GLADSTONE NEW FUELS DEVELOPMENT PROJECT - STAGE 2A PROJECT DESCRIPTION TO SUPPORT DRAFT TERMS OF REFERENCE

OCTOBER 2014

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1 INTRODUCTION AND SHORT DESCRIPTION

This Project Description is for the purpose of informing the review of Draft Terms of Reference for an Environmental Impact Statement (EIS) to support an amendment of an existing environmental authority (EA). The existing EA relates to the oil shale mining and processing operation at the existing New Fuels Development Centre within the existing Mining Lease (ML) 80003.

The project is known as the Gladstone New Fuels Development Project – Stage 2A (the Project or GNFDP Stage 2A). The proponents and applicants are the holders of ML 80003, petroleum facility licence 8 and the corresponding existing EA (EPML00658213) for resource activities: Queensland Energy Resources (No.1) (Stuart) Pty Limited, Queensland Energy Resources (No.2) (Stuart) Pty Limited and Queensland Energy Resources (Aussun) Pty Limited (the holders). ML 80003 is located on the Stuart Oil Shale Deposit near Yarwun, approximately 15 kilometres (km) north-west of Gladstone, Queensland (Qld) (Figure 1).

The Project comprises:

- Construction of a commercial scale oil shale processing plant (also referred to as the QOS2A Plant) within the previously disturbed footprint within ML 80003 (Figures 2 and 3) and operation of this plant to produce diesel and other fuel products and valuable by-products, using the Paraho technology; and
- The extension of oil shale mining activities into areas beyond the approximate extent of area approved under the current EA (and at Commonwealth level, beyond the area previously finally assessed under the *Environment Protection (Impact of Proposals) Act, 1974*, within the boundaries of the existing ML 80003 (Figures 2 and 3).

The Project is proposed to occur over an operational period of approximately 20 years (with a construction period of approximately 3 years).

1.1 HISTORY AND BACKGROUND

The first effective exploration of the Stuart Resource commenced in 1977 and a succession of drilling programs over a number of years defined the deposit's quality and extent.

ML 80003 was granted in 1996 following the assessment of the *Environmental Impact Assessment Study of the Proposed Stuart Oil Shale Project* (Envirosciences Queensland Pty Limited, 1993) under the *Mineral Resources Act, 1989*. The parent company of the QER Group (which includes the current holders) acquired the companies that included the original proponents and changed their names.

An Environmental Management Overview Strategy (EMOS) for the Stuart Oil Shale Project was prepared and approved in 1996. In summary, the scope of the existing/approved project included:

(a) **The ML 80003 mine** – A conventional open pit mine of the Kerosene Creek Member of the Stuart Oil Shale Deposit, within the boundaries of what was then MLA 80003 (now ML 80003), in accordance with the approximate extent of existing/approved surface disturbance shown on Figure 2. The project description also provided for on-site infrastructure and for solid waste to be stored in a surface waste emplacement area and backfilled in the mining pit.

(b) **Processing** – The project description also included on-site processing of oil shale, comprising crushing and drying of the excavated feed, followed by retorting and refining.

(c) **Product transfer** – The scope covered product transfer to Fisherman's Wharf by pipeline and shipment from Fisherman's Wharf.

The original proponents commenced operation of Stage 1 in 1997. QER (on behalf of the holders) has continued mining in accordance with the existing/approved project scope, but dismantled the plant due to technical issues with the AOSTRA Taciuk Processor (ATP) retorting technology.

QER (on behalf of the holders) replaced the Stage 1 ATP plant with a Technology Demonstration Plant (TDP) using Paraho retorting technology. The Paraho retorting technology is significantly different from ATP retorting technology described in the existing/approved project description. The TDP was constructed on an area of disturbed land within ML 80003, and operates under PFL 8 and EA (EPML00658213).

The Qld Department of Environment and Heritage Protection (DEHP) (2013) subsequently conducted an environmental review and recognised the Paraho process and associated TDP as incorporating "*best practice pollution control technology*".

FIGURE 1: REGIONAL LOCATION

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Yarwun Inset

PROPOSED PROJECT EXTENT

ML 80003

Location of map in QLD

GLADSTONE

QLD

BRISBANE

See Yarwun Inset

CURTIS ISLAND

GREAT BARRIER REEF MARINE PARK

THE NARROWS

GLADSTONE

BOYNE ISLAND

PORT CURTIS

CALLIOPE RIVER

BOYNE RIVER

Curtis Island Conservation Park

Curtis Island National Park

Curtis Island State Forest

Southend Conservation Park

Garden Island Conservation Park

Calliope Conservation Park

Mount Stowe State Forest

Mount Larcom State Forest

Targinnie State Forest

Beecher State Forest

Mount Maurice State Forest

Mount Larcom

APLNG Plant

QCLNG Plant

GLNG Plant

CLNG Plant

Gladstone LNG (Proposed)

Fisherman's Landing Northern Expansion

Port of Gladstone Dredging Project

Fisherman's Landing

Cement Australia Plant

Northern Oil Refinery

GPC Quarry

Transpacific Industries

Gladstone Stone Quarry

Rio Tinto Yarwun

Yarwun Coal Terminal (Proposed)

Wiggins Island Coal Export Terminal

Yarwun Ammonium Nitrate Plant

Gladstone Pacific Nickel (Proposed)

Landing Road

Gladstone - Mount Larcom Road

Port Curtis Way

Targinnie Road

Aurizon Railyard (Proposed)

Bechtel and QGC Laydown Areas

Earth Commodities Quarry

East End Limestone Mine

Bruce Highway

Dawson Highway

RG Tanna Coal Terminal

Clinton Wharf

Gladstone Marina

Barney Point Wharf

South Trees Wharf

Boyne Wharf

Gladstone Power Station

Queensland Alumina Refinery

Boyne Smelters Limited

Gladstone - Benaraby Road

0 5 10 15 20 km

Datum: GDA 94
Projection: MGA Z56

Railway lines

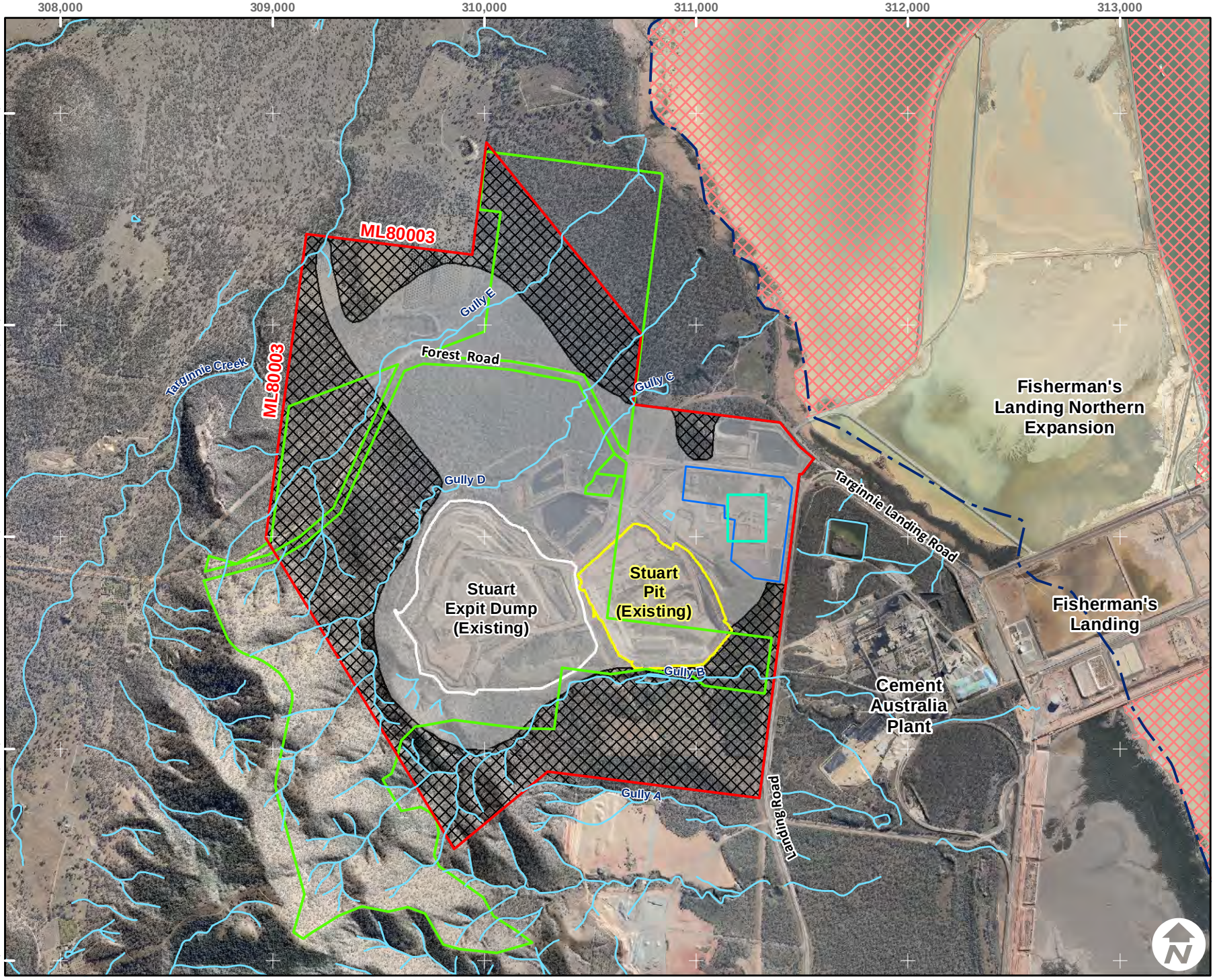
Major Roads
- Highway
- Main Road

Major Gas Pipelines
- Gas Main
- Export Pipeline
- ML 80003
- QOS2A Plant Extent
- Ammonium Nitrate Plant
- LNG Plant
- Alumina Refinery / Aluminium Smelter
- Cement Plant
- Power Plant

Port Of Gladstone

Protected Areas
- Conservation Park
- National Park
- Resource Reserve
- State Forest
- Great Barrier Reef Marine Park
- Great Barrier Reef World Heritage Area

DATA SOURCES
QER: Surveyed ML boundary, QOS2A Plant, Project Locations
QLD DEHP: Railways, Roads, Protected Areas, World Heritage Areas, Marine Parks
QLD DSDIP: Export Gas Pipelines (2014)
Geoscience Australia: Gas Pipelines (2011)
USGS: Landsat 8 Satellite Imagery
Gladstone Ports Corporation: Port of Gladstone Limits (2007) - adapted from PDF map.



Datum: GDA 1994
Projection: MGA Z56

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FIGURE 2:
EXISTING / APPROVED MINE AND ADDITIONAL DISTURBANCE FOOTPRINT

- Watercourses
- Conceptual TDP Footprint (EPBC2009/5604)
- QOS2A Plant Extent
- ML 80003
- Approximate Extent of Existing/Approved Surface Disturbance
- Maximum Extent of Additional Disturbance Footprint
- Targinnie State Forest Boundary
- Great Barrier Reef World Heritage Area
- Port of Gladstone

1.2 THE PROJECT

The Project involves the construction and operation of a commercial-scale processing plant within ML 80003 (Figure 2) ultimately to produce diesel and other liquid fuel products and valuable by-products (e.g. ammonium sulphate salts).

The plant would be based on the Paraho II™ technology which was successfully demonstrated at the site to meet all licence requirements verified by a DEHP audit in 2012.

The feed material for the QOS2A plant would continue to be oil shale from the Kerosene Creek Member of the Stuart Oil Shale Deposit within ML 80003.

Mining activities would continue within ML 80003. However, only mining areas beyond the approximate extent of the existing/approved surface disturbance would result in an additional disturbance footprint (Figure 2).

1.3 PROJECT LOCATION AND LAND TENURE

The location of the Project is shown on Figure 1.

The Project is located within the Gladstone Regional Council area. Relevant land ownership information, including for the land within ML 80003 and for the adjoining land, is provided on Figure 3.

1.4 THE APPLICANT, MINE TENEMENT AND OWNERSHIP

The operator currently appointed by the holders is QER.

The holders of ML 80003 are Queensland Energy Resources (Aussun) Pty Ltd (50%), Queensland Energy Resources (No.1) (Stuart) Pty Ltd (25%) and Queensland Energy Resources (No. 2) (Stuart) Pty Ltd (25%). The principal holder of the current EA is Queensland Energy Resources (Aussun) Pty Ltd.

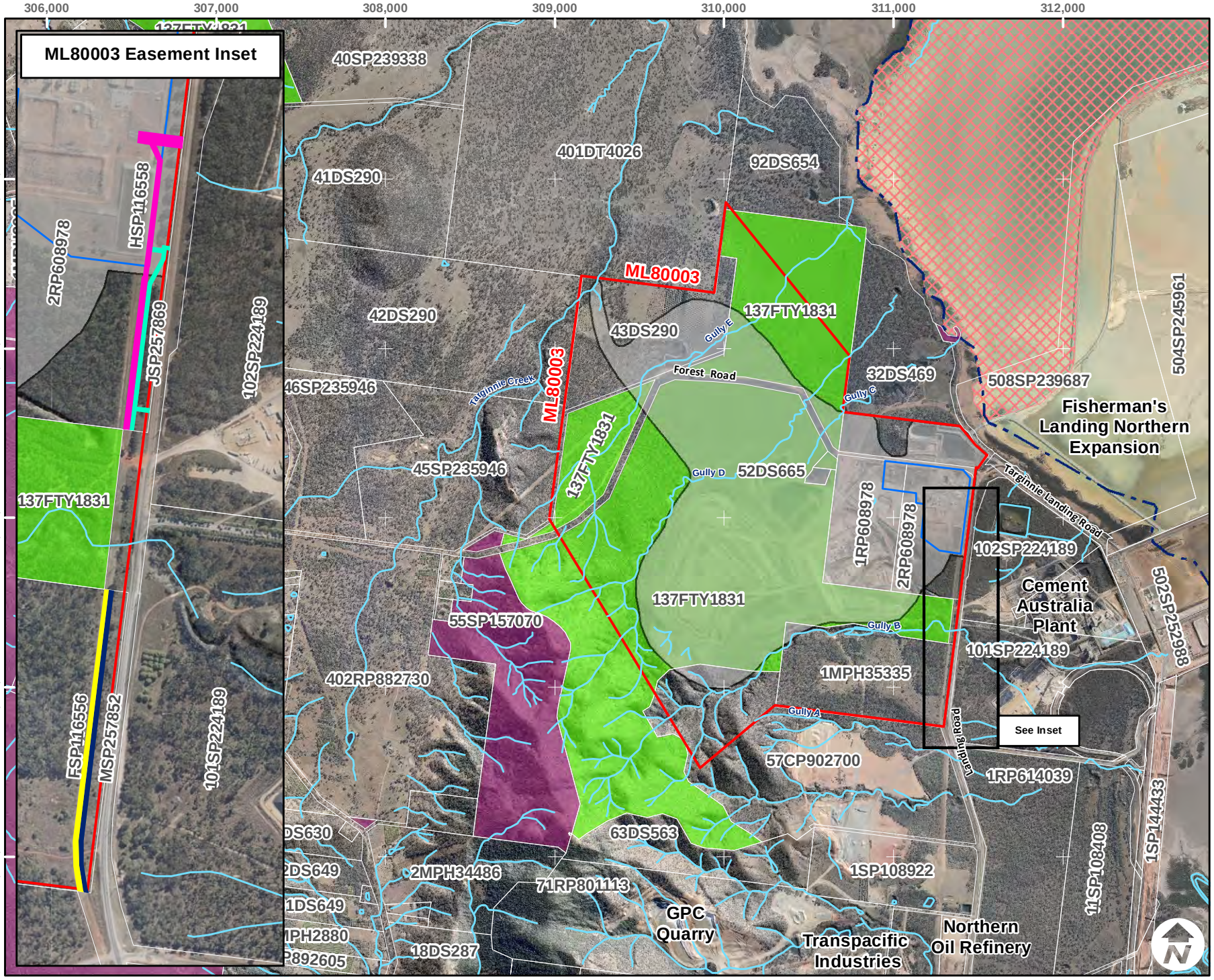
QER is the Applicant for the Project on behalf of the holders.

1.5 PURPOSE OF THIS DOCUMENT

The purpose of this Project Description is to inform the review of Draft Terms of Reference for an EIS.

In accordance with the DEHP's *Triggers for Environmental Impact Statements under the Environmental Protection Act 1994 for mining, petroleum and gas activities* (EM1128, Version 2a), the Project would produce '*greater than 2 million tonnes per annum of 'run-of-mine' (unprocessed) ore or coal*', and therefore the preparation of an EIS is warranted.

This Project Description has been prepared to provide an overview of the Project to stakeholders and the general public.



Datum: GDA 1994
Projection: MGA Z56

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FIGURE 3:
LAND TENURE

Main Map Legend

- Watercourses
- QOS2A Plant Extent
- ML 80003
- Approximate Extent of Existing/Approved Surface Disturbance

Selected Tenure

- State Forest
- State Land
- Great Barrier Reef World Heritage Area
- Port of Gladstone

Inset Legend

Selected Easements

- FSP116556
- HSP116558
- JSP257869
- MSP257852

2 PROJECT DESCRIPTION

2.1 EXISTING/APPROVED ACTIVITIES

Existing/Approved Mining Activities

Oil shale from the Kerosene Creek Member of the Stuart Oil Shale Deposit is mined by open cut methods and loaded into haul trucks for transportation to the run-of-mine (ROM) stockpile. Waste rock material (i.e. overburden and interburden) is hauled to both in-pit and ex-pit emplacement areas.

The existing mining area within ML 80003 (i.e. Stuart Pit and Stuart Ex-pit Emplacement) is shown on Figure 4. The approximate extent of existing/approved surface disturbance within ML 80003 where mining disturbance had already substantially commenced is also shown on Figure 2.

Existing Processing Activities

Oil shale has been processed within ML 80003 at the TDP (Figure 2) using the Paraho process. The TDP commenced operating in 2011.

In 2013, a review of the environmental performance of the Paraho process used at the TDP was conducted by the DEHP. The review stated (DEHP, 2013):

> *EHP officers compared the QER adopted technology with the industry best practice pollution control technology, and found that the TD plant incorporates best practice environmental management*…

2.2 PROJECT SUMMARY

The proposed operational life of the Project is approximately 20 years, with a construction period of approximately 3 years. The Project would commence as soon as practicable after all the necessary approvals have been obtained and any prerequisite conditions fulfilled, with production anticipated to commence in 2018. The Project would ultimately produce up to approximately 3 million barrels of diesel and other fuel products per annum, with peak daily production of liquid fuels of up to approximately 9,000 barrels per day. Depending on the financing arrangements, the Project may be completed and commissioned in two or more phases. Raw oil may be produced and sold during the initial period and at other times during the Project.

The 'operational land' for the Project is defined by ML 80003. The total area of ML 80003 is approximately 527 hectares (ha).

The maximum extent of additional disturbance footprint within ML 80003 associated with the Project (i.e. beyond the approximate extent of existing/approved surface disturbance) is approximately 230 ha (Figure 2).

The proposed general arrangement of the Project is shown on Figure 4.

Table 1 provides a summary comparison of the approved 1996 EMOS (Southern Pacific Petroleum and Central Pacific Minerals [SPP/CPM], 1996) activities within ML 80003 (refer to Section 1.1) and the proposed Project activities.

2.3 MINING

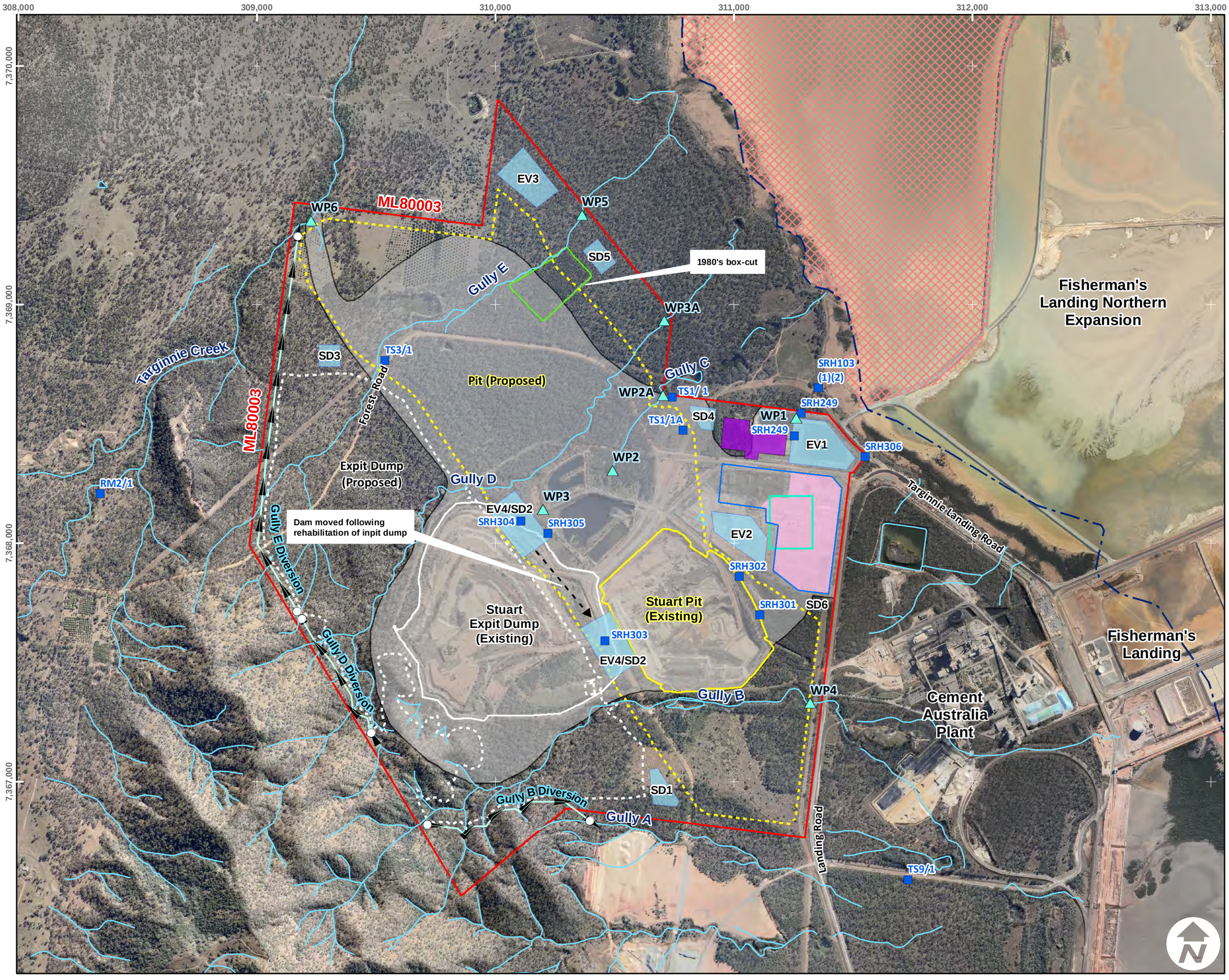
Mining activities within ML 80003 would include:

- Vegetation clearance and topsoil stripping.
- Mining of waste rock (i.e. overburden and interburden).
- Haulage of waste rock to a combination of ex-pit and in-pit waste emplacements.
- Mining of oil shale using surface miners and/or excavators.
- Loading of mined oil shale to haul trucks using front end loaders and/or excavators.
- Haulage of the oil shale to ROM pad (Figure 4).
- Haulage of processed oil shale (i.e. following processing) back to the mining area for in-pit and ex-pit emplacement.
- Progressive rehabilitation.

Figure 4 provides the approximate extent of the existing and proposed pit and ex-pit emplacement, and associated water management infrastructure (indicative only) associated with the Project.

Mining Rate

Up to approximately 5 million tonnes per annum (Mtpa) of oil shale would be mined for the Project as feed for the processing plant.



Datum: GDA 94
Projection: MGA Z56

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FIGURE 4: PROPOSED GENERAL ARRANGEMENT

- Outlet WQM
- Groundwater Monitoring Bores
- Upcatchment diversion
- Watercourses
- Dam
- ML 80003
- Pit - Existing
- Pit - Proposed
- Dump - Existing
- Dump - Proposed
- ROM Pad
- QOS2A Plant Extent
- Conceptual TDP Footprint (EPBC2009/5604)
- Existing Plant Extent
- Box Cut (1980's)
- Approximate Extent of Existing/Approved Surface Disturbance
- Great Barrier Reef World Heritage Area
- Port of Gladstone

DATA SOURCES
QER: WQM, ML boundary, Plant and Project Locations, Water Management Infrastructure, Mine Design (2014), Aerial Photography (2012), Box Cut
QLD DEHP: Roads (2011), World Heritage Areas (2014)
Gladstone Ports Corporation: Port of Gladstone Limits (2007) - adapted from PDF map.

Table 1
Comparison of Originally Approved (1996) and Proposed Project Activities

Project Component	Summary of the Approved Activities*	Summary of the Proposed Project Activities
Processing Technology	AOSTRA Taciuk Process.	Paraho II™ Retorting Technology, following demonstration of "*best practice pollution control technology*" of this processing technology at the TDP.
Project Life	A 30 year project life was proposed.	The Project would occur over a period of approximately 20 years, with commencement of operations anticipated in 2018.
Mining Lease	The activities would be undertaken within ML 80003.	No change.
Mining Method	Conventional truck and shovel mining method. Surface waste emplacement during initial operations and until the mine reached its working dimensions. Progressive backfilling of waste rock/processed shale into the mine voids.	Terrace mining. Initial ex-pit dumping is required to establish the mining pit, and occasionally when the advancing in-pit emplacement encroaches on the mining face. No change to the progressive backfilling of waste rock/processed shale into mine voids.
Mining Rate	Mining of approximately 2 Mtpa of oil shale.	Mining of approximately 5 Mtpa of oil shale.
Product	Production of up to approximately 4,500 barrels per day of liquid fuel products.	Peak production of up to approximately 9,000 barrels per day of diesel and other fuel products. Annual average liquid fuel production would be approximately 3 million barrels per annum.
Product Transport	Product transfer to Fisherman's Wharf by pipeline and shipment from Fisherman's Wharf.	Product transfer by road tanker to supply the domestic market (e.g. Gladstone, Brisbane and Mackay).
Water Supply	Water supplied via the following sources: • raw water sourced from Awoonga Dam (supplied by the Gladstone Area Water Board); • recycled storm water; • treated process water; and • mine pit groundwater.	Water would be supplied via the following sources: • raw water would be sourced from Awoonga Dam (supplied by the Gladstone Area Water Board); • recycled storm water; • treated process water; and • mine pit groundwater.
Operation Hours	24 hours per day, seven days per week.	No change.
Workforce and Employment	Construction and operations workforce peaking at approximately 365 personnel.	Construction workforce peaking at approximately 250 personnel, with 200 staff during operations.

Mtpa = million tonnes per annum.

*Based on the 1996 EMOS (SPP/CPM, 1996).

Vegetation Clearing and Topsoil Stripping

Vegetation would be progressively cleared over the life of the Project ahead of the active mining and ex-pit emplacement areas. Topsoil stripping would occur prior to the commencement of mining activities and stripped topsoils would be used for progressive rehabilitation.

Waste Rock

Ex-pit Emplacement

Waste rock (i.e. overburden and interburden) would be removed by scraper and excavator, and/or surface miner and front end loader, with supporting dozers. Waste rock would be transported to ex-pit and in-pit waste rock emplacement areas by haul trucks. To allow the mining pit to advance, waste rock would initially be placed in an ex-pit emplacement located to the west of the pit (Figure 4). Minor quantities of waste rock may also be required to be placed in the ex-pit emplacement once the mining pit is established if the advancing in-pit dumping encroaches on the mining face.

Processed shale (i.e. shale which has no remaining oil) would also be emplaced in the ex-pit emplacement following processing of the oil shale at the processing plant.

In-pit Emplacement/Backfilling

Following establishment of the mining pit, progressive backfilling of the mining pit and in-pit emplacement with waste rock and processed shale would occur.

Geochemistry and Waste Rock Management

Geochemical testing conducted by QER to date indicates more than 99% of all overburden, interburden and ore samples have been classified as non acid forming (NAF) (QER, 2012).

Overburden and interburden identified as potentially acid forming (PAF) (i.e. less than 1%) would be selectively mined and encapsulated by NAF materials, to provide a barrier to the ingress of oxygen and water in accordance with relevant guidelines (QER, 2012).

Mining of Oil Shale

Surface miners would be paired with front end loaders and trucks for oil shale extraction. The surface miners would loosen the *in situ* oil shale to allow loading by the front end loaders into rear dump trucks.

Mined oil shale would then be hauled to the ROM pad (Figure 4).

Haul Roads

Ramp systems would be established in both the advancing mining face and emplacements to allow the haulage of materials to the surface, and to the face.

Ex-pit haul roads would be established along the length of the deposit on the western side for waste rock haulage to ex-pit emplacement and on the eastern side for oil shale haulage to the ROM pad and processed shale haulage for in-pit emplacement.

Grade Control, Stockpiling and ROM Operations

Oil shale transported to the ROM pad would be separated into stockpiles (e.g. high, medium and low grade). The various grades of oil shale would be blended to meet the feed requirements of the processing plant.

The ROM stockpiles would be managed by a front end loader and dozer.

Blended shale would be loaded to a hopper as feed to the processing plant.

Processed Shale Handling

Following processing, processed shale would be returned to the mine area and would be emplaced in-pit or within the ex-pit emplacement.

Progressive Rehabilitation

Rehabilitation of disturbed areas would be undertaken progressively over the life of the Project. A detailed description of the rehabilitation strategy and proposed post-mine landform and land use will be provided in the EIS.

The approved post-mine landform for areas disturbed by mining within ML 80003 includes a return to 'native vegetation comparable to analogous sites', consistent with the existing EA (EPML00658213).

2.4 PROCESSING

2.4.1 Initial Construction Activities

The proposed processing plant would be constructed adjacent to the existing TDP within a pre-disturbed area ML 80003, and would use existing equipment and infrastructure where practicable.

The majority of construction of processing plant infrastructure would occur off-site and would be delivered to the site as modular units, which would be assembled on-site.

Construction activities are expected to take approximately 3 years.

2.4.2 Processing Activities

The main activities associated with the processing of oil shale for the Project include (Figure 5):

- Crushing and screening of mined oil shale.
- Drying of the crushed shale to reduce its moisture content.
- Further screening of the dried shale.
- Briquetting of fine shale (using particles smaller than 10 millimetres [mm]).
- Production of oil in retorts (i.e. vertical kilns) using the Paraho process, with:
  - raw product oil leaving the retort as part of the gas stream; and
  - processed shale being collected and returned to the mining area (as described in Section 2.3).
- Separation of oil and water from the gas stream in the Oil Recovery Plant, producing:
  - a raw oil product;
  - a fuel gas product, which would be treated to remove contaminants and used to provide heat to the retorting and drying processes;
  - process water, which would be treated to produce water (for re-use), and ammonium salts as a valuable by-product that would be sold; and
- Upgrading of the raw oil in the Oil Upgrading Plant to produce ultra-low sulphur diesel, naphtha and low sulphur fuel oil products.

Crushing and Screening of Mined Oil Shale

The oil shale would undergo tertiary crushing to a top size of 40 mm, and would then be screened to produce a lump product (10 to 40 mm) and a fines product (smaller than 10 mm).

Drying, Further Screening and Briquetting Fine Shale

Lump product material would be dried in a vibrating fluidised bed dryer.

Fine material would be dried in a vibrating fluidised bed dryer or crusher dryer.

To prevent the fine material filling void spaces between the lump material in the retort (which would obstruct the flow of gas in the retorts) the dried fine material would be briquetted to produce a lump sized material.

Retort

Consistent with the TDP, the dried lump and briquetted oil shale would be processed using Paraho retort technology. The Paraho process involves the heating of oil shale in the absence of oxygen to produce a gas stream containing oil, fuel gas and evaporated water.

The oil shale would be continuously fed into the top of the retort (i.e. vertical kiln), and then move down the retort over a period of approximately three hours.

The gas stream containing the oil separated from the processed shale would exit the top of the retort and would then be processed in a sealed circuit for oil recovery.

The processed shale would be removed from the bottom of the retort, cooled and moistened before being loaded into haul trucks for ex-pit or in-pit emplacement.

Oil Recovery

The gas stream exiting the retort would be treated in an oil recovery circuit to recover the extracted oil. Liquid products from the oil recovery plant would be directed to a separation vessel, where a raw oil stream and a processed water stream free of hydrocarbons would be produced (i.e. through separation by gravity).

Raw oil may be produced during the Project.

The retort produces a net export of fuel gas which would be processed through a three-stage gas treatment unit to remove ammonia and sulphur-containing species. This would then be used as a fuel source in the retort furnace and shale drying to reduce the make-up demand for externally sourced natural gas.

The remaining gas stream would be recycled back to the retort, with part of the recycle being heated by a furnace to provide the energy for the retorting process.

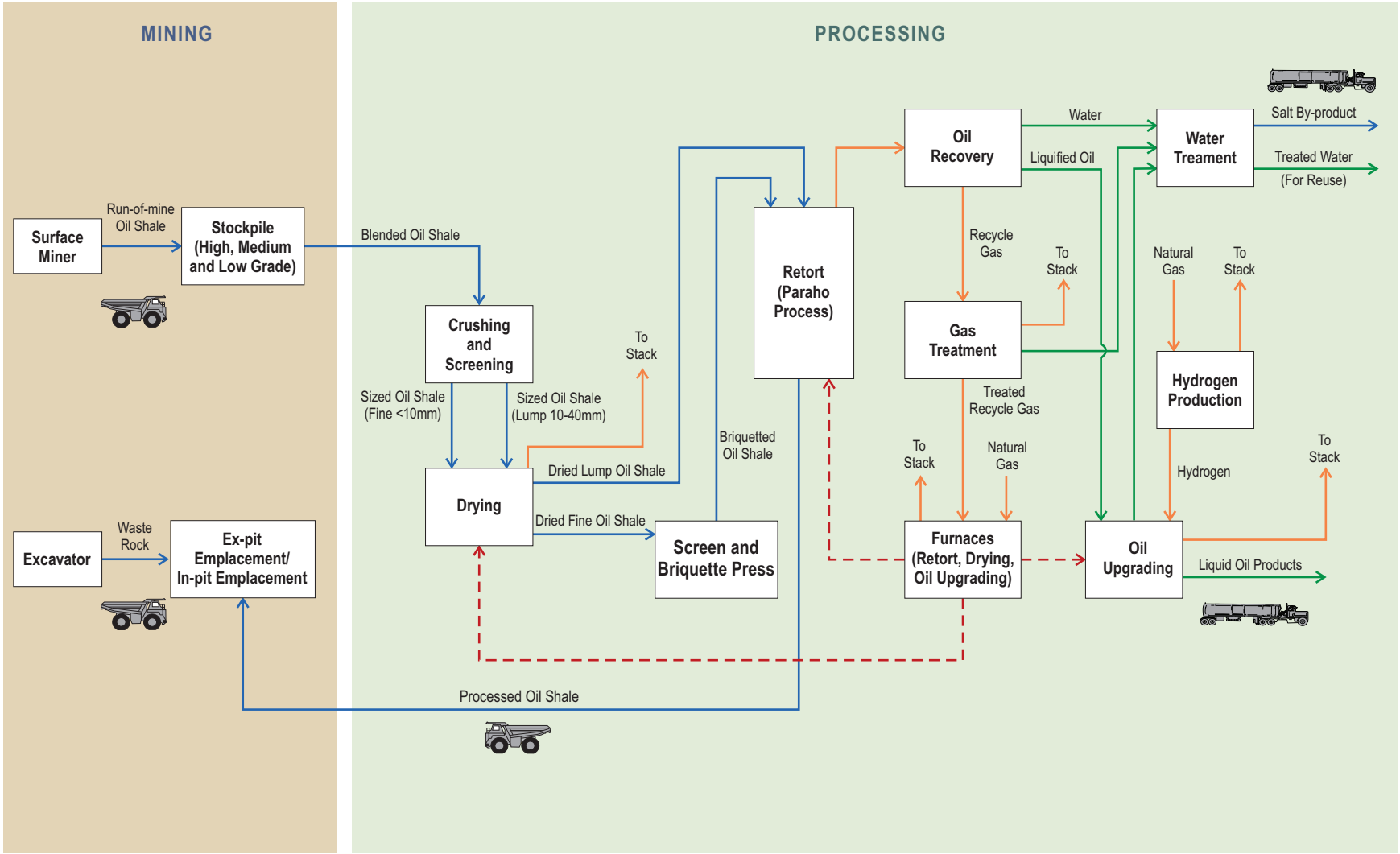

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FIGURE 5: SIMPLIFIED PROCESS FLOW DIAGRAM

- Solid
- Liquid
- Gas
- Heat

DATA SOURCES
Filename: QER-14-02_003E

Oil Upgrading

The raw oil would be processed in an Oil Upgrading Plant.

The raw oil would initially be treated to remove contaminants such as metals and partially saturated with hydrogen to improve its stability, allowing longer term storage. The stabilised oil would be further processed to yield finished products (i.e. ultra-low sulphur diesel and other liquid fuel products).

Processed Water Treatment

Processed water from the Oil Recovery Plant, Oil Upgrading Plant and gas cleaning units would be combined to undergo a multi-stage water treatment process including biological treatment, filtration, colour removal, polishing and reverse osmosis (followed by evaporation and salts crystallisation). This process would be used to produce treated water and valuable by-products (i.e. ammonium salts).

The treated water would be of a quality where it could be re-used in the processing plant.

Product Distribution

Certified finished fuel products would be stored on-site, with a road tanker loading facility used to supply domestic markets (e.g. Gladstone, Brisbane and Mackay).

Solid products (ammonium salts) would be stored on-site in silos and then loaded into trucks for transfer to local markets.

Auxiliary Processing Activities

Auxiliary activities associated with the processing of oil shale include:

- Production of hydrogen (i.e. from natural gas) for use in the Oil Upgrading Plant.
- Electricity consumption.
- Natural gas consumption.
- Raw water treatment and consumption.
- Sulphuric acid production for processed water treatment and by-products feedstock.
- On-site storage of oil products.
- Air compression (for air-operated instrumentation and equipment).
- Boiler feed water treatment and steam production.
- Fire water storage and distribution.
- Nitrogen storage and distribution (e.g. for equipment purging).
- Maintenance, administration, control room and laboratory facilities.

2.5 WATER MANAGEMENT

Runoff from disturbed areas within ML 80003 would continue to be captured in a dedicated Site Water Management System (SWMS) for the Project. Key elements of the SWMS would include:

- upcatchment diversions;
- segregation of stormwater and process water streams;
- collection of groundwater inflow to the mining pit;
- preferential re-use of water contained on-site; and
- treatment and controlled releases in accordance with water quality release limits prescribed in the existing EA (EPML00658213) (or as otherwise amended in consultation with DEHP).

The Project would involve the controlled release of water from WP1, WP2 and WP3 or new release points (i.e. WP2A, WP3A, WP4, WP5 and WP6) (Figure 4) as required (e.g. during or following storm events), subject to any water released being compliant with the existing water release conditions of EA (EPML00658213) (or as otherwise amended in consultation with DEHP).

The Project would be designed and operated in a manner consistent with the water management hierarchy identified in the *Environmental Protection (Water) Policy, 2009*.

2.5.1 Water Consumption

A summary of main water demands for the Project processing activities is provided below. Raw water would be used for processing activities including processed shale cooling and moistening, processed water filtration and as a liquid seal for specific plant equipment. In addition, water would be required for washdown of mobile equipment and other minor non-potable uses, such as firefighting.

The estimated raw water demand when fully operational is set out in Table 2.

Table 2
Raw Water Requirements for the Project

Time Period	Estimated Average Raw Water Demand	Estimated Maximum Raw Water Demand
Annual	350 ML/y	588 ML/y

ML/y = megalitres per year

2.5.2 Water Sources

Stormwater runoff and treated water from the oily water system would be stored and re-used on site. Raw water supply 'make-up' would be sourced from Awoonga Dam and supplied by the Gladstone Area Water Board. Raw water would be brought onto site as feed to the raw water treatment package to produce potable and demineralised water. Annual raw water requirements are estimated to account for around 30% of the site water requirements, however actual import requirements would vary depending on rainfall.

In addition to recycled storm water and raw water sourced from the Awoonga Dam, the following sources of water would be utilised for the Project:

- treated waters; and
- mine pit groundwater.

Notwithstanding the above, a detailed site water balance would be completed as a component of the EIS to determine the make-up water supply requirements for the Project.

2.5.3 Groundwater Management

Excavation of the mining pit would form a sink in the local groundwater system towards which groundwater would flow. Groundwater inflow to the mining pit would be collected in sumps excavated into the floor of active mining areas to manage the inflows. Mine pit groundwater would be pumped into the SWMS for preferential re-use on-site (e.g. haul road watering for dust suppression).

Groundwater monitoring would be conducted at a network of monitoring bore locations to determine compliance with the groundwater quality requirements of EA (EPML00658213).

The groundwater monitoring network would be expanded as the mining area advances to determine compliance with groundwater quality objectives.

2.6 RESOURCE AND GEOLOGY

The Project would continue to mine part of the Kerosene Creek Member of the Stuart Oil Shale Deposit, for its feed material. The Kerosene Creek Member of the Stuart Oil Shale Deposit contains about 134 million barrels of oil.

The Stuart Deposit occurs in thick, relatively consistent and laterally continuous deposits. The total Stuart deposit contains an estimated total of 2.6 billion barrels of resource, the majority of which is well delineated and falls into the measured or indicated Joint Ore Reserves Committee categories. Around 1.3 billion barrels of this resource is currently estimated to be economically recoverable, depending on market conditions.

The resource is a shallow, rich, oil shale which lies within a larger, basin-type formation known as The Narrows Beds.

These beds have been deposited in a geological structure known as the Narrows Graben, some 40 km long and 5 km wide which also hosts the Rundle oil shale deposit. The Narrows Graben is defined to the west by the Western Basement Fault, beyond which lies the Yarwun Targinnie Hinterland (Figure 6). The Hinterland terrain is distinct in both geology and landform from the Narrows Graben.

The Narrows Beds are divided into three formations with a total sediment thickness of at least 1,000 metres (m) (Figure 7). The middle formation, the Rundle Formation, is subdivided into eight members, six containing predominantly oil shale and two containing predominantly claystone (Figure 7). The Stuart and Rundle deposits are part of the Rundle formation. The Rundle Formation is up to approximately 600 m thick, the upper 400 m contains the majority of the oil shale (Figure 7). The bulk of the sediments dip at 2 degrees to 7 degrees to the south-west with a smaller area on the west side of the Graben dipping at up to 40 degrees to the east.

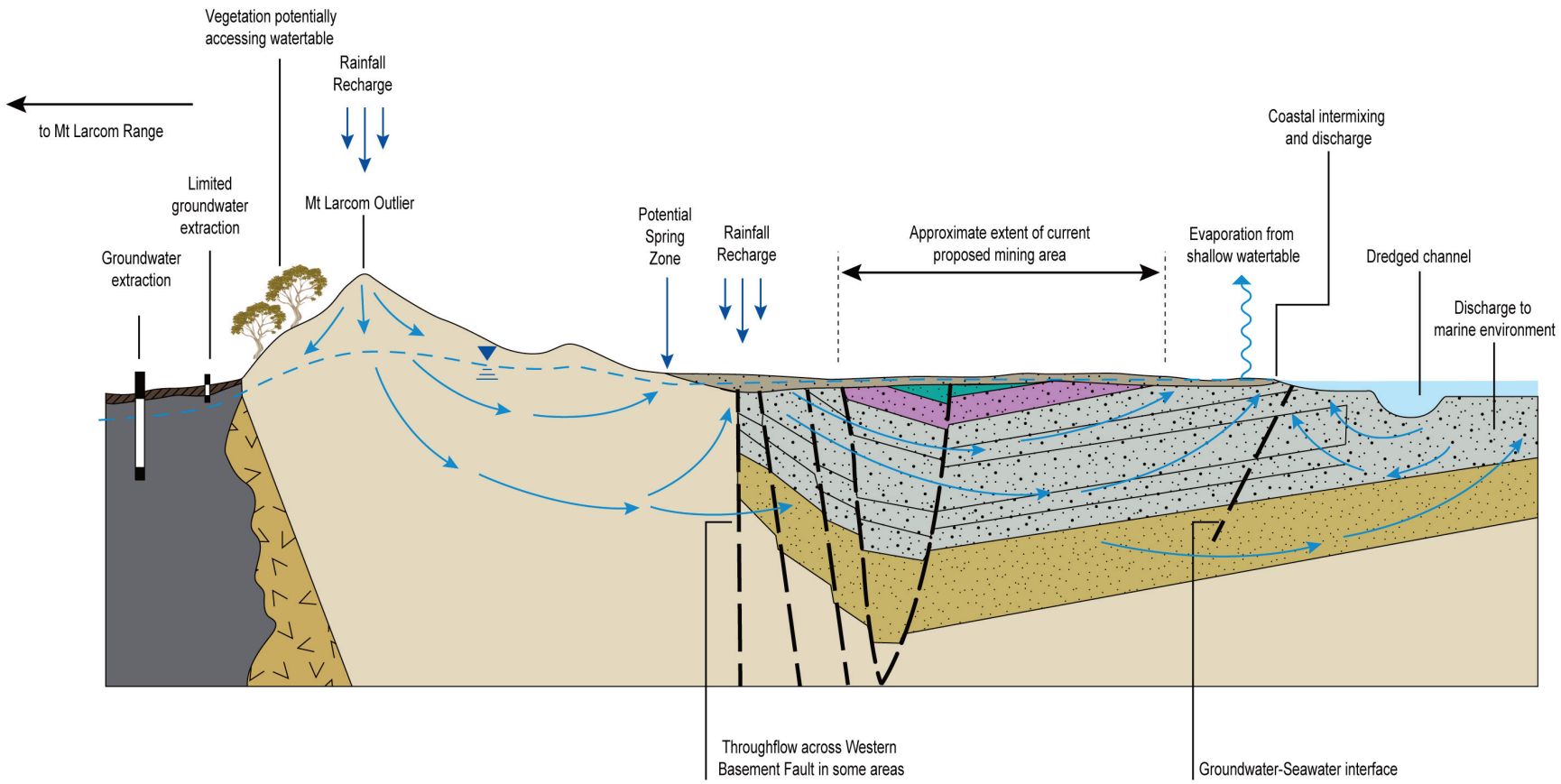

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FIGURE 6: CONCEPTUAL SITE MODEL

- Fault
- Groundwater movement
- Alluvium
- Colluvium overlying Rundle Formation
- Curlew Formation
- Rundle Formation
- Kerosene Creek Member
- Worthington Formation
- Doonside Formation
- Balnogowan Volcanic Member
- Targinie Granite

DATA SOURCES
Coffey, 2014
Filename: QER-14-02_001B

STUART OIL SHALE DEPOSIT - STRATIGRAPHIC COLUMN

	AGE	Series		Formation	Member	Graphic	Lithology	Thickness
CAINOZOIC	Quaternary	Holocene			Surficial Deposits		Alluvial gravel, sand silt & clay saline mud ridge sand.	Up to 30m
					Colluvial Deposits		Colluvial gravel sand & soil, minor conglomerate & sandstone.	Maximum possibly 15m
	Tertiary	Middle to Late Eocene	The Narrows beds	Curlew Formation			Claystone interbeds of lignite oil shale sandstone	Up to 90m
				Rundle Formation	Kerosene Creek		Oil shale, lesser interbeds of claystone & lignite	41-61m
					Telegraph Creek (Upper MAT / Lower)		Claystone, lesser interbeds of oil shale minor dolomite.	55-95m
					Munduran Creek		Oil shale, lesser interbeds of claystone rare lignite	24-55m
					Humpy Creek		Oil shale, lignite and lesser claystone interbeds	9-31m
					Brick Kiln Member (Upper / Lower)		Oil shale, minor interbeds of claystone rare lignite	52-151m
					Ramsay Crossing (Upper / Lower)		Oil shale, claystone dominant in upper section rare lignite.	35-70m
					Teningie Creek (Upper / Lower)		Oil shale, claystone dominant in upper section, rare lignite	34-69m
					Monte Christo		Interbedded claystone and oil shale, siltstone sandstone lignite dolomite "red beds"	219m
				Worthington Formation			Fining upward sequences of conglomerates, sandstone and claystone.	At least 289 m.
PALAEOZOIC			Curtis Island Group	Shoalwater Formation			Arenite, mudstone & minor chert	At least 10 000m
				Wandilla Formation			Mudstone, arenite & chert	At least 9 000m
				Doonside Formation			Chert, mudstone, minor tuff & tuffaceous arenite.	At least 3 000m

- Oil Shale
- Lignite/Lignitic Oil Shale
- Claystone
- Claystone and Sandstone

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DATA SOURCES
QER, 2014
Filename: QER-14-02_002A

FIGURE 7:
STRATIGRAPHIC COLUMN

2.7 REHABILITATION AND POST MINING LAND USE

The approved post mining landform for areas disturbed by mining within ML 80003 includes a return to 'native vegetation comparable to analogous sites', consistent with the EA (EPML00658213).

Rehabilitation of disturbed areas would be undertaken progressively over the life of the Project. A detailed description of the rehabilitation strategy and proposed post mining landform and land use would be provided in the EIS.

2.7.1 Non-Beneficial Land Use

At the cessation of mining, a final void would remain in the northern area of ML 80003. The surface catchment of the final void would be reduced to a practicable minimum through the use of upslope diversions and contour drains around the final void perimeter.

The final void would function as a groundwater sink. Mean annual precipitation into the pit void (980 mm/year) is significantly exceeded by potential evaporation (1,750 mm/year) and hence the final pit void would provide a net sink to groundwater, with an equilibrium water level below the surrounding groundwater level, ensuring that a hydraulic gradient, radially towards the pit, is established.

Accordingly, water captured within the final void would not migrate from the void to the surrounding groundwater system (Coffey Geotechnics, pers. comm.).

3 EXISTING ENVIRONMENT

3.1 CLIMATE

The Project is located in a subtropical climate, with hot, humid conditions during the summer, and mild dry conditions during the winter. The area is prone to convective storms and cyclonic events, which can affect the area during the summer wet season months (QER, 2009a).

3.2 LAND USE AND SOILS

Land use around ML 80003 is predominantly rural and industrial, comprising some small-scale cattle grazing activities and orchards to the north. ML 80003 also includes a section of the Targinnie State Forest. Adjacent to the east and south of the Project site are existing industrial facilities including a cement plant, an industrial oil recycling facility, and the multi-user Fisherman's Landing Wharf facility.

The land tenure information relevant to the Project is shown on Figure 3.

Approximately 66% of ML 80003 is made up of production forestry (approximately 213 ha), livestock grazing (approximately 125 ha) and irrigated perennial horticulture which has not been actively farmed in the past 15 years (approximately 8.6 ha).

Soils within ML 80003 area vary from deep structured earths (Kandosols) to a range of duplex soils consisting of deep to moderately deep non-acid (Chromosols), moderate depth acid (Kurosols) and shallow, sodic (Sodosols) soils (QER, 2009b).

Small quantities of alluvium associated with drainage lines (Rudosols and Kandosols) and marine soils (Hydrosols) also occur.

Wide areas of Sodosols are found on the more poorly drained elevated sites and low-lying coastal plains. These soils are poorly structured, low in nutrients and are highly prone to erosion when disturbed (QER, 2009b).

A review of the relevant trigger maps for the properties in the area indicate that areas of potential Strategic Cropping Land (SCL) are present and therefore, an SCL Validation Assessment would be required under the *Regional Planning Interests Act, 2014* (Qld).

3.3 TOPOGRAPHY AND SURFACE WATER

The majority of the naturally occurring landform in ML 80003 is a level to undulating coastal plain of low elevation (0 to 40 m AHD) sloping upwards in an westerly direction (Figure 8).

Outside of ML 80003 to the west, this plain continues to rise gradually to rolling low hills (approximately 50 m relief), which abut the rolling to steep hills of the Mount Larcom Range (280 to 450 m relief) (Figures 1 and 8).

ML 80003 is drained by a number of small ephemeral gullies known as Gullies A through to E, as shown on Figure 2. These ephemeral gullies drain hinterland catchments lying between the Mount Larcom Range and the Port of Gladstone, and eventually drain to the Port of Gladstone. Stream flow is highly seasonal, with few small semi-permanent waterholes remaining during dry periods.

Prior to the commencement of the existing mining activities, historical land use (e.g. rural activities, land clearing and construction activities for roads and dams) altered the natural drainage patterns across ML 80003. As such, disturbance of the catchments to these ephemeral gullies occurred prior to the commencement of the existing mining activities.

Background water quality has been monitored during flow events in Boat Creek, Targinnie Creek and Humpy Creek over the past decade.

3.4 GROUNDWATER

Groundwater resources of the Yarwun and Targinnie areas are primarily influenced by regional and structural geology. The region can be subdivided into two distinctly different hydrogeological domains, which are geologically separated by the Narrows Graben Fault. These different hydrogeological domains are (Coffey Geotechnics, pers. comm.):

- To the east – the coastal Stuart lowland area, located within the Tertiary Narrows Graben and associated sediment; and
- To the west – the hilly Yarwun Targinnie Hinterland, comprised of pre-Tertiary volcanic and metamorphic rocks with associated fractured rock aquifers.

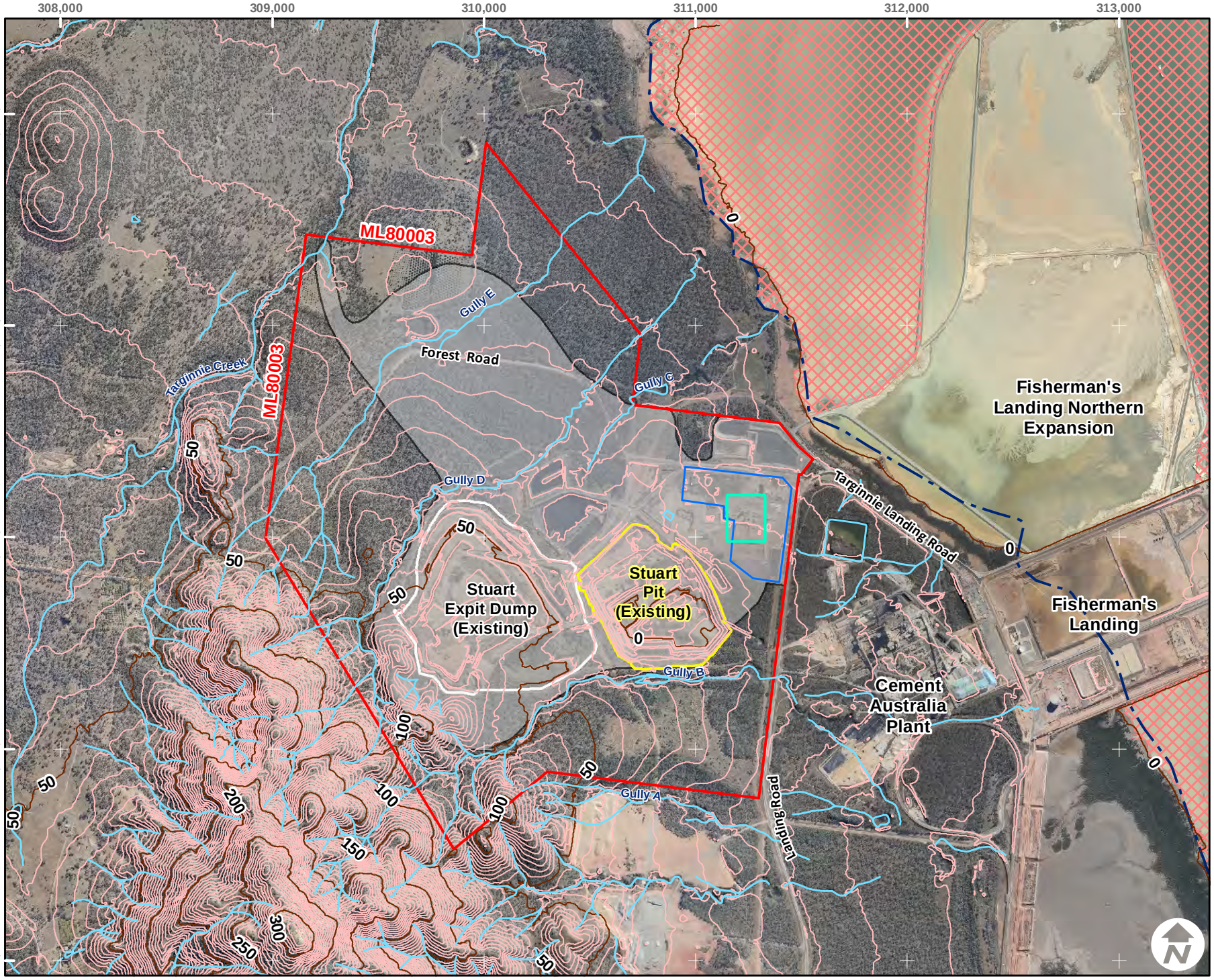

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FIGURE 8: TOPOGRAPHY

- Watercourses
- Conceptual TDP Footprint (EPBC2009/5604)
- QOS2A Plant Extent
- ML 80003
- 50m countour interval
- 5m countour interval
- Great Barrier Reef World Heritage Area
- Port of Gladstone
- Approximate Extent of Existing/Approved Surface Disturbance

Datum: GDA 1994
Projection: MGA Z56

DATA SOURCES
QER: ML boundary, Disturbance Polygons, Aerial Photography (2012), Contours in ML80003 (2014)
QLD DEHP: Roads (2011), World Heritage Areas (2014), Cadastre and Tenure (2014)
QLD DSDIP: Contours outside ML80003 (2006)

DISCLAIMER
Based on or contains data provided by the State of Queensland (Department of Environment and Resource Management) 2014. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Groundwater in the vicinity of ML 80003 is associated with the unconfined Quaternary alluvial aquifer and the deeper confined, low transmissivity, Rundle Formation groundwater system.

Dewatering of the existing mine pit has resulted in more than 20 m reported drawdown proximal to the pit (Coffey Geosciences, 2003), with rapid decline at commencement of dewatering.

Groundwater quality is variable. To the east of the Narrows Graben Fault, groundwater in the Rundle Formation is typically saline and unsuitable for domestic, crop or stock purposes. Groundwater in the shallow alluvium is also variable, however lenses of fresher (<1,000 mg/L TDS) groundwater occur. Productive groundwater in these areas is typically limited in extent. Analysis of groundwater monitoring data indicates that salinity in both systems typically increases towards the coast.

To the west of the Narrows Graben Fault groundwater is also variable, but generally suitable for stock purposes.

3.5 MARINE WATERS

The Port of Gladstone experiences a large tidal range, with extensive areas of mangroves and salt flats being inundated at higher tides. Tidal variation in the region is well understood from extensive recordings and analyses by the Qld Government. Strong tidal currents are evident in the main channel to and from The Narrows (Figure 1) with associated high mixing and flushing.

The currents in the western bay area are much lower and the corresponding flushing rates are less than in the main channel. However, the large tidal range and shallow depths ensure that these waters are still relatively well mixed and flushed (QER, 2009a).

The Port of Gladstone is a major industrial port with mangroves and mud flats fringing the harbour, as well as seagrass beds. More recently, dredging and reclamation activities have been undertaken on the fringes of the Port of Gladstone including the Fisherman's Landing Northern Expansion (Figure 1). Part of the Port of Gladstone and several offshore islands are included in the Great Barrier Reef Marine Park.

The Port of Gladstone and The Narrows support international scale industries such as alumina refining and aluminium smelting, power generation, cement production, liquefied natural gas production and coal export by offering deep water channels for sea transportation.

3.6 VEGETATION AND FAUNA HABITATS

A portion of ML 80003 has been previously cleared for mining and processing activities (within the approximate extent of existing/approved surface disturbance shown on Figure 2).

The flora and fauna habitats within ML 80003 and surrounds mostly comprise woodlands, open forest and ephemeral watercourses.

The majority of ML 80003 falls within the Targinnie State Forest (Figures 1 and 2). The approximate extent of existing/approved surface disturbance includes areas within the Targinnie State Forest.

3.7 NOISE AND AIR QUALITY

The Project is located adjoining an industrial precinct which includes a variety of heavy industrial activities including cement manufacturing, waste oil processing, alumina refining, power generation and LNG plants (Figure 1).

These existing industrial activities have influenced the existing air quality and noise environments.

3.8 CULTURAL HERITAGE

QER has in place a Cultural Heritage Management Plan and an Indigenous Land Use Agreement (ILUA) with the Bailai People, the Gurang People, and the Gooreng Gooreng People (consolidated into the Port Curtis Coral Coast Native Title Claimant Group). These agreements with the Port Curtis Coral Coast Native Title Claimant Group were formalised in October 2004. The ILUA was officially registered with the National Native Title Tribunal on 5 August 2005.

4 SCOPE OF ENVIRONMENTAL ASSESSMENT

A preliminary environmental risk review was conducted by QER (with input from relevant specialists) to identify potential environmental issues associated with Project in order to identify the required level and scope of environmental assessment for key issues (to inform the Draft Terms of Reference). The list of potential environmental issues identified during the preliminary environmental risk review is provided in Appendix A, and were sorted into the following categories:

- flora and fauna;
- surface water;
- groundwater;
- air quality;
- soils and agriculture;
- rehabilitation, final landforms and voids;
- noise;
- waste and land contamination;
- cultural heritage;
- socio-economic contribution and impacts;
- transport; and
- visual amenity.

It is proposed that an EIS will be prepared for the Project. QER will submit a Draft Terms of Reference for carrying out an EIS to the DEHP's chief executive in accordance with section 41 of the EP Act. The EIS would be prepared in accordance with the DEHP's EIS Terms of Reference for the Project.

By way of background information, QER anticipates up-catchment diversions may be required off the mining lease (Figure 4), which would not be considered to constitute part of the resource activities. Approval for up-catchment diversions will be sought through separate water approvals and planning approvals, however, the key legislation governing those approvals are currently subject to review and amendment (e.g. the *Water Act, 2000* is currently subject to a major review and the *Sustainable Planning Act, 2009* is proposed to be replaced by the Planning and Development Act in mid-2015).

The consent authority for the Operational Works Permits would be the local council.

A Riverine Protection Permit under the *Water Act, 2000* may also be required if exemption requirements are not met (Department of Natural Resources and Mines [DNRM], 2013).

5 ENVIRONMENTALLY RELEVANT ACTIVITIES

This Project Description is provided to inform the review of Draft Terms of Reference for an EIS for the purposes of an application for a major amendment of an existing EA (EPML00658213) for 'resource activities'. Those resource activities comprise:

(a) mining activities; and

(b) petroleum activities (i.e. a petroleum facility).

In more detail, the existing prescribed environmentally relevant activities under Schedule 2 of the *Environmental Protection Regulation, 2008 (Qld)* which are ancillary to the resource activities for this Project and which are listed in EPML00658213 at the date of this application, together with the corresponding aggregate environmental score (AES) are listed in Table 3 and shown on Figure 9.

Table 3
Environmentally Relevant Activities

Environmentally Relevant Activities (ERA)		Aggregate Environmental Score (AES)
Schedule 2, *Environmental Protection Regulation, 2008* (Qld)		
• ERA 7 – Chemical Manufacturing	7(4)(b) manufacturing, in a year, more than 5,000 t of fertiliser.	153
• ERA 8 – Chemical Storage	8 (3) storing more than 500 m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c).	85
• ERA 10 – Gas Producing	10 manufacturing, processing or reforming 200 t or more of hydrocarbon gas in a year.	64
• ERA 11 – Oil refining or processing	11 (c) refining or processing, in a year, more than 150,000 m^3 of crude or shale oil.	237
• ERA 15 – Fuel Burning	15 using fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour.	35
• ERA 31 – Mineral processing	31(2) (b) processing, in a year, more than 100,000 t of mineral products, other than coke.	280
• ERA 33 – Crushing, milling, grinding or screening	33 crushing, grinding, milling or screening more than 5,000 t of material in a year.	No score
• ERA 50 – Bulk material handling	50 (1) loading or unloading 100 t or more of minerals in a day or stockpiling 50,000 t or more of minerals within 5 km of the highest astronomical tide or 1 km of a watercourse.	73
• ERA 56 – Regulated waste storage	56 receiving and storing regulated waste.	21
• ERA 60 – Waste disposal	60 (1) (d) operating a facility for disposing of, in a year, more than 200,000 t of waste mentioned in subsection (1) (a).	110
• ERA 61 – Waste incineration and thermal treatment	61 (3) (b) incinerating or thermally treating regulated waste other than clinical waste or quarantine waste.	41
• ERA 63 – Sewage treatment	63 (b)(i) operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1,500 EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.	27

Note: m^3 = cubic metres
AS = Australian Standard
t = tonnes
EP = equivalent persons

308,000 309,000 310,000 311,000 312,000 313,000

7,370,000 7,369,000 7,368,000 7,367,000

Environmentally Relevant Activity	ERA	Activity Summary	Location of Activity in Development: Plant	Pit / Inpit Dump	Expit Dump	ROM	MSA
	ERA 7	Chemical manufacturing	Yes				Yes
	ERA 8	Chemical storage	Yes				
	ERA 10	Gas producing	Yes				
	ERA 11	Oil refining or processing	Yes				
	ERA 15	Fuel burning	Yes				
	ERA 31	Mineral processing	Yes				
	ERA 33	Crushing, milling, grinding, or screening	Yes				
	ERA 50	Bulk material handling		Yes	Yes	Yes	
	ERA 56	Regulated waste storage	Yes	Yes	Yes	Yes	
	ERA 60	Waste disposal		Yes	Yes		
	ERA 61	Waste incineration and thermal treatment	Yes				
	ERA 63	Sewage treatment	Yes				

Mine Services Area (Initial Location)

ML80003

Gully E

Gully C

Gully D

Gully B

Gully A

Targinnie Creek

Forest Road

ML80003

Fisherman's Landing Northern Expansion

Mine Services Area (Final Location)

Targinnie Landing Road

Fisherman's Landing

Cement Australia Plant

Landing Road

Dam moved following rehabilitation of inpit dump

Mine Services Area to be relocated to final position around year 12 of mining and post rehabilitation of the new area.

0 1 2 3 km

Datum: GDA 94
Projection: MGA Z56

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FIGURE 9: ENVIRONMENTALLY RELEVANT ACTIVITIES

- Watercourses
- ML 80003
- Conceptual TDP Footprint (EPBC2009/5604)
- QOS2A Plant Extent
- Pit / Inpit Dump
- Expit Dump
- ROM Pad
- Mine Services Area (MSA)
- Dam - Proposed
- Approximate Extent of Existing/Approved Surface Disturbance
- Great Barrier Reef World Heritage Area
- Port of Gladstone

6 CONSULTATION MECHANISMS

There has been extensive public consultation in relation to historic and recent activities at the New Fuels Development Centre. As noted above, the Paraho technology, demonstrated in the TDP, was the subject of detailed assessments over two years, with the Qld State Government reaching the conclusion that it represented '*best practice environmental management*' (DEHP, 2013), to allow for an application to be made for a commercial-scale plant.

QER also contributed to the Qld Government's review of the oil shale industry in general, which resulted in the Government implementing a policy which acknowledges the potential strategic importance of the industry.

QER has developed a stakeholder engagement strategy for the Project. The stakeholder engagement strategy has been implemented prior to and during the development and lodgement of this Project Description, and would be implemented during:

- development and finalisation of the Terms of Reference;
- during preparation and lodgement of the EIS; and
- post EIS lodgement, exhibition and post exhibition (e.g. responses to EIS submissions) prior to determination.

Implementation of the stakeholder engagement strategy would include engagement and opportunity for consultation with all affected and interested persons, and any other relevant stakeholders identified during its implementation.

A range of consultation mechanisms have been proposed for implementation during the assessment and approvals process for the Project including, but not necessarily limited to, the following:

- one on one visits to key stakeholders (including question and answer sessions);
- operation of QER's visitor centre (including project display);
- occasional advertising in Gladstone News Weekly;
- community newsletters;
- monitoring to social media;
- fortnightly 'Fuel for Thought' column in Gladstone Observer, repeated in the Gladstone Advocate;
- local government (council) briefings;
- State government department briefings;
- Commonwealth government department briefings;
- regular updates and maintenance of the QER website; and
- DEHP website.

Consultation with the registered Native Title claimants (Port Curtis Coral Coast Native Title Claimant Group), which has been ongoing for many years, would be conducted in accordance with the requirements of the *Native Title Act, 1993* (Commonwealth) in relation to Native Title issues. Consultation in relation to Indigenous cultural heritage would be conducted with the registered Native Title claimants (Port Curtis Coral Coast Native Title Claimant Group) in accordance with the requirements of the *Aboriginal Cultural Heritage Act 2003* (Qld).

7 REFERENCES

Coffey Geosciences Pty Ltd (2003) *Regional Groundwater Monitoring Review 2002 – Stuart Oil Shale Project*. Report prepared for Queensland Energy Resources (Management) Pty Ltd, Report No. B17671/01-B.

Department of Environment and Heritage Protection (2013) *Environmental Review of QER Pty Ltd's Oil Shale Technology Demonstration Plant, Gladstone, Queensland.*

Department of Natural Resources and Mines (2013) *Riverine Protection Permit Exemption Requirements.*

Environsciences Queensland Pty Limited (1993) *Environmental Impact Assessment Study of the Proposed Stuart Oil Shale Project.*

Queensland Energy Resources (2009a) *Stuart Shale to Liquids Mining Project Incorporating a Technology Demonstration Plant: Environmental Management Plan.*

Queensland Energy Resources (2009b) *EPBC2009/5064 Stuart Shale to Liquids Technology Demonstration Plant Project.*

Queensland Energy Resources (2012) *QER Submission to Queensland Government Interdepartmental Working Group on Oil Shale.*

Southern Pacific Petroleum and Central Pacific Minerals (1996) *Stuart Energy R&D Project: Environmental Management Overview Strategy.*

APPENDIX A
PRELIMINARY ENVIRONMENTAL RISK REGISTER

Issue Reference	Identified Issues (Preliminary)
Flora and Fauna	
1	*Potential fragmentation of habitats impacting fauna movement.*
2	*Potential loss of biodiversity associated with clearing of habitat.*
3	*Potential impacts on vegetation communities of conservation significance.*
4	*Potential impacts on State and Federally listed conservation significant species.*
5	*Potential impacts to flora and fauna within Targinnie State Forest.*
6	*Potential increase in weed species and feral vertebrate fauna.*
7	*Potential impacts on water quality and ecosystem health.*
8	*Ensuring offsets cater for impacts on threatened species (if necessary).*
Surface Water	
9	*Potential excision of natural catchment and consequent impacts (during and post-mining) on downstream gullies.*
10	*Potential impacts of mine water releases/contaminated surface water runoff to downstream water bodies and the Great Barrier Reef World Heritage Area.*
11	*Potential for generation of sediment and erosion during construction and soil stripping.*
12	*Mine water containment and potential for significant mine water discharge/surface water runoff in extreme weather events.*
13	*Potential inability to comply with EA water quality limits for water releases.*
14	*Potential for pit inundation to impact production.*
15	*Potential change to natural drainage and flooding regimes.*
16	*Potential increase in sedimentation and turbidity within surrounding watercourses.*
Groundwater	
17	*Potential impacts on alluvial groundwater.*
18	*Potential impacts on groundwater users/landholder bores.*
19	*Potential for groundwater inflows and potential inundation of pit (disruption to mining).*
20	*Potential impacts on groundwater dependent ecosystems (e.g. stygofauna).*
21	*Potential seepage into unconfined aquifer of low pH surface waters.*
22	*Potential changes to groundwater flow regimes.*
23	*Potential contamination to groundwater resources.*
Air Quality	
24	*Potential for odorous emissions impacting on surrounding land users.*
25	*Potential for air pollutant emissions from the processing plant impacting surrounding land users and the Great Barrier Reef World Heritage Area.*
26	*Potential for mine site and processing plant dust emissions impacting surrounding land users Great Barrier Reef World Heritage Area.*
27	*Potential increase in greenhouse gas emissions from baseline levels.*
28	*Potential for plumes from the processing plant to impact aviation safety.*
Soils and Agriculture	
29	*Potential impacts on existing agricultural land.*
30	*Potential impacts on Strategic Cropping Land.*
31	*Potential leachate contamination of soils.*
32	*Potential generation of acid sulphate soils.*
33	*Potential for decreased topsoil quality due to aeration, compaction, weeds, etc.*

Issue Reference	Identified Issues (Preliminary)
Rehabilitation and Final Landforms/Void	
34	*Long-term stability and rehabilitation of waste rock/processed shale backfilled in the pit.*
35	*Final landforms and potential restrictions for future land use.*
36	*Final void and associated surface water and groundwater management.*
37	*Final void location.*
38	*Mine site rehabilitation performance (e.g. potential failure due to soil nutrient deficiency).*
39	*Management of mine waste rock/processed shale (e.g. geochemistry considerations).*
40	*Final void - risk of spill.*
Noise	
41	*Potential effects of noise emissions on surrounding land users.*
42	*Potential impacts of low-frequency noise during construction and operation.*
Waste and Land Contamination	
43	*Potential for inappropriate generation, handling and disposal of mine site and processing plant wastes.*
44	*Management of contaminated land (if identified).*
Cultural Heritage	
45	*Potential effects of the Project on Indigenous cultural heritage.*
46	*Potential effects of the Project on non-Indigenous historical cultural heritage.*
47	*Potential loss of/damage to artefacts of heritage significance.*
Socio-Economic Contribution and Impacts	
48	*Perceived social impacts on nearby and regional towns (e.g. Gladstone, Calliope etc.).*
49	*Potential impacts on community (including agricultural) resources.*
50	*Potential impacts of closure of the site on the community.*
51	*Socio-economic benefits to the region, State and Commonwealth.*
Traffic	
52	*Potential public road usage impacts and reduced intersection performance.*
53	*Potential safety risk associated with increased traffic movements.*
54	*Potential impact on daily traffic volumes.*
Visual Amenity	
55	*Potential visual impacts from night-lighting and mine landforms.*
56	*Potential visual impacts plant equipment.*
57	*Potential visual impacts to aviation safety.*