<5cm		x	3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm		x	3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm		chert	3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
D4	>5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	<5cm	x		3194 - 3197
D4	>5cm	x		3194 - 3197
D4	<5cm		chert	3194 - 3197
D4	>5cm	x		3194 - 3197
D4	>5cm	x		3194 - 3197
D4	>5cm	x		3194 - 3197
D5	>5cm	x		3199 -3201
D5	>5cm	x		3199 -3201
D5	>5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm		chert	3199 -3201
D5	<5cm	x		3199 -3201
D5	>5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm		chert	3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm		chert	3199 -3201
D5	<5cm		chert	3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	>5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm		chert	3199 -3201
D5	<5cm	x		3199 -3201

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
D5	<5cm		x	3199 -3201
D5	<5cm	x		3199 -3201
D5	<5cm		x	3199 -3201
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	>5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm		chert	3203 - 3205
E1	<5cm		chert	3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm		chert	3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	>5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm		chert	3203 - 3205
E1	<5cm	x		3203 - 3205
E1	<5cm	x		3203 - 3205
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm		chert core	3206-3209
E2	<5cm		chert core	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E2	<5cm	x		3206-3209
E2	<5cm	x		3206-3209
E2	<5cm		chert	3206-3209
E3	<5cm	x		3210-3212
E3	>5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
E3	<5cm	x	chert	3210-3212
E3	<5cm		x	3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	<5cm	x		3210-3212
E3	>5cm	x		3210-3212
E3	>5cm	x		3210-3212
E3	<5cm		x	3210-3212
E3	>5cm	x		3210-3212
E3	>5cm		x	3210-3212
E3	>5cm	x		3210-3212
E3	>5cm	x		3210-3212
E3	>5cm	x		3210-3212
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm		x	3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	>5cm		core	3213-3216
E4	<5cm	x		3213-3216
E4	>5cm	x		3213-3216
E4	<5cm	x		3213-3216
E4	<5cm	x		3213-3216
E4	<5cm	x		3213-3216
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	>5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm		x	3217-3218
E5	<5cm	x		3217-3218
E5	<5cm		x	3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	>5cm	x		3217-3218
E5	<5cm		x	3217-3218

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm			3217-3218
E5	<5cm		x	3217-3218
E5	<5cm	x		3217-3218
E5	<5cm		x	3217-3218
E5	<5cm		x	3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218
E5	<5cm	x		3217-3218

Appendix E laydown study zone, Grid 2 (3 m x 3 m) Data

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
A1	<5cm	x		3241-3243
A1	<5cm		chert	3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	>5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm		chert	3241-3243
A1	<5cm	x		3241-3243
A1	4cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm		chert	3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm		x	3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x	chert core	3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	>5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm		basalt flake	3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243
A1	<5cm	x		3241-3243

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
A1	<5cm	x		3241-3243
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm		chert	3245-3247
A2	<5cm	x		3245-3247
A2	<5cm		chert	3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x	chert	3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm		chert core	3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	4.5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	<5cm		chert	3245-3247
A2	>5cm		chert	3245-3247
A2	>5cm		chert	3245-3247
A2	>5cm		chert	3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm		chert	3245-3247
A2	>5cm		chert	3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
A2	>5cm	x		3245-3247
A2	<5cm	x		3245-3247
A2	>5cm	x		3245-3247
A2	<5cm		chert	3245-3247
A2	>5cm	x		3245-3247
A2	>5cm	x		3245-3247
A3	<5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm		chert core	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x	chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
A3	>5cm	x		3248-3251
A3	<5cm	x		3248-3251
A3	>5cm		core	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	<5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm	x		3248-3251
A3	<5cm		chert	3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm	x		3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm		chert	3248-3251
A3	>5cm		chert	3248-3251
B1	<5cm		chert	3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm		chert core	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
B1	>5cm		core	3252-3255
B1	>5cm		chert	3252-3255
B1	<5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm	x		3252-3255
B1	>5cm		chert	3252-3255
B2	<5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm		chert core	3256-3258
B2	>5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm		chert flake	3256-3258

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
B2	>5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm		chert flake	3256-3258
B2	>5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm		chert flake	3256-3258
B2	>5cm		basalt flake	3256-3258
B2	>5cm	x		3256-3258
B2	<5cm		chert flake	3256-3258
B2	>5cm		basalt core	3256-3258
B2	<5cm	x		3256-3258
B2	>5cm	x		3256-3258
B2	>5cm	x		3256-3258
B3	<5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	<5cm	x		3260-3262
B3	>5cm		chert	3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	<5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	<5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
B3	>5cm	x		3260-3262
C1	<5cm	x		3263-3268

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C1	>5cm		chert	3263-3268
C1	>5cm		chert	3263-3268
C1	4.5cm	x		3263-3268
C1	<5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		x	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		x	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		x	3263-3268
C1	>5cm		core	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	<5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm			3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		x	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert core	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	<5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	<5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm		chert	3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C1	>5cm	x		3263-3268
C2	>5cm		x	3269-3271

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm		x	3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	<5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		chert	3269-3271
C2	>5cm		chert	3269-3271
C2	>5cm		chert	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	<5cm		x	3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm	x		3269-3271
C2	>5cm		x	3269-3271
C2	>5cm		x	3269-3271
C2	>5cm		x	3269-3271

Grid Code	Diameter (cm)	Pottery Fragments	Stone	Pictures
C3	>5cm		x	3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm		x	3272-3275
C3	>5cm		core	3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm		x	3272-3275
C3	>5cm		x	3272-3275
C3	>5cm		core	3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	<5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm		chert	3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	<5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275
C3	<5cm		x	3272-3275
C3	>5cm	x		3272-3275
C3	>5cm	x		3272-3275

