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REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE
SECRETARIA DE ESTADO DOS RECURSOS NATURAIS

Tasi Mane Project – Suai Supply Base Environmental Impact Assessment

EXECUTIVE SUMMARY



ENVIRONMENTAL IMPACT ASSESSMENT TASI MANE PROJECT – SUAI SUPPLY BASE

EXECUTIVE SUMMARY

Introduction

The Government of the Democratic Republic of Timor-Leste (GoTL), through the Secretaria de Estado dos Recursos Naturais (SERN) is proposing to build, own and operate a maritime supply base near the town of Suai on the south coast of Timor-Leste to service the offshore petroleum sector.

Located in the Cova Lima District (see Figure ES-1) approximately 138 km south-west of Dili and 22 km east of the Indonesian border, the Suai Supply Base will be a phased development that will provide the following services and facilities:

- A Supply Base (including land-based facilities and harbor infrastructure).
- A new town; Nova Suai.
- An upgraded airstrip.
- Two crocodile reserves.

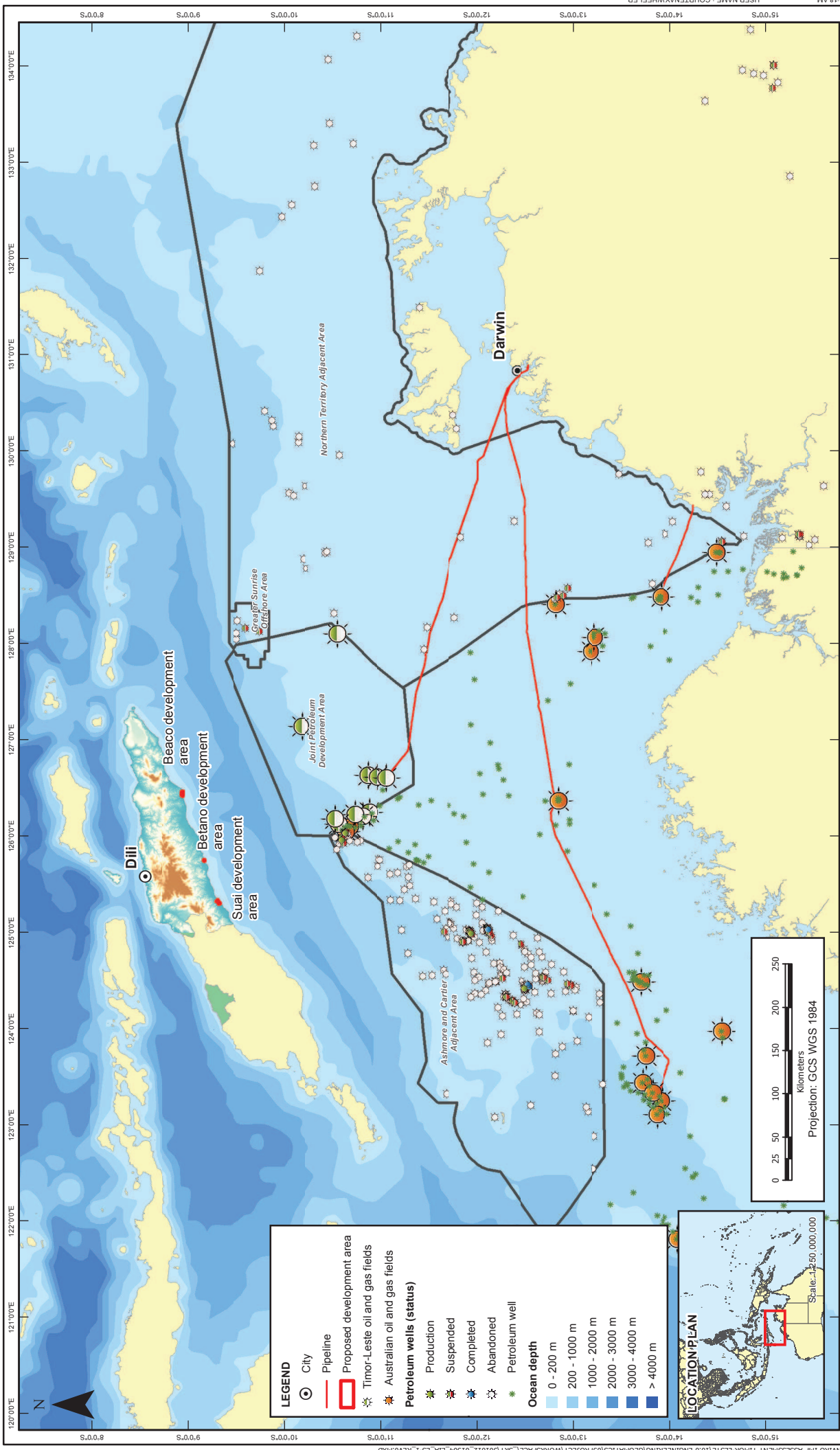
The project originates from the GoTL's vision for the development of the national infrastructure system outlined in the Strategic Development Plan (SDP) 2011-2030. A central component of the SDP is the Tasi Mane Project; comprising three petroleum-related sites on the south coast of Timor-Leste. This project is of critical importance to Timor-Leste as it underpins the nation's projected revenue base (mainly as taxes and royalties), a potentially multi-billion dollar source of capital investment, foreign currency earnings and job creation. The project will, in many respects, be a flagship project for Timor-Leste due to its importance to the economic development of the country. It will also be the first example for both government and community of the benefits and costs associated with large-scale industrial development.

The three sites that comprise the Tasi Mane Project are:

- Suai Supply Base.
- Betano Petroleum Refinery and Petrochemical Complex.
- Beaco LNG Plant.

This document relates to the planned development of the Suai Supply Base. The supply base will service the offshore exploration and development of petroleum in the Timor Sea and is otherwise unrelated to the development at Betano or Beaco although, it may play a role as a port during the construction of those developments.

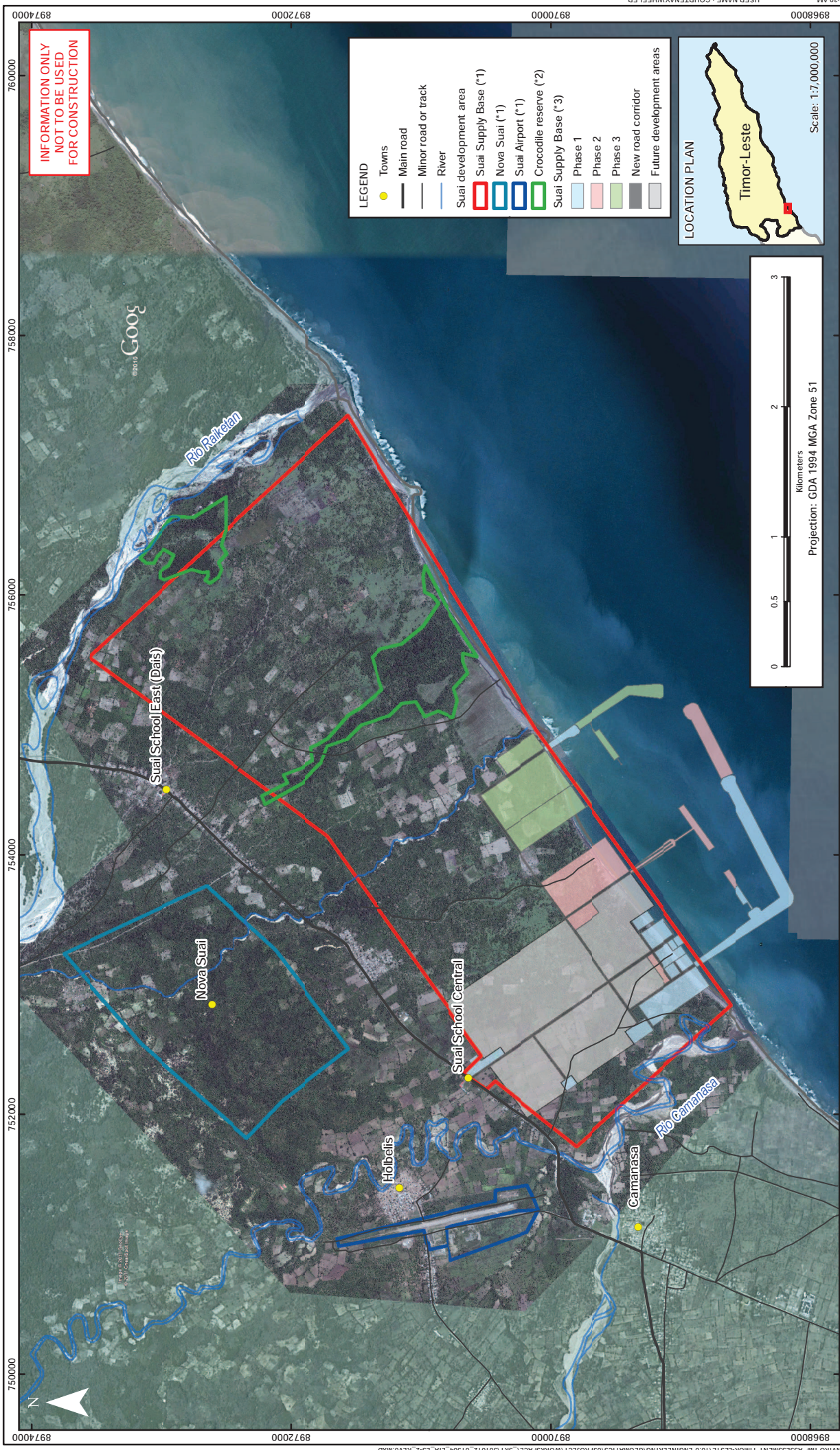
The indicative layout of the Suai Supply Base facilities is shown in Figure ES-2. The supply base will be built in three phases commencing in 2012 with the third and final phase completed in 2030. SERN has advised that the capital cost during the construction phase is expected to be in the order of US\$350 million, depending on local market conditions at the time of procurement. An estimated US\$4.5 million will be spent annually from the operating budget (EastLog, 2011).



<p>NOTES:</p> <p>This map consists of:</p> <ol style="list-style-type: none"> 1. DEM: SRTM (2011) 2. Petroleum wells: Department of Mines and Petroleum, Western Australia 		<p>0</p> <p>REV</p>	<p>9/05/2012</p> <p>DATE</p>	<p>FINAL FOR ISSUE</p> <p>REVISION DESCRIPTION</p>	<p>MW</p> <p>CW</p> <p>CS</p> <p>GH</p>	<p>DRN</p> <p>CHK</p> <p>DES</p> <p>ENG</p> <p>APPD</p> <p>CUST</p>	<p>A4 SHEET</p> <p>SCALE 1:6,000,000</p> <p>PROJECT No: 301012-001504</p>	<p>TASI MANE PROJECT - SUAI SUPPLY BASE ENVIRONMENTAL IMPACT ASSESSMENT</p> <p>Figure ES-1 Petroleum developments in the Timor Sea</p>
<p>WorleyParsons resources & energy</p>		<p>TIMOR GAP, E.P. TIMOR GAS & PETROLEUM</p>		<p>REPUBLICA DEMOCRATICA DE TIMOR-LESTE SECRETARIA DE ESTADO DOS RECURSOS NATURAIS</p>		<p>oneWay to zero harm Copyright © WorleyParsons Services Pty Ltd</p>		

LOCATION: I:\PROJECTS\301012-0154 ENVRO IMP ASSESSMENT\TIMOR-LESTE\10.0 ENGINEERING\GEMAT\309\PROJECT\WORKSPACE\SKT\301012_0154_EIA_ES-1_REV0.MXD

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<p>NOTES:</p> <p>This map consists of:</p> <ol style="list-style-type: none"> 1. Imagery: DigitalGlobe (2008-2011) 2. Imagery: Google Earth (2010) 3. Rivers: Geographic Information Group TimorLeste (2010) 4. Roads: DivaGIS (2010) <p>*1 SERN, Dec. 2011 *2 SERN, Jan. 2012 *3 Eastlog SERN, May 2011</p>		<p>0</p> <p>REV</p> <p>DATE</p> <p>9/05/2012</p>		<p>FINAL FOR ISSUE</p> <p>REVISION DESCRIPTION</p> <p>TIMOR GAP, E.P. TIMOR GAS & PETRÓLEO</p>		<p>MW</p> <p>CW</p> <p>CHK</p> <p>DRN</p> <p>DES</p> <p>ENG</p> <p>APPD</p> <p>CUST</p>		<p>A4 SHEET</p> <p>SCALE 1:40,000</p> <p>PROJECT No: 301.012-001.504</p>		<p>TASI MANE PROJECT - SUAI SUPPLY BASE ENVIRONMENTAL IMPACT ASSESSMENT</p> <p>Figure ES-2 Suai development area</p>	
<p>0</p> <p>0.5</p> <p>1</p> <p>2</p> <p>3</p> <p>Kilometers</p> <p>Projection: GDA 1994 MGA Zone 51</p>		<p>750000</p> <p>752000</p> <p>754000</p> <p>756000</p> <p>758000</p> <p>760000</p>		<p>8968000</p> <p>8970000</p> <p>8972000</p> <p>8974000</p> <p>8976000</p> <p>8978000</p> <p>8980000</p>		<p>8968000</p> <p>8970000</p> <p>8972000</p> <p>8974000</p> <p>8976000</p> <p>8978000</p> <p>8980000</p>		<p>Scale: 1:7,000,000</p> <p>Timor-Leste</p> <p>LOCATION PLAN</p>		<p>LEGEND</p> <ul style="list-style-type: none"> Towns Main road Minor road or track River Suai development area Suai Supply Base (*1) Nova Suai (*1) Suai Airport (*1) Crocodile reserve (*2) Suai Supply Base (*3) Phase 1 Phase 2 Phase 3 New road corridor Future development areas 	



ENVIRONMENTAL IMPACT ASSESSMENT TASI MANE PROJECT – SUAI SUPPLY BASE

The Role of Government

The proponent for the project is the Secretaria de Estados dos Recursos Naturais (Secretary of State for Natural Resources, SERN), a department of the GoTL and the principal law governing the development of the project is Environmental Decree Law No.5/2011. Under Part V, Annex 1, Category A of that law, a series of defined projects require an environmental impact assessment. The trigger for Category A for the Suai Supply Base is that the port and port facilities are of a scale ≥ 500 gross tons.

In addition to an environmental licence, a port licence needs to be granted under Decree Law 3/2003 prior to the commencement of construction.

Project Description

The key feature of the proposed Suai Supply Base is the development of a new, all-weather port with a number of related service facilities. Other non-petroleum industries, such as commercial fisheries, expected to be attracted to the area by the port itself, are also anticipated. The port will be developed in three stages through to the year 2030 and, at that time, will occupy approximately 650 ha.

Overall, the new facilities will comprise the following:

- Suai Supply Base

The Supply Base facilities at Suai will be situated on the coast near the village of Samfuk (in the sub-district of Suai Vila). There will be a new breakwater and jetty with four multi-purpose berths capable of handling ships and barges up to 10,000 DWT with an overall capacity of approximately 2.0 mtpa of dry bulk cargo.

- An industrial estate

As part of future development at the Suai Supply Base, an industrial estate will be developed adjacent (north-east) of the Suai Supply Base.

- Nova Suai

A new town, Nova Suai, will be located on 188 ha of land between the existing villages of Holbelis and Dais. The town is expected to house up to 6,500 staff, contractors and their families.

- Suai Airport upgrade

The existing Suai Airport, located in Holbelis, is classified as a district airport and will be upgraded to cater for expanded passenger and freight services. The main new features will be a 2 km long runway and, a new terminal building and fire station.

- Crocodile reserves

Two crocodile reserves are proposed within the existing crocodile habitat areas located at We Dare, near the centre of the Suai Supply Base development area, and at We Matan Bua Oan, inside the north-east boundary of the Supply Base development area adjacent to the Rio



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Raiketan. Development of the two reserves will focus on the protection of the existing natural environment regarded as sacred by many locals.

Stakeholder Consultation

Stakeholder consultation with the affected communities in the project area has been underway since 2010 and is a crucial component of work on the project to ensure that the proposed works are understood and any concerns addressed. The EIA process has a formal requirement for stakeholder consultation and, separate from this, there is also a need for more focused and direct consultation with those whose farms or residences need to make way for the new project facilities.

The stakeholder consultation for the Suai Supply Base has been led by SERN and has largely been aimed at informing the community about the nature and location of the planned development. The involvement of senior members of the GoTL, including the Prime Minister, in stakeholder consultation undertaken to date provides an indication of the importance placed on the project by the government.

Feedback from the consultation program with potentially affected communities reflects some community support for the project, particularly the potential for jobs for local residents. However, there is predictable concern about the need for appropriate compensation for those displaced and pressures associated with the likely influx of people seeking work. Some have also expressed concern about the lack of information available to the local community.

Stakeholder consultation will continue through the course of the project construction and operation and will underpin the overall success of the project.

Existing Environment

Land Use

The project area comprises a mosaic of rural subsistence farms serviced by a small network of roads and tracks. Where they occur, villages and towns are clustered around the inter-regional roads while scattered housing is prevalent throughout the project area. A variety of animals (chickens, pigs, cattle and goats) and food crops (maize, rice, cassava, coconuts and bananas) are raised. Trees such as teak, rosewood and sandalwood are also farmed and artisanal fishing is common.

Topography, Geology and Soils

The topography of the project area slopes southwards towards the Timor Sea and merges with a wide, flat, coastal plain on which most project-related facilities are located. Nova Suai is the exception and is located on the slopes. The coastal plain is bounded to the north by the Rio Raiketan and to the south by Rio Camanasa. There are swamps, two of which coincide with the proposed crocodile reserves.

Geologically, the project area is situated on unconsolidated sediments ranging from fine silts to conglomerates and, apart from Nova Suai, the project area has very little consolidated rock at surface.



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Some potentially unstable or chemically aggressive soil types have been recorded in the project area including expansive clays and, closer to the sea, acid sulfate soil and compressible soils. Erosion and waterlogging are risks during construction. The risk of earthquakes and tsunamis in the region is ever present.

Existing soil contamination from poorly decommissioned oil bores is evident in the area although, it is expected that with the application of appropriate chemical storage and soil management methods, the risk of contamination arising from project activities can be managed without difficulty.

Climate and Meteorology

The project area has a typical tropical monsoonal climate with distinct wet and dry seasons. Seasonal variation in temperature is minimal, with the diurnal temperature variation often greater than the seasonal variation. Daytime temperatures are typically in the low to mid 30's and night-time temperatures are in the mid 20's. Humidity is consistently high, frequently greater than 90% for significant proportions of the day. Long-term, multi-year rainfall trends are generally dictated by El Niño / La Niña effects; however, shorter-term annual rainfall patterns are monsoonal in nature experiencing a 7 to 9 month wet season with two peak months; December and May (CSIRO, 2010).

Tropical cyclones are a feature of weather patterns of Timor-Leste and since 1906, 12 cyclones have passed within 200 km of Suai, with 3 of these travelling within 100 km.

Air Quality

The existing air quality in the project area has been sampled and, in the absence of Timor-Leste standards, has been compared against World Health Organisation, US EPA or Australia's National Environment Protection Council (Ambient Air Quality) standards. The assessment shows that most existing sources of air pollutants (dust particles as PM_{2.5} and PM₁₀ and gases such as nitrogen dioxide, sulfur dioxide and carbon monoxide) originate mainly from human activities such as dust from roads, vehicle exhausts, power generation exhausts, smoke from cooking stoves and the burning of vegetation. Current air quality indicators are, with the exception of Freon 12 (a refrigerant gas), all below the limit of reporting or the assessment criteria set in the standards.

During construction, the exposure of large areas of soil accompanied by vehicular traffic will cause localised increases in airborne dust particles. During operations, dust emissions will diminish and the emission of pollutant gases arising from fixed or mobile plant and equipment (power generation and vehicles) will take on a greater significance.

Based on experience with port operations and construction sites in similar environments in Southeast Asia, it is believed that, with the application of appropriate dust mitigation and management measures, continued compliance with these air quality standards should be readily achievable during both construction and operation of the Suai Supply Base.



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Noise

The main existing sources of anthropogenic (i.e., caused by human activity) noise in the project area are motor vehicles and power tools while animals such as chickens and dogs also contribute to the current noise environment. Project-specific noise limits have been developed based on the Western Australian Environmental Protection (Noise) Regulations 1997. These limits recognise the need to have varying permissible noise levels depending on the time of day (e.g., to protect sleeping patterns) and the sensitivity of the affected premises (residence, commercial premises or industrial site).

The recommended noise limits are based on the existing noise levels in the area and, for noise sensitive premises such as a dwelling, range from 55 to 62 dB(A) during daylight hours to 45 to 52 dB(A) during the night period from 2200 hrs. Commercial premises (75 dB(A)) and industrial premises (80 dB(A)) have higher limits at all times due to their lower sensitivity.

Hydrology, Drainage and Water Quality

The mean annual rainfall across Timor-Leste varies between 500 mm to 3,000 mm.

The two largest watercourses in the project area, Rio Raiketan and Rio Camanasa, have catchment areas of approximately 110 km² and 75 km². Both streams discharge into the Timor Sea and have braided channels, which is characteristic of steep watercourses that have high energy and high sediment loads. Significantly for the Supply Base area, there is evidence of relict channels that indicate that the river path has wandered over time. The flow patterns of these rivers are highly variable between wet and dry seasons and, as a result, water quality varies widely due to the changing sediment loading and the effect of dilution.

The shore base site is within the Mola and Tafara Hydrologic Unit where the dominant consumer of water was crop irrigation which is well below average flows. Mean annual streamflows for the Rio Raiketan and Rio Camanasa are 99,000 ML and 58,410 ML respectively while respective annual irrigation demands are 7,000 ML and 4,760 ML.

Groundwater

In the project area, at a regional scale, groundwater recharge occurs in the Ramelau mountain range to the north and generally flows southwards towards the Timor Sea where it discharges through the unconsolidated sediments of the Suai and Dilor formations.

Groundwater is the principal source of drinking water in Timor-Leste and natural groundwater springs are the dominant sources of water supply in rural areas, supplying potable water to approximately 60% of the population (ADB, 2001). Shallow wells are used extensively in villages and rural areas, especially those such as Suai, near the sea or on river plains.

The World Health Organization (WHO) drinking water guidelines have been used as a benchmark to assess the current state of groundwater quality. Groundwater samples were analyzed for TDS, salinity and turbidity. TDS values ranged from 6 to 7,935 mg/L, with two water samples above the WHO drinking water guideline criteria of 1,000 mg/L. Salinity values ranged from 0.04 to 19%. There is currently no WHO drinking water guideline for salinity. Turbidity values ranged from 0.9 to



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384 nephelometric turbidity units (NTU); with a majority of the samples reporting values above the WHO drinking water guideline criteria of 5 NTU.

The potential contamination of groundwater during the disposal of process water could affect residents that consume groundwater for drinking water purposes or as a potable water supply for agricultural purposes and will need to be managed carefully.

Marine Ecology

Water Quality

Currently, sediment plumes arising from the entrainment of soil during heavy rains is the primary source of variations in marine water and sediment quality otherwise, marine water quality conditions at Suai are generally considered typical of a tropical marine ecosystem at the start of the wet season (Kirono, 2010). Turbidity recorded at nearshore and offshore sites displayed large variability; between 0.6 NTU and 47.4 NTU (onshore) and between 3.1 NTU to 20.0 NTU (offshore).

Turbidity levels offshore were found to increase with depth, increasing from around 4 NTU near the surface to 12 NTU near the seabed. Turbidity values were generally less than the ANZECC/ARMCANZ (2000) guideline of 1 to 20 NTU. Concentrations of nutrients were generally below the laboratories limit of reporting (LOR) for all nearshore and offshore sites, with the exception of ammonia and total nitrogen which are believed to be affected by the use of nitrogenous fertilisers and potentially, the drainage of sewage.

Sediments within the project area are generally uncontaminated, with the levels of cadmium, chromium, copper, lead, zinc and mercury all well below ANZECC trigger values for sediment quality (ANZECC/ARMCANZ (2000)).

Benthic Habitat

The benthic habitat within the project area is dominated by sediment and a natural high flux of fluvial sediments occurs. Hard substratum made up approximately 13% of the surveyed transects. The only hard substrate found in the project area was weathered coastal limestone.

Within the project area, the biotic benthic community was dominated by turfing brown algae. The turf algae was primarily associated with areas of hard substrate and generally had <25% coverage. The only coral reef known locally is located out of the project area to the south west.

The proposed development of the breakwater and the introduction of commercial shipping will cause the greatest changes in the local water quality, benthic environment and its use by artisanal fishers.

No impacts from mobilised contaminants or the saline plume from the planned reverse osmosis plant are expected whereas construction of the breakwater and any dredging that may occur will unavoidably disturb and alter habitats within the area of the breakwater. Temporary resuspension of sediments will occur during construction; however, this will diminish once it ends. Antifoulant contamination, the risk of invasive marine species and the need (for safety reasons) to exclude small boats from the shipping channels and harbour remain residual risks that will need to be managed through further environmental management planning.



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Land Transport

The current degraded condition of the existing road network in the project area reflects the heavy rainfall, challenging soil conditions and low maintenance budgets. Within the project area, the major means of transport are buses, trucks, motorcycles and horses. Pedestrian traffic on roadsides and informal tracks is also widespread while cars are relatively uncommon.

Traffic counts during the study period show that a large number of vehicle movements are localised, between residential properties and local areas of activity such as the market, schools and other community facilities. Slightly longer distance trips were also recorded between local town centres (e.g., between Suai and Beaco).

When construction commences, there will be a large and rapid increase in the use of local roads notably between Nova Suai and the port area. It is estimated that approximately 50% of the residents of Nova Suai will be workers and 90% of them will travel to the port and industrial areas by bus.

During construction there will also be additional heavy vehicle traffic bringing in construction equipment (cranes, bulldozers, graders, excavators and piling rigs) and materials such as rock for the breakwater. Traffic management of these large vehicles will require care to ensure that the safety of existing road users along the relatively densely populated roadsides is maintained. This will need to include new road diversions with enhanced pavement and drainage controls, public education processes, new signage and, in places, new pedestrian paths.

Assuming that these mitigation measures are implemented, the residual impact of changes to the land transport conditions will range from negligible to minor.

Terrestrial Flora and Fauna

Terrestrial flora and fauna in the project area has been considered from the perspective of both its commercial and conservation significance due to the economic importance of some flora species to the local community and in recognition of Timor-Leste's commitment to protecting the natural environment.

As noted earlier, the project area is a patchwork of farmland and native vegetation. Patches of native vegetation are generally less than 20 ha and commonly used as foraging areas for stock and for gathering firewood.

There are three main types of vegetation communities in the project area:

- Coastal vegetation that includes the *Pes-caprae* formation that occurs along sandy foreshores where sand is actively deposited or eroded, and is typical near lagoons and in areas of low nutrients and high salt (Monk *et al.* 1997). The area is dominated by *Borassus flabellifer* and *Corypha utan* palms and introduced timber trees along with some thickets of *Acacia/Vachellia* spp. Also present were introduced crop trees such as candlenut and tamarind, teak, and weed tree species such as coffee bush.
- Riparian vegetation includes *Bambusa vulgaris* (bamboo), occasional ai-na, ai-baganasa and infestations of Siam weed (*Chromolaena odorata*). Riparian vegetation is predominantly deciduous during the dry season.



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- Mangroves occur on beaches, at brackish inlets and at lagoons. The dominant mangrove present was ai-tano which prefers beaches while the second dominant is Ai-biku is found in sand and mud. Mangroves are of conservation significance.

The IUCN Red List of Threatened Species does not list any Critically Endangered, Endangered or Vulnerable plant species specifically for the region of Timor-Leste (IUCN, 2011). However, there are previous records of three Vulnerable species from the east coast of Timor-Leste; *Intsia bijuga*, Ai-na (*Pterocarpus indicus*) and sandalwood (*Santalum album*) (Cowie, 2006, 2007). Two of these were recorded in the Suai development area during the field surveys, Ai-na and sandalwood.

Eleven species of economic importance occur in the project area. They are: coconut, cashew, banana, breadfruit, mango, candlenut, cinnamon, teak, gmelina, cassod, sandalwood, rosewood and mangrove trumpet tree. Nine major weed species were identified, the most widespread is Siam weed (*Chromolaena odorata*), a highly invasive species, estimated to cover more land than any other species in Timor-Leste.

The IUCN Red List has been used as a benchmark to establish the conservation significance of fauna species during the study. Five species on the Red List were recorded in the project area: beach thick-knee (Near Threatened), slaty cuckoo dove (Near Threatened), yellow-crested cockatoo (Critically Endangered), Timor (white-bellied) bushchat (Near Threatened), Canut's horseshoe bat (Vulnerable).

The greatest threat to these and other native plant and animal species arising from this project is the clearance of native vegetation. The avoidance of native vegetation by any project-related activities will help to preserve all species regardless of their conservation significance; however, this will need to be balanced against the need for farmland, particularly to cater for those displaced by the new facilities and those new to the area seeking work.

Socio-economic

Cova Lima is located in the western part of Timor-Leste and borders Indonesia to the west. It has a population of 59,455 inhabitants (Census 2010) and an area of 1,226 km². Camanasa is situated the closest to the development areas and consequently stands to be most directly affected by the Suai Supply Base development. Belecasac, Matai and Labarai are located within 500 m of the Suai development sites. The total number of households across all villages is 2,515 with an average household size of 5.5 people.

According to the 2010 Census, the vast majority of households in the project area are subsistence farmers although this varies from as little as 18% (Labarai) to 85% in Suai Loro and Matai.

Wood is the most commonly used energy source for cooking with an average of 96% of households using wood across the five villages. Fishing is important as a food source and a source of cash income.

Literacy rates in the 15 to 24 year old group ranged between 78 and 92% in the five villages.

Common perceptions of the project expressed in all five villages in the Suai project area include:

- Development is good for Timor-Leste and the project will have a positive impact on the community.



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- It is recognised that outsiders will have to be employed to fill some of the skilled positions. However, local people need to receive priority during the recruitment process over people from other districts and foreigners, especially for positions where skills are available locally.
- ‘Outside’ employees can be housed in, or adjacent to, the villages as long as their numbers remain low. Large number of outside employees should be housed elsewhere.
- It is hoped that the project will provide a brighter future through job creation, in particular for the youth.
- The project will have a positive impact in terms of infrastructure development of the area.
- There is concern about physical and economic displacement. Compensation to be provided needs to be fair, properly negotiated with affected individuals, and payments made over a long period of time (monthly) to avoid ‘splurging’.

Economically, the local impacts include financial benefits of a scale unprecedented in the area. An estimated 40% of the engineering, procurement and construction contracts will also be awarded to local contractors for works and services to be performed in the construction of the breakwater and Supply Base facilities as well as for purchase of local supplies and materials (EastLog, 2011).

The key residual socio-economic impacts will be; job creation, economic opportunities, involuntary relocation, loss of farming land and commercial trees, and population influx.

Environmental Management Framework

Integral to the EIA process has been the identification of potentially adverse impacts on the existing environment and community, and specific measures to avoid, manage and mitigate those impacts. An environmental management framework has been developed for the project that will provide guidance to the future management of these issues during the construction and operation of the Supply Base. Nevertheless, preparation of specific management measures, in the form of an environmental and social policy, environmental management plans, work instructions and monitoring programs, can only be completed once the project design has been confirmed and more detailed assessments have been undertaken.

Implementation of the management framework will see a regular program of monitoring against defined standards, auditing to confirm compliance and opportunities for improvement and, reporting to GoTL regulators and community stakeholders.

For the Suai Supply Base, a program of monitoring is planned including: air quality and dust particulates, noise, water quality and biodiversity.