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CONCEPT MINE CLOSURE PLAN

Tweed Sand Plant – Future Expansion
Altona Road, Cudgen

A Report Prepared for
Hanson Construction Materials Pty Ltd

APRIL 2022

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1 INTRODUCTION

JWA Pty Ltd were engaged by Hanson Construction Materials Pty Ltd (Hanson) to prepare a Concept Mine Closure Plan (MCP) for the proposed expansion of Hanson's Tweed Sand Plant (TSP) operation in Cudgen, NSW. The sand plant has operated on part of the subject site since 1983, with Hanson acquiring and operating the sand plant since 2007. TSP Phase 4 is currently operational on part of the project site. To meet ongoing demand for sand, Hanson is proposing to expand its existing operations into lands to the north and west of the TSP site over a thirty (30) year period (market driven). This expansion will be carried out progressively over seven (7) extraction phases (Phase 5 to Phase 11).

This Concept MCP has ben prepared to provide a framework for the planning of mine closure activities associated with the proposed expansion. This Concept MCP describes Hanson's strategies for decommissioning mining infrastructure, rehabilitating land disturbed by mining activities and preparing the area for future use. The document describes the closure strategies necessary to adequately address environmental issues to the satisfaction of regulatory authorities and Hanson at the completion of operations. The strategies are designed to provide a low maintenance site over the long term.

This document has been prepared with regard to the Strategic Framework for Mine Closure (ANZMEC and MCA 2000) and is based upon existing information available from applicable site studies and investigations to meet legislative and policy requirements.

This document addresses the following key elements:

- Closure obligations;
- Closure risks;
- Post-extraction land use;
- Closure objectives and strategy;
- Process for developing closure criteria;
- Closure designs for waste rock landforms and abandonment bunds;
- Monitoring programme for the closure and post-closure phases;
- Action plans for closure and rehabilitation activities to be completed during the operational, closure and post-closure phases; and
- Closure cost estimate and methodology.

This plan is a live document that will be reviewed at each extraction phase and updated (as required) during site operations to ensure it remains accurate and relevant. It is anticipated that subsequent revisions of this document will contain more detailed information concerning actual infrastructure, rehabilitation, closure criteria and management of any issues that may develop as the project moves from the current planning stage through to operation.

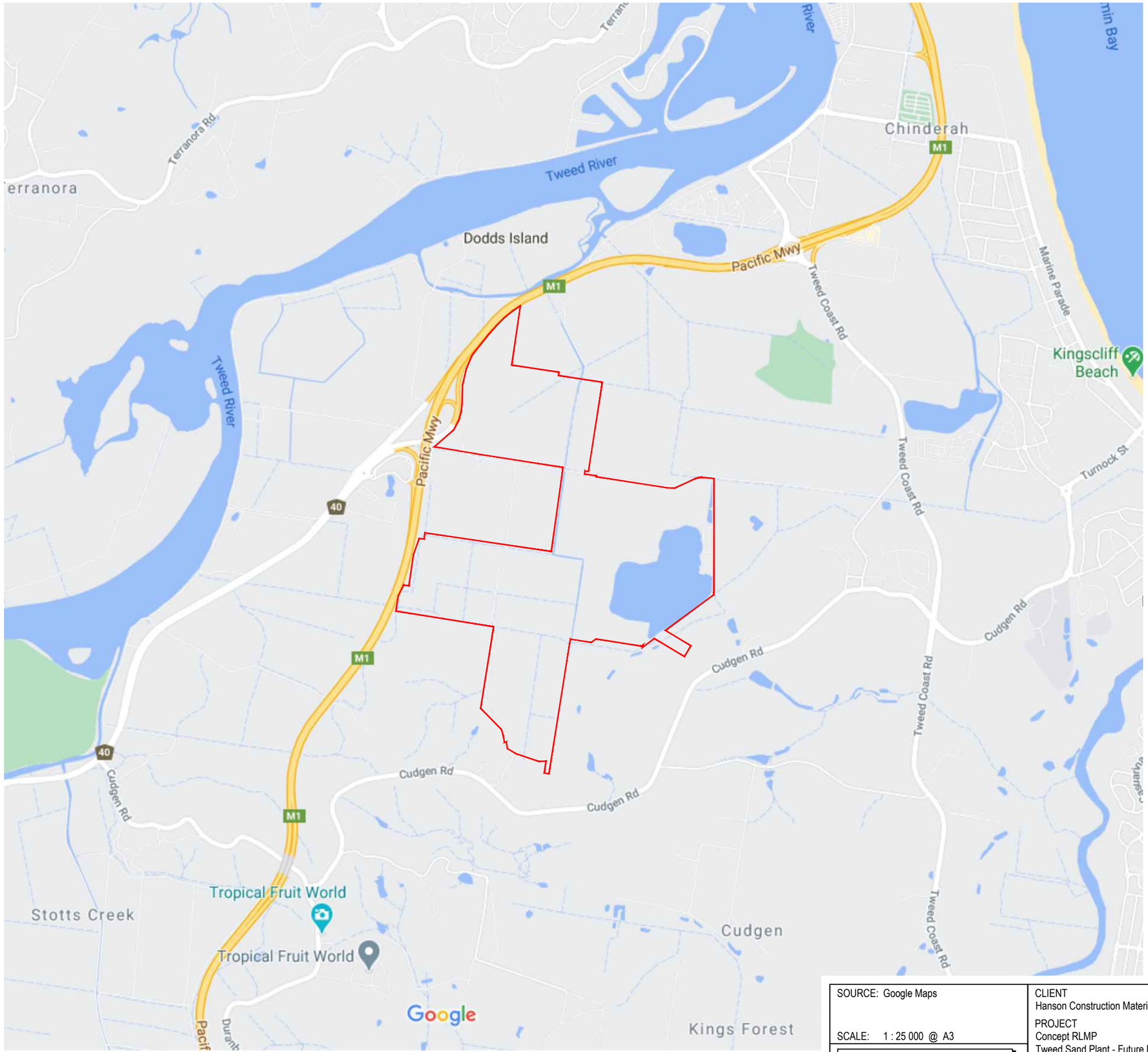
2 PROJECT OVERVIEW

2.1 Location and Ownership

TSP is located off Altona Road at Cudgen, NSW within the Tweed local government area (**FIGURE 1**). The project site comprises eight (8) allotments and one (1) unnamed road reserve. Enabling works are required in one (1) additional allotment and two (2) road reserves. The legal description, registered owners / controlling authority (at the time of preparation of this document) and the area of land associated with each are summarised in **TABLE 1**. The site covers a total area of approximately 236 ha, of which 46 ha is currently approved for sand extraction.

TABLE 1
PROJECT SITE SUMMARY

Property Description	Owner / Controlling Authority	Lot / Land Size	Zoning
Project Site			
Lot 22 DP1082435	Hanson Construction Materials Pty Ltd	74.56ha	RU1 Primary Production
Lot 23 DP1077509	Hanson Construction Materials Pty Ltd	2.552ha	RU1 Primary Production
Lot 494 DP720450	Hanson Construction Materials Pty Ltd	0.104ha	RU1 Primary Production
Lot 1 DP1250570	Cudgen Land Pty Ltd	90ha	RU1 Primary Production / RU2 Rural Landscape
Lot 2 DP1192506	Cudgen Land Pty Ltd	11.12ha	RU1 Primary Production
Lot 3 DP1243752	Cudgen Land Pty Ltd	1.612ha	RU1 Primary Production
Lot 51 DP1166990	Hanson Construction Materials Pty Ltd	55.13ha	RU1 Primary Production
Lot 50 DP1056966	Hanson Construction Materials Pty Ltd	1.094ha	RU1 Primary Production
Unnamed road reserve	Tweed Shire Council	~2.077485ha	RU1 Primary Production
Enabling Works			
Lot 51 DP1056966	Roads and Traffic Authority of NSW	0.7690ha	RU1 Primary Production
Pacific Highway / Tweed Valley Way Interchange Road Reserve	RMS / Tweed Shire Council (#)	N/A	SP2 Classified Road
# The RMS is the roads authority for the Pacific Highway and Tweed Shire Council is the roads authority for Tweed Valley Way.			



LEGEND

Subject Site

Scale 1:25 000 - Lengths in metres

200 0 200 400 600 800 1000

SOURCE: Google Maps SCALE: 1 : 25 000 @ A3 *JWA PTY LTD* *Ecological Consultants*	CLIENT Hanson Construction Materials Pty Ltd PROJECT Concept RLMP Tweed Sand Plant - Future Expansion Altona Road, Chinderah NSW Tweed Shire Council LGA	FIGURE 1 PREPARED: BW DATE: 01 November 2021 FILE: N09007_CRLMP_20211101.dwg	TITLE LOCALITY PLAN

TSP is located within the Tweed Valley flood plain and is surrounded by the following land uses:

- North – Tweed Shire Council (TSC)'s wastewater treatment facility; agricultural land (cane, grazing); Pacific Motorway and township of Chinderah in the distance (approximately 2 km).
- East – Cudgen Lake Sand Quarry (Cudgen Lakes); township of Cudgen (approximately 1 km); Township of Kingscliff (approximately 3 km).
- South – Residential receptors located along Cudgen Road ridge; agricultural and partially cleared land.
- West – Australian Bay Lobster Producers Pty Ltd; Melaleuca Station Memorial Gardens and Crematorium; Caltex service station and travel stop; Pacific Motorway; agricultural land (cane, grazing).

An aerial photograph of the site is shown in **FIGURE 2**.

2.2 Project Objectives

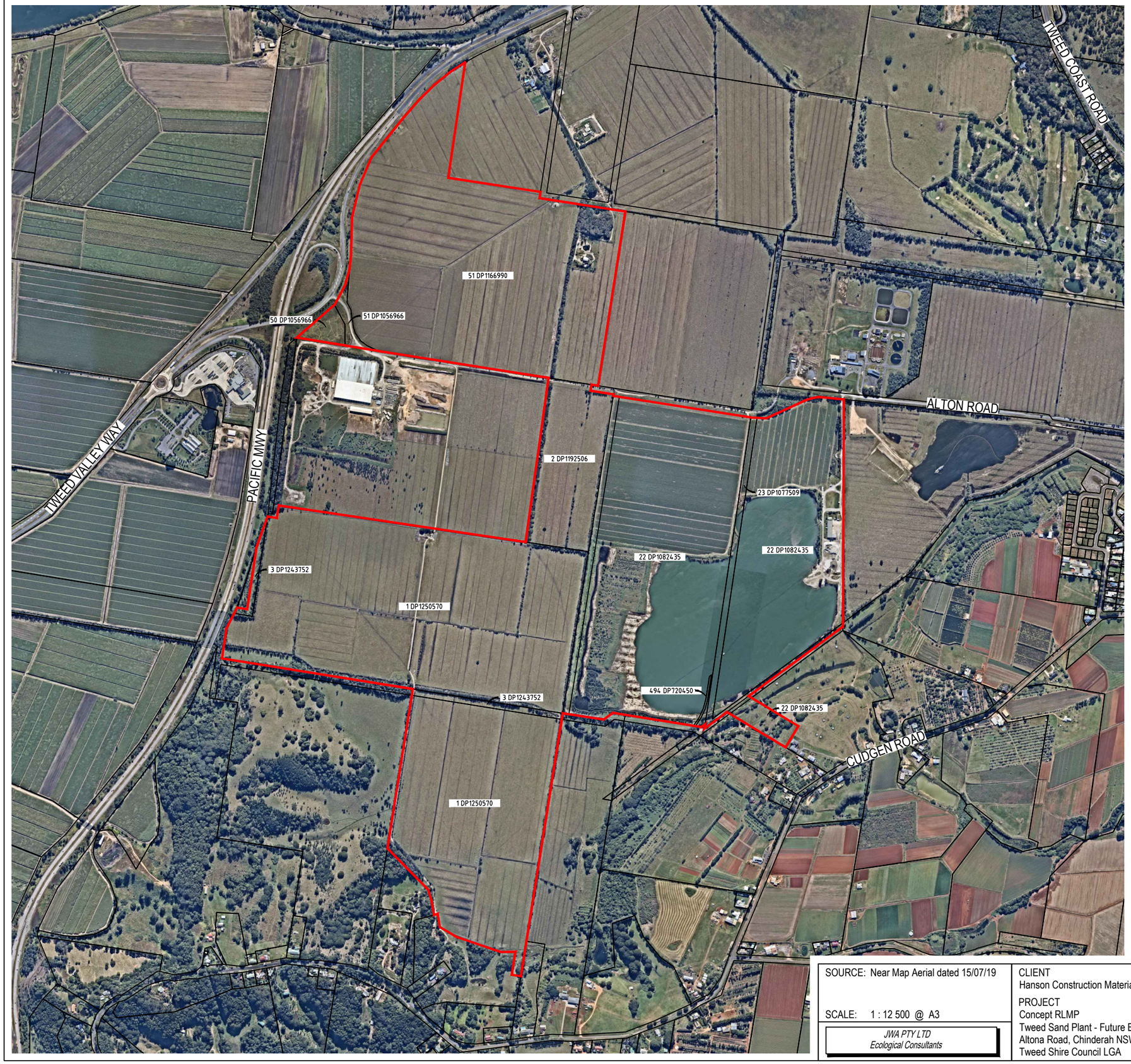
The project objectives are to:

- Increase the extraction capacity of TSP in an environmentally, socially, and economically sustainable way.
- Increase the transportation capacity of TSP in an environmentally, socially, and economically sustainable way.
- Secure long term local and regional supply of sand as a construction material.
- Provide capacity to address construction material demand spikes.
- Achieve optimal use of a regionally significant resource.

2.3 Project Description

TSP is currently operating on part of the project site with Phase 1 to 4 either completed or currently under extraction. TSP operates under Development Application (DA) DA 152-6-2005, as modified on 20 August 2018 (Notice of Modification MOD 1). The current MOD 1 approval remains valid until 1 July 2036 and authorises TSP to produce and transport from the site up to 500,000 tonnes of quarry products per financial year. TSP currently operates a single dredge unit which is linked to an onshore wash plant via a floating flow line. Sand product is processed through the wash plant, stockpiled and loaded via a front-end loader into standard highway trucks for transport and ultimate use.

To meet ongoing demand for sand, Hanson is proposing to expand its existing operations into lands to the north and west of the TSP site over a thirty (30) year period. Seven (7) extraction phases are proposed (Phase 5 to Phase 11). A layout and staging plan for the extraction works expansion is shown in **FIGURE 3**. The footprint of the expansion area is approximately 190 ha, giving a total combined footprint of 236 ha for the existing and



LEGEND

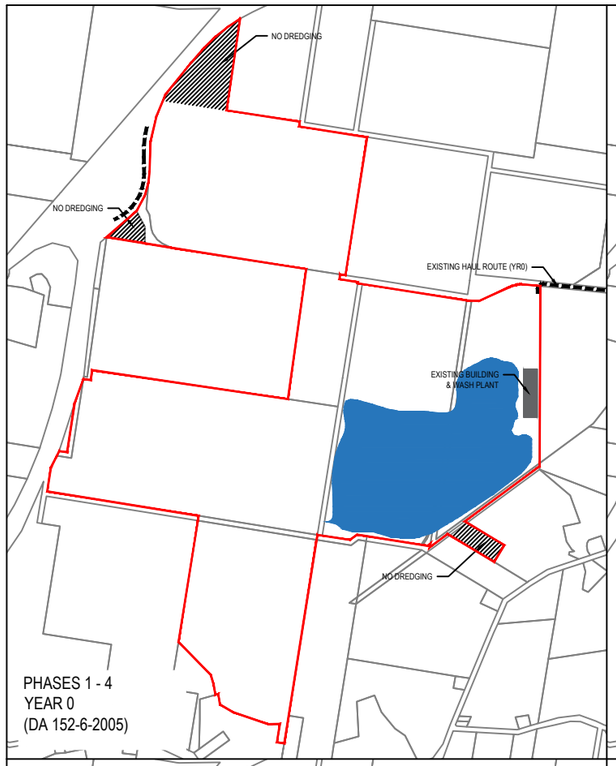
Subject Site

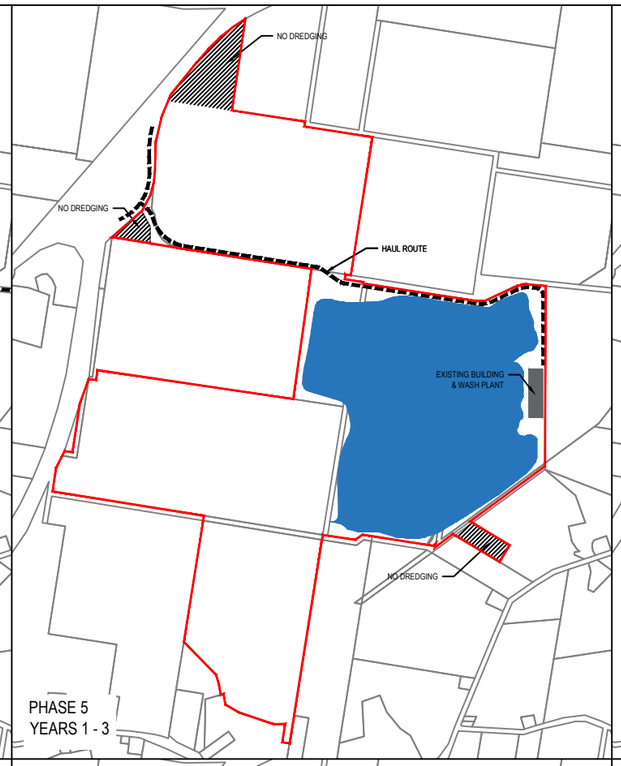
N

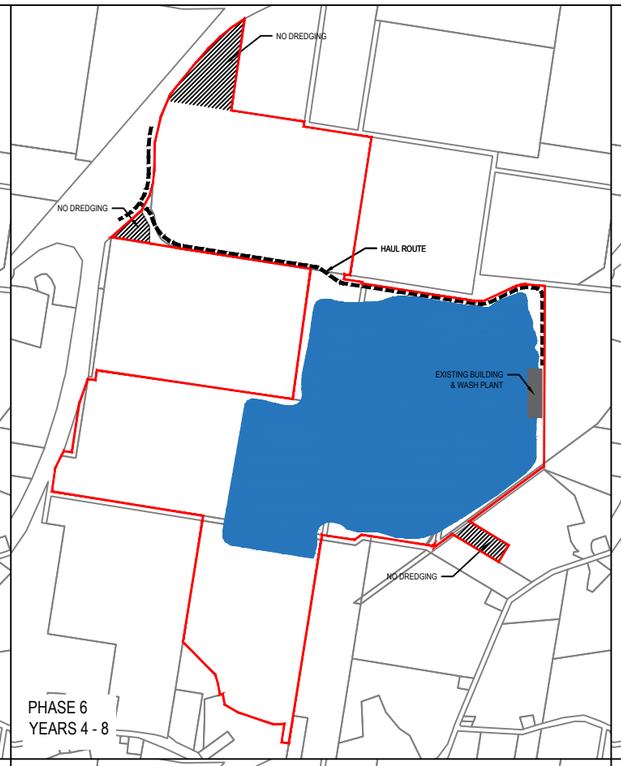
Scale 1:12 500 - Lengths in metres

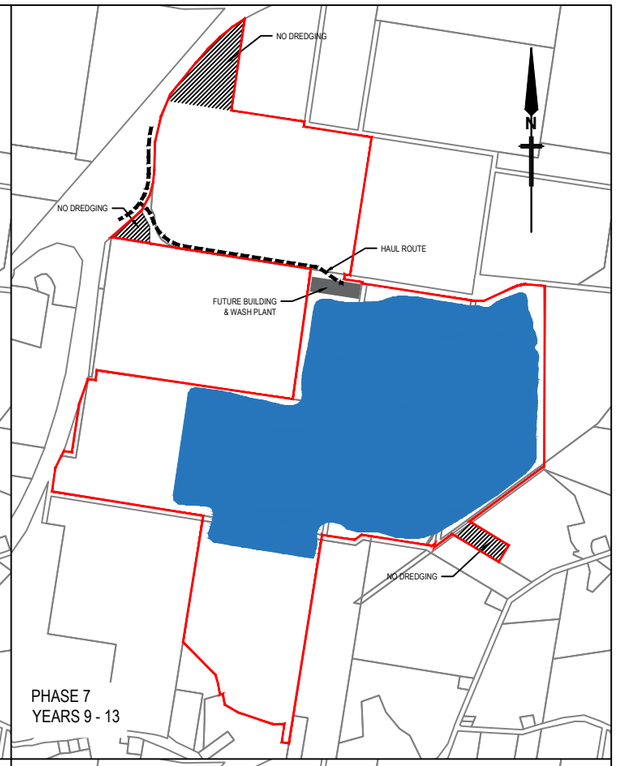
100 0 100 200 300 400 500

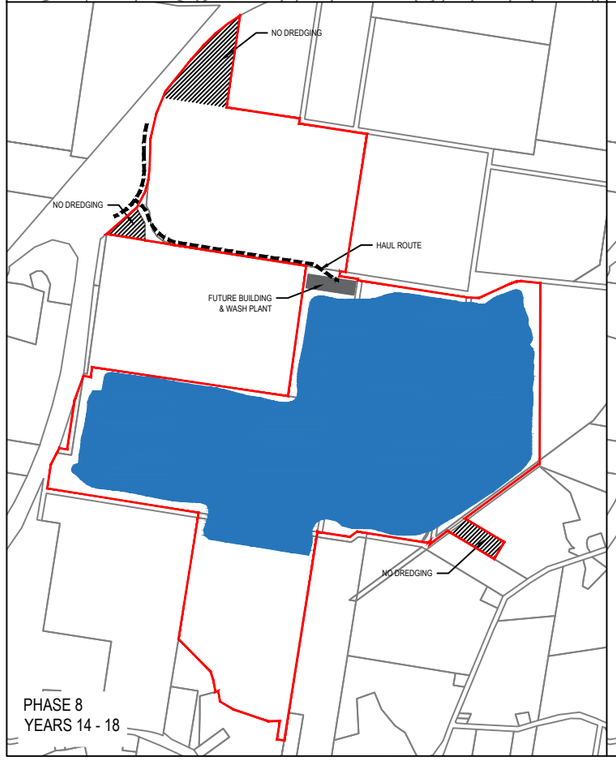
SOURCE: Near Map Aerial dated 15/07/19 SCALE: 1 : 12 500 @ A3 *JWA PTY LTD* *Ecological Consultants*	CLIENT Hanson Construction Materials Pty Ltd PROJECT Concept RLMP Tweed Sand Plant - Future Expansion Altona Road, Chinderah NSW Tweed Shire Council LGA	FIGURE 2 PREPARED: BW DATE: 01 November 2021 FILE: N09007_CRLMP_20211101.dwg	TITLE AERIAL PHOTOGRAPH

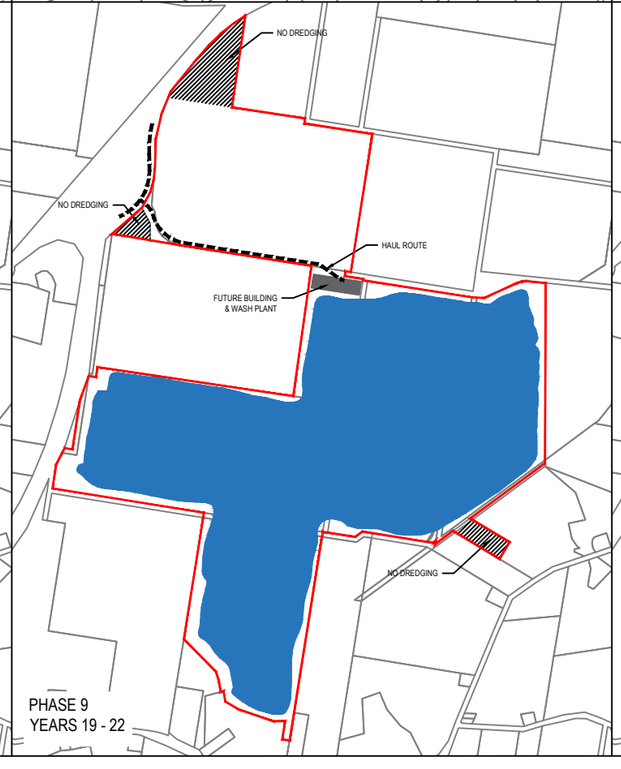


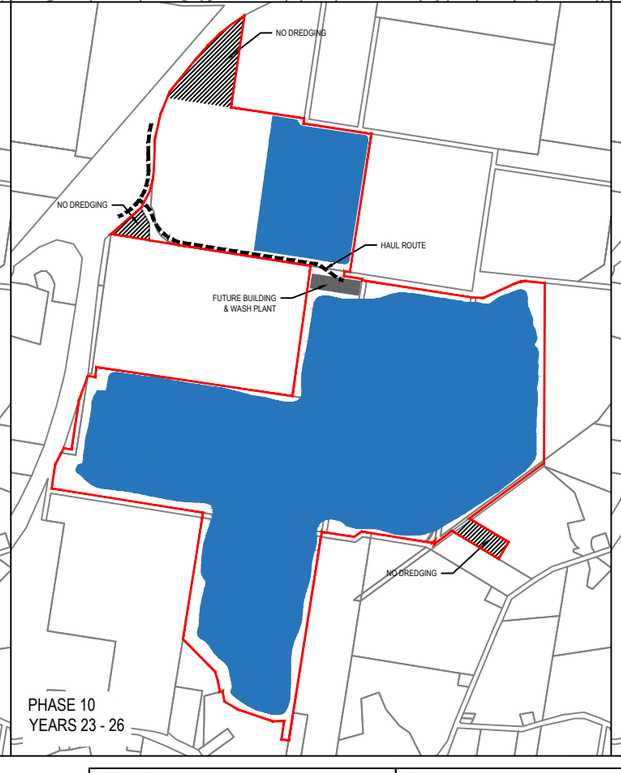


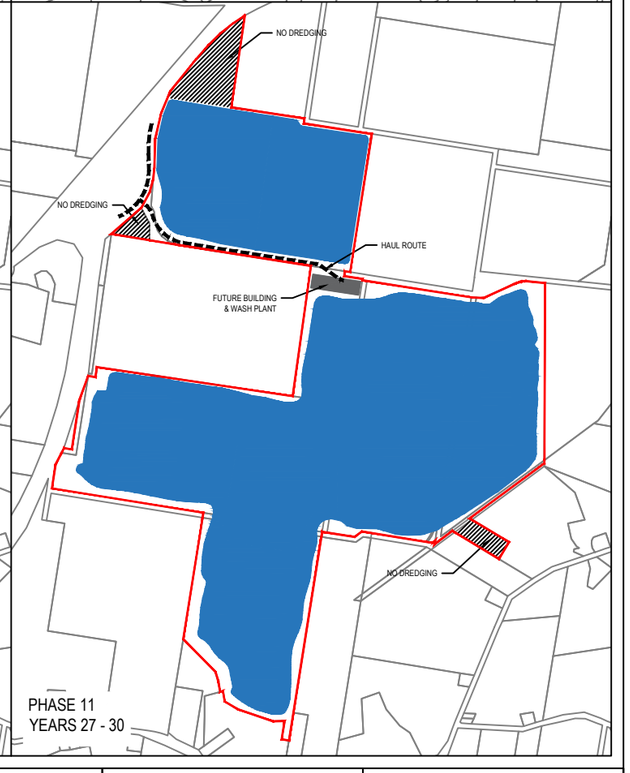












LEGEND

- Subject Site
- Extent of Sand Extraction
- Haul Route
- Building & Wash Plant

Scale 1:25 000 - Lengths in metres

200 0 200 400 600 800 1000

SOURCE: Zone Planning Group - Figure 19: Extraction Phases dwg No. Z19163-F119 Rev C dated 20/10/21 (Ref: FIG18.dwg)

SCALE: 1 : 25 000 @ A3

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FIGURE 3

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FILE: N09007_CRLMP_20211101.dwg

TITLE

CONCEPT DEVELOPMENT PHASING

future extraction areas. Expansion works will also include construction of an internal haul road connected to the Pacific Motorway and a new sand washing plant and associated buildings.

3 IDENTIFICATION OF CLOSURE OBLIGATIONS AND COMMITMENTS

This conceptual Mine Closure Plan has been prepared in accordance with the Strategic Framework for Mine Closure and to satisfy the rehabilitation requirements set forth in the Planning Secretary's Environmental Assessment Requirements (SEARs). The Plan has been prepared with specific regard to Section 4.12(8) of the Environmental Planning and Assessment Act 1979, Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

The identified closure objectives outlined in Section 6 of this document adhere to the closure obligations and commitments set forth by the SEARs and aim to return mine sites to viable, self-sustaining ecosystems while ensuring adequate financing, implementation and monitoring procedures.

4 STAKEHOLDER ENGAGEMENT

4.1 Introduction

Hanson is committed to undertaking a proactive engagement program with its stakeholders, government and the broader community as part of its community engagement program for the TSP. The project has been subject to various forms of consultation as part of its existing operations and as part of the development application process for the proposed expansion of operations. Initial engagements for the proposed expansion have included 'scoping consultation', post SEARs public authority consultation, post SEARs community consultation and post public exhibition public authority consultation.

4.2 Identification of Key Stakeholders

Key stakeholders for the project have been identified as having an influence and/or interest throughout the life of the project and who are impacted by the project's operations. The key stakeholders for the TSP identified to date are listed in **TABLE 2**.

TABLE 2
KEY STAKEHOLDERS

Key Stakeholder Group	Stakeholder
Landowners and Community Groups	• Immediate neighbours, local residents and businesses • Cudgen residents • Cudgen Public School • Tweed Byron Local Aboriginal Land Council
Local Government Authorities	• Tweed Shire Council
State Government Departments and Agencies	• NSW Environment Protection Authority • NSW Department of Planning, Industry and Environment – Resource Assessments • NSW Department of Planning, Industry and Environment – Biodiversity and Conservation Division • NSW Department of Planning, Industry and Environment – Water Division • NSW Department of Planning, Industry and Environment – Division of Resources and Geoscience • North Coast Local Land Services • NSW Health • Natural Resource Access Regulator • NSW Roads and Maritime Services • NSW Rural Fire Service • NSW Government – Heritage NSW • NSW Department of Industry - Lands
Non-Government Organisations including Special Interest Groups	• TSP Community Consultative Committee • Tweed Chamber of Commerce

4.3 Stakeholder Consultation Strategy

To ensure stakeholders are continually engaged in the project, particularly any changes to the proposal, consultation with key stakeholders will continue throughout all phases of the expansion, from project planning, operation through to rehabilitation, decommissioning and closure. The ongoing stakeholder consultation process will follow the five principles outlined in the Strategic Framework for Mine Closure (ANZMEC and MCA 2000) as repeated below:

- Stakeholders and interested parties be identified;
- Consultation is carried out on a regular basis with all of these parties;
- A targeted communication strategy should reflect the needs of the stakeholder groups and interested parties;
- Adequate resources have been allocated to ensure the effectiveness of the consultation process; and
- Wherever practical, the company will work with communities to manage the potential impacts of mine closure.

All communication channels utilised for community consultation during the development application process remain open and can be utilised to contact the project team at any time. In addition, the TSP Community Consultative Committee was established as part of the existing TSP operations and will continue to convene during the life of expanded TSP operations.

5 POST-MINING LAND USE

Following completion of all proposed sand extraction, Hanson will retain ownership of the site and propose to create a public access, multi-use recreation facility. A concept end use plan has been prepared by Zone Landscape Architecture and is provided in **APPENDIX 1**. In order to transition the site to this final land use, rehabilitation and works required to establish a stable and self-sustaining final landform will occur progressively as sand extraction progresses.

Final landform restoration works will involve grading of the banks of the extraction lakes to appropriate levels and stabilisation works where necessary. These works will be completed to ensure the banks and batters within and adjacent to the extraction lakes are non-uniform and exhibit an undulating surface (including areas of deep water) to maximise habitat diversity and mimic natural landform variance. The final form of the lake banks will vary from gently inclined sandy 'beach' areas and wetlands to steeper banks reinforced with vegetation, floating wetlands and/or placed rock (or similar).

Rehabilitation works on the site will cover approximately 38.21 ha (over 16% of the total site area) and will be completed on a stage-by-stage basis following completion of sand extraction works within each phase. The rehabilitation works will deliver three (3) types of rehabilitation areas (**FIGURE 4**) as follows:

- Wetland rehabilitation areas – primarily assisted natural regeneration of water plants/macrophytes around the fringes of the lakes;
- Open space and riparian rehabilitation areas – providing a minimum 10 m wide vegetated buffer around the perimeter of the subject site; and
- Road batter areas – consisting of landscaped and grassed areas where major earthworks are to be completed for road works.

A Concept Rehabilitation and Landscape Management Plan (CRLMP) (JWA 2022) has been prepared for the site. The CRLMP establishes responsibilities and procedures for the progressive rehabilitation of the site following completion of sand extraction works, including the stabilising/reprofiling of banks, planting methods, control of weeds and monitoring requirements. Prior to the commencement of rehabilitation works within each phase including the end-use phase, a phase specific Rehabilitation and Landscape Management Plan (RLMP) will be prepared to provide site specific guidance for the rehabilitation and management of the land to be restored.

A Soil and Water Management Plan (SWMP) (G&S 2022) has also been prepared for the site. At completion of sand extraction two (2) large, enclosed lakes with a total surface area of approximately 203ha will have been formed in the landscape. The lakes will provide diverse habitats for aquatic species and bord life. The SWMP provides the strategies to manage the site's soil and water throughout the operational life of the project and following completion of sand extraction such that a stable, self-sustaining ecosystem suitable for recreational end-use can be achieved. The SWMP establishes procedures and responsibilities for the management of soil and water related aspects of the TSP operations,

LEGEND

- Subject Site
- Indicative Monitoring Location
- Final Lake Extents
- Beaches
- Wetland Rehabilitation Area
- Open Space and Riparian Rehabilitation Area (minimum width 10m)
- Roadwork Batter Extents

Scale 1:25 000 - Lengths in metres

200 0 200 400 600 800 1000

SOURCE: Zone Planning Group - Figure 27: Rehabilitation Phases dwg No. Z19163-F127 Rev C dated 20/10/21 (Ref: FIG25.dwg)

SCALE: 1 : 25 000 @ A3

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FIGURE 4

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TITLE
CONCEPT REHABILITATION PHASING

including acid sulfate soil management, erosion and sediment control, surface water and groundwater monitoring programs and cyanobacteria (blue-green algae) management.

6 MINE CLOSURE OBJECTIVES

The core goals to be achieved by the end-use proposal are:

- A self-sustaining, water body with stable water quality suitable for recreational uses;
- A diverse ecosystem of native flora designed to provide habitat for native fauna;
- A visually pleasing site with water bodies and vegetation designed to achieve a 'natural' appearance;
- Low maintenance infrastructure to enhance the recreational appeal of the site; and
- The incorporation of any necessary infrastructure to ensure public safety.

These core goals are supported by more detailed closure objectives which provide the basis for development of closure criteria against which closure performance will be measured. The overall closure objectives as provided in **TABLE 3**.

TABLE 3
CLOSURE OBJECTIVES

Feature	Objective
All areas of the site affected by the development	• Safe • Hydraulically and geotechnically stable, including the extraction lake margins (particularly where subject to regular wind and wave action) • Non-polluting • Fit for the intended post extraction land use(s) • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land
Surface infrastructure	• Decommissioned and removed, unless otherwise agreed by the Secretary
Extraction lakes	• Perimeter of extraction lakes landscaped and vegetated using native tree and understory species • Natural looking bank design with curved lake boundaries, with a variety of bank treatments (e.g., beaches, wetlands) providing a variety of habitats • Minimise the occurrence and/or persistence of algal blooms • Water quality fit for the intended post extraction land use(s)

7 IDENTIFICATION AND MANAGEMENT OF CLOSURE ISSUES

Management of impacts is based on the risk management framework. The main objectives of management are:

- Identification of the potential environmental hazards associated with the works program;
- Assessment of environmental risks; and
- Development of controls to eliminate or minimise residual environmental risk.

A key outcome of risk management is to rank impacts and risks, so specific management measures can be developed for high risk impacts, to reduce the risk to as low as practicable.

A risk assessment has been undertaken to identify and manage potential environmental risks associated with the TSP. The risk assessment is based on an understanding of the existing environment through desktop assessments/site visits and issues raised during the development application process. This risk assessment evaluates unmitigated project specific environmental hazards, including assigning likelihood and consequence levels, to determine a risk rating for each identified risk. The criteria for determining likelihood and consequence levels, and risk ratings for each identified risk are based on AS/NZS ISO 31000:2009 Risk management – Principles and Guidelines.

Each risk event is assigned an overall level which is determined as a factor of probability (likelihood) and the associated environmental consequence. Likelihood and consequence criteria and the risk rating matrix adopted in this risk assessment are provided in **TABLES 4 to 6**. The results of the risk assessment are documented in **TABLE 7**. Note that in cases where the likelihood and consequence of risks relating to a particular hazard varied across the works site, the most conservative figure was adopted.

TABLE 4
LIKELIHOOD LEVELS

Level	Descriptor	Qualitative Description
A	Almost Certain	The event is expected to occur. The event will occur on an annual (or more frequent) basis.
B	Likely	It is probable the event will occur. The event has occurred several times before at similar developments.
C	Possible	The event may or may not occur. The event may occur once during the development.
D	Unlikely	The event may occur at some time but is unlikely. The event has been known to happen from time to time at similar developments.
E	Rare	The event may occur in exceptional circumstances. The event has not been heard of occurring at similar developments.

TABLE 5
CONSEQUENCE LEVELS

Level	Descriptor	Qualitative Description
1	Insignificant	**Environment:** No damaged detected. **People:** Event does not result in injury (i.e. no medical treatment required). **Property:** No damage to property. **Amenity:** No detectable impact on amenity.
2	Minor	**Environment:** Minor impact of short duration or short term damage. **People:** Reversible injury or illness. **Property:** Minor damage to property (<$5,000 to repair). **Amenity:** Minor, localised and short term amenity impacts, no complaints.
3	Moderate	**Environment:** Short term damage, localised impact. **People:** Irreversible disability or impairment (30%) to one or more persons. **Property:** Moderate damage to property (<$50,000 to repair). **Amenity:** One (1) or two (2) complaints, impacts extending to several properties and/or lasting for several days.
4	Major	**Environment:** Significant impact locally and potential for offsite impacts. **People:** Severe injuries or impairment (60%) to one or more persons, single fatality. **Property:** Major damage to property (<$500,000 to repair). **Amenity:** Many complaints, impacts extensive and/or lasting for many days, up to five (5) properties rendered uninhabitable for more than one day.
5	Catastrophic	**Environment:** Significant impacts to regional ecosystems and threatened species, potential for widespread off site impacts. **People:** Multiple fatalities, or irreversible injuries/impairment (>60%). **Property:** Significant loss to property (>$1,000,000 to repair). **Amenity:** Multiple dwellings rendered uninhabitable for >1 day.

TABLE 6
RISK MATRIX CRITERIA

Risk Matrix		Consequence				
		1 (Insignificant)	2 (Minor)	3 (Moderate)	4 (Major)	5 (Catastrophic)
Likelihood	A (Almost Certain)	Medium	High	High	Extreme	Extreme
	B (Likely)	Medium	Medium	High	High	Extreme
	C (Possible)	Low	Medium	High	High	High
	D (Unlikely)	Low	Low	Medium	Medium	High
	E (Rare)	Low	Low	Medium	Medium	High

The risk ratings presented in **TABLE 6** are to be interpreted as follows:

- **Low:** Risk can be adequately managed by routine procedures and work practices.
- **Medium:** Corrective action other than administrative controls is needed.
- **High:** Significant risk control measures need to be implemented before works commence.
- **Extreme:** Operations are not to be undertaken without extensive risk control and mitigation measures in place prior to the commencement of works.

TABLE 7
RISK ASSESSMENT

Issue	Risk	Before Management			Management Practices to be Implemented to Reduce Risk
		Likelihood Level	Consequence Level	Inherent Risk	
Legislation/Approvals	Non-compliance with legislation and/or approval conditions	C (Possible)	4 (Major)	High	HSTP Management to undertake frequent reviews of compliance.
Financial	Insufficient funds to complete closure requirements	C (Possible)	4 (Major)	High	Costs to complete required works will be reviewed at each phase of the operation and funding adjusted as required.
Rehabilitation	Poor rehabilitation performance	C (Possible)	3 (Moderate)	High	Revegetation works including monitoring and maintenance to be completed at each phase in accordance with CRLMP (JWA 2022).
	Limited fauna recolonisation	C (Possible)	3 (Moderate)	High	
	Reduction in ecological value of rehabilitated areas	C (Possible)	3 (Moderate)	High	
Landform Stability	Erosion and/or de-stabilisation of lake banks	C (Possible)	3 (Moderate)	High	Bank stability shall be monitored and managed in accordance with the SWMP (G&S 2022) and additional bank stabilisation mechanisms employed where required in the event that significant soil deposition occurs. Revegetation works including monitoring and maintenance to be completed along lake banks at each phase in accordance with CRLMP (JWA 2022).
Soil Erosion	Erosion of bunds and/or lake banks	C (Possible)	4 (Major)	High	Appropriate sediment and erosion control measures will be undertaken in accordance with the SWMP (G&S 2022) to minimise sedimentation, erosion and the transportation of materials (across and offsite).
	Decrease in surface water quality (outside the effects of drought or flood) in extraction lakes	C (Possible)	3 (Moderate)	High	
	Transport of materials across and offsite	C (Possible)	3 (Moderate)	High	
Acid Sulfate Soils	Potential for disturbance of Acidic non-acid sulfate soil (ANASS) and/or Acid sulfate soil (ASS) (and subsequent acid generation) during removal of overburden.	C (Possible)	4 (Major)	High	Appropriate procedures for the identification and management of PASS or ASS in the sites overburden will be undertaken in accordance with the SWMP (G&S 2022).
	Potential for disturbance and oxidation of Potential acid sulfate soil (PASS) materials (and subsequent acid generation) associated with the sand extraction and processing operation	C (Possible)	4 (Major)	High	Appropriate procedures for the processing of sands will be undertaken in accordance with the SWMP (G&S 2022) in order to mitigate risks associated with PASS.
Surface Water Quality	Decrease in surface water quality (outside the effects of drought or flood)	C (Possible)	3 (Moderate)	High	Surface waters in the extraction lakes will be hydraulically isolated from external drainage lines except during times of high rainfall. Any effluent generated on-site will be treated prior to disposal using an appropriately designed, operated and maintained treatment system. Surface water quality in the extraction shall be monitored and managed in accordance with the SWMP (G&S 2022).

Issue	Risk	Before Management			Management Practices to be Implemented to Reduce Risk
		Likelihood Level	Consequence Level	Inherent Risk	
					Soil disturbance shall be minimized wherever possible and managed in accordance with the SWMP (G&S 2022). Bank stability shall be monitored and managed in accordance with the SWMP (G&S 2022).
Groundwater	Decrease in groundwater quality (outside the effects of drought or flood)	B (Likely)	4 (Major)	High	All groundwater-related site activities will be undertaken in accordance with the groundwater licences issued for the site and the SWMP (G&S 2022). No dewatering of the extraction lake will occur without an equivalent volume of 'top-up' water being returned to the lake. All sand extraction below the groundwater table shall be undertaken via dredge to minimize impacts on groundwater both on and off-site. Long term groundwater quality and levels will be monitored and analysed against specified water quality objectives in accordance with SWMP (G&S 2022).
	Decrease in groundwater levels (outside the effects of drought or flood)	C (Possible)	4 (Major)	High	
	Offsite dieback of vegetation caused by variations in groundwater table caused by TSP operations	D (Unlikely)	4 (Major)	Medium	
Algal Blooms	Potential occurrence of algal blooms within the extraction lakes	A (Almost Certain)	3 (Moderate)	High	Cyanobacteria (blue-green algae) populations within the extraction lakes shall be monitored on a regular basis in accordance with the SWMP (G&S 2022). TSP Management shall conduct all works in a manner that minimises risks to staff and visitors associated with the potential presence of cyanobacteria in accordance with the SWMP (G&S 2022). Wherever possible, TSP Management shall implement practical measures in accordance with the SWMP (G&S 2022) to reduce the prevalence and severity of algal blooms within the extraction lakes.
	Human health risks associated with exposure to algal blooms and associated toxins	C (Possible)	4 (Major)	High	
Waste Minimisation and Management	Waste produced onsite is stored and disposed of inappropriately	D (Unlikely)	3 (Moderate)	Medium	Management of waste will be in accordance with the SWMP (G&S 2022).

8 COMPLETION/CLOSURE CRITERIA

8.1 Introduction

Performance targets to assess closure completion are outlined in the CRLMP (JWA 2022) and the SWMP (G&S 2022). Relevant performance criteria from these management plans have been reproduced in the following sections.

8.2 Rehabilitation Works

TABLE 8 provides the performance indicators and targets for the proposed rehabilitation works within Wetland and Riparian Rehabilitation Areas.

TABLE 8
REAHBILITATION PERFORMANCE TARGETS AND CORRECTIVE ACTIONS

Performance Indicator	Target – Establishment period[1]	Target – Maintenance period[2]
Survival and continued growth of seedlings (i.e. planted stock).	>90% survival of plantings during all monitoring events.	>90% survival of plantings during all monitoring events
Establishment of native ground cover/macrophytes within revegetation areas.	Planted ground covers/macrophytes substantially established.	• >60% after three (3) years; • >80% after five (5) years;
Establishment of native canopy cover (where applicable) within revegetation areas.	Planted trees substantially established.	• >60% canopy cover of native tree species >1.5 m in height after three (3) years; • >80% canopy cover of native tree species >2.5m in height after five (5) years.
Natural recruitment of native species throughout rehabilitation areas.	Evidence of natural recruitment of shrub and ground cover species.	Increasing natural recruitment of shrub and groundcover species.
All identified weeds controlled to an acceptable level within retained vegetation and rehabilitation areas.	Foliage Projective Cover (FPC) (%) assessed using eye estimates or photo points reduced to <10% within first year.	Foliage Projective Cover (FPC) (%) assessed using eye estimates or photo points: • reduced to <10% within first year; • <10% in second year; • <5% in the third year and consecutive years.

8.3 Assessment of Biological Indicators

Data collected as part of ongoing monitoring for existing sand extraction operations (i.e. Phases 1 – 4) will form the baseline for future monitoring of biological indicators on the site. Biological indicator monitoring will aim for maintenance or improvement on the baseline levels identified in the existing extraction operations as a completion criterion.

8.4 End Use Water Quality Management

To ensure suitability of the extraction lakes for the proposed recreational end-use monitoring of the extraction lakes and groundwater network will be undertaken on a biannual basis at representative locations including a minimum of seven surface water sites and up to fifteen groundwater bores.

Biannual surface water, groundwater and cyanobacterial monitoring shall continue following the completion of sand extraction for five (5) years or until key water quality performance indicators stabilise. Monitoring frequency will then reduce to annual.

The NHMRC Guidelines for Recreational water quality (**TABLE 9**) (or relevant guideline as current at the completion of sand extraction) shall be adopted for water quality performance criteria.

TABLE 9
NHMRC RECREATIONAL WATER QUALITY GUIDELINES

Indicator	Guideline value
Temperature	16 - 34°C
Microbial quality	Preventive risk management practices should be adopted to ensure that designated recreational waters are protected against direct contamination by fresh faecal material, particularly of human or domesticated animal origin.
Cyanobacteria	Fresh recreational water bodies should not contain: • >10 µg/L total microcystins; >50 000 cells/mL toxic Microcystis aeruginosa; or biovolume equivalent • >4 mm3/L for the combined total of all cyanobacteria where a known toxin producer is dominant in the total biovolume;
pH	6.5 – 8.5 (A wider pH range of 5–9 is acceptable for water with a very low buffering capacity.)
Dissolved Oxygen	>80% saturation

9 FINANCIAL PROVISIONING

Since acquiring the site, Hanson has demonstrated a consistent approach of integrating TSP's operational objectives with a progressive and adaptive rehabilitation strategy that addresses the here-and-now and provides for careful end-of-production-life planning for the site. Whilst TSP is not a mine site, relevant end-of-production-life planning advice and guidance is set out in the 'Strategic Framework for Mine Closure' ('the Framework'). A key consideration of the Frameworks is the adequate provision of funds to ensure site rehabilitation and end-use objectives will be met.

Consistent with the principles of the Framework, Hanson proposes a funding method to ensure that:

- The costs of closure and site maintenance are adequately identified, estimated and accommodated within the closure plan;
- The closure and maintenance costs are reviewed regularly to appropriately respond to changing circumstances;
- The financial provision for closure and maintenance reflects the real cost;
- The financial provision accrues, is securely held and appropriately managed over time in accordance with appropriate accounting standards;
- The community and other stakeholders are protected from the burden of maintenance liabilities.

The funding method would be codified and realised through a financial structure and/or legal instrument(s) (prepared to the satisfaction of the regulator upon approval of the TSP Expansion) having the following features (or similar):

- Initially established by Hanson, the fund structure would feature independent oversight and guarantees that the funds attach and remain dedicated to the TSP site;
- The fund's income would be secured as an amount per tonne of sand product produced from the site;
- Whilst the fund would meet all financial obligations in accordance with appropriate accounting standards, the fund operators would also hold regular (at least five-yearly) reviews of the fund's balance, growth and income provisions to ensure they remain appropriate to the stated rehabilitation and maintenance goals and objectives.

Alternatively, Hanson may choose to hold a bank guarantee for the requisite amount as determined through application of the principles of the closure Framework. The ultimate funding method would be determined by Hanson in consultation with the regulator upon approval of the TSP expansion.

Closure cost estimates are difficult to accurately define at this stage of the application process however estimates have been provided in **TABLE 10**. Review of these cost

provisions will be completed on a regular basis by Hanson. The cost estimates consider the following components:

- Final landform construction;
- Infrastructure costs (i.e. recreational structures and walking tracks, necessary infrastructure to ensure public safety etc.);
- Infrastructure maintenance costs;
- Rehabilitation and biodiversity management (in accordance with the CRLMP);
- Landscape maintenance costs (e.g. regular mowing/slashing etc.);
- Monitoring costs; and
- Allowance for failed rehabilitation or pollution that may necessitate rework of rehabilitation areas (i.e. contingency funding).

TABLE 10
CLOSURE COST ESTIMATES
FOR THE INITIAL 5 YEARS POST CLOSURE (AS AT 2022)

Closure Works Item	Total Cost Estimate (Years 31 – 35)
Final landform/earthworks	To be completed progressively during the life of the operation.
Infrastructure costs	As above.
Infrastructure maintenance costs	$50,000
Rehabilitation and biodiversity management	$75,000
Rehabilitation and biodiversity monitoring	$40,000
Landscape maintenance costs	$25,000
Water quality monitoring	$200,000
Contingency fund	$150,000

REFERENCES

Australian and New Zealand Minerals and Energy Council (ANZMEC) and Minerals Council of Australia (MCA) (2000) Strategic Framework for Mine Closure. ANZMEC and MCA, Canberra.

Gilbert & Sutherland (G&S) (2022) Soil and Water Management Plan. Tweed Sand Plant Expansion, Cudgen New South Wales. A report prepared for Hanson Construction Materials.

JWA (2022) Concept Rehabilitation and Landscape Management Plan. Tweed Sand Plant – Future Expansion, Altona Road, Cudgen. A Report Prepared for Hanson Construction Materials Pty Ltd.

APPENDIX 1 – END USE AND FINAL LANDFORM PLAN (ZONE LANDSCAPE ARCHITECTURE 2022)

End Use Plan

Hanson Tweed Sand Plant Expansion Project

50m Buffer
(located within the Nil Extraction Area)

Nil Extraction Area

North Lake

Nil Extraction Area

Primary Site Access

Pontoon / Kayak Launch

South Lake walking
and access trail

50m Buffer

South Lake walking
and access trail

South Lake

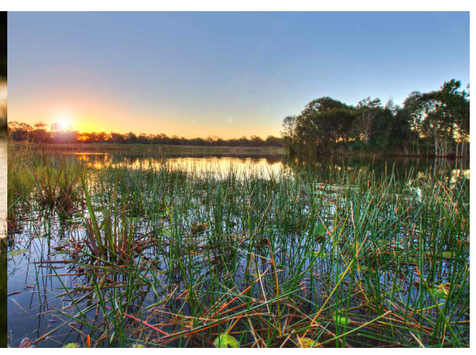
South Lake walking
and access trail

South Lake walking
and access trail

50m Buffer

Nil Extraction Area

0M 250M 500M N



End Use & Final Landform Plan

On completion of the sand extraction works and subsequent final rehabilitation phases, the Project Site will present as a large natural lake bordered by significant vegetation to its perimeter. This vegetated buffer will consist of existing retained vegetation stands as well as revegetated rehabilitation areas consisting of locally occurring native species. The lake banks will vary from gently inclined wetland areas to steeper banks reinforced with vegetation, floating wetlands and/or rock (or similar). The lake edge will also include areas of gently inclined sandy 'beaches' as typically illustrated on this plan.

Central Open Space: An area of grassed open space with scattered shade trees located between the North and South Lake. This central area of open space will feature car parking, pontoon / kayak launch and also serve as the start / finish location for a 2.5m wide access trail to the perimeter of the South Lake. The lake edge will also include areas of gently inclined sandy 'beaches' as typically illustrated on this plan.

Open Space & Riparian Rehabilitation Areas: The open space around the perimeter of the lakes will feature areas of open grass combined with retained and rehabilitated locally occurring native vegetation. This vegetated buffer varies in width from a minimum of 10m, to an average maximum width of 20m. This buffer increases to a width of 50m in key locations noted on this plan.

Wetland Rehabilitation: Wetland rehabilitation is proposed consisting primarily of natural regeneration of macrophytes around the fringes of the lake.

Zone Planning Group · Gilbert Sutherland · Oska Consulting Group · Zone Landscape Architecture · Hanson Heidelbergcement Group