GHD Advisory

DBCT Rehabilitation Plan and Rehabilitation Cost Estimate

DBCT Management

7 June 2019

GHD

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Executive summary

Dalrymple Bay Coal Terminal (DBCT or the Terminal) is a coal-handling facility at the Port of Hay Point, located approximately 38 km from Mackay. The terminal is owned by the Queensland Government, and after being declared for third party access in 2001, was leased to DBCT via a series of long-term lease agreements (together, the long-term lease). DBCT Holdings (DBCTH) is the counter-party to the long-term lease, as the agency that represents the Queensland Government.

The long-term lease is subject to the Port Services Agreement (PSA) between DBCTM and DBCTH. The PSA establishes DBCTM's obligations in respect of site rehabilitation at the expiry of the long-term lease. Under clause 22.3 of the PSA, DBCTM is required to provide DBCTH with a Rehabilitation Plan that details the scope of DBCTM's proposed rehabilitation works for the site.

Access to the coal-handling services provided by DBCT is regulated by the Queensland Competition Authority (QCA) under the Queensland Competition Authority Act 1997 (the QCA Act). The QCA regulates access and pricing matters at DBCT through, among other things, the review of Draft Access Undertakings (DAUs) and the approval of AUs.

The AU provides for an annual amount in the form of an annuity to fund the final cost of the rehabilitation. This is defined as the Rehabilitation Allowance (the Allowance) in this document, and is included in the Terminal Infrastructure Charge (TIC). The current allowance is $7.02 million per annum, reflecting the Allowance approved by the QCA as part of DBCTM's 2017 AU. The QCA's consultant for the exercise was Turner & Townsend (T&T). We understand that the Allowance will be a component of the upcoming 2021 DAU submission to the QCA.

DBCTM engaged GHD Advisory (us) to develop a rehabilitation plan and cost estimate that reflects site rehabilitation outcomes that are consistent with DBCTM's obligations under the PSA.

Rehabilitation Plan

Our Rehabilitation Plan has been based on a site visit (conducted by four representatives on 8 and 9 October 2018) and a desktop study of relevant information provided to us by DBCTM or in the public domain. Our Rehabilitation Plan reflects the rehabilitation activities required for the infrastructure and assets at DBCT, as at October 2018. It has been developed based on DBCTM's obligations under the PSA, current legislative requirements guidelines and leading practice considerations. That is, our Rehabilitation Plan reflects the scope of works and associated cost estimate if the requirement to rehabilitate the site was to fall due now.

We note that no Australian port terminal has yet been subject to a rehabilitation process and there is a high degree of uncertainty about the Federal and Queensland Government's requirements for rehabilitation of such infrastructure in Queensland, particularly where that infrastructure is proximally located to the Great Barrier Reef Marine Park.

DBCTM's obligation will not fall due until after September 2051. Given this, it is likely that conditions at the site, the scope and extent of the infrastructure on the site and the volume of trade at the site will be different to current conditions. We recognise that the composition of assets that will reside within the facility during the incoming 2021 DAU period (FY2021 to FY2025) may be different from that of October 2018.

There is also significant uncertainty regarding the scope of works required to rehabilitate the facility when the obligation falls due. Technology and the equipment available for the rehabilitation process could change as more rehabilitation activities of mines are undertaken and more is learnt about process improvements. While technology and construction processes may improve in the interim, it is expected that any related cost saving will be offset by cost increases due to increasingly stringent safety, social and environmental requirements. This may influence the nature and timing of different rehabilitation activities, which could significantly impact the cost estimate.

The base case for the Rehabilitation Plan assumes the battery limits and asset composition at the facility as at October 2018, and is based on current legislation. The rehabilitation outcomes for DBCT's infrastructure have been benchmarked against recent mine rehabilitation activities and experience in Australia, North America and South Africa, including identifications of the key cost drivers.

Our approach for deriving the Rehabilitation Plan required the following considerations to be addressed:

- Balancing the rehabilitation requirements under the PSA, as written, against relevant Federal/State laws.
- The methods and assumptions underpinning the 2016 T&T report on DBCT rehabilitation costs for the QCA during the 2015 DAU process; and QCA's draft and final decisions on the 2015 DAU.
- DBCTM's request for us to propose a practical rehabilitation approach that accounts for users' concerns on the approach to rehabilitation and the associated magnitude of the rehabilitation costs. That is, to design a Rehabilitation Plan that reflects the required rehabilitation works to satisfy DBCTM's obligations under the PSA while balancing the need to reflect cost-efficient outcomes for users. We understand that the QCA's decision making on the appropriateness of the Rehabilitation Cost Estimate will be based on the assessment criteria in section 138(2) of the QCA Act.

Rehabilitation Cost Estimate

We estimated decommissioning and demolition costs and engaged Axiom Project Services Pty Ltd (**Axiom**) to estimate disposal, remediation and rehabilitation costs. Axiom's deliverables to us included: a Basis of Estimate (**Attachment 1**) for disposal, remediation and rehabilitation costs; and a *Microsoft Excel* workbook containing its cost estimate. Our Rehabilitation Cost Estimate, which consolidates our and Axiom's spreadsheet analysis, is derived in a *Microsoft Excel* workbook 'DBCT Rehabilitation Cost Estimate' (**Attachment 2**).

The Rehabilitation Cost Estimate that we have derived is **$1.22 billion** (Oct 2018 dollars). This approach is based on the sum of direct, indirect and contingency costs to undertake the decommissioning, demolition, disposal, remediation and rehabilitation of the Terminal, including the maintenance and monitoring that needs to occur to validate that rehabilitation objectives have been met.

The bottom-up build of costs, and all relevant assumptions, are contained in Attachments 1 and 2. Our cost estimate by Domain is presented in Table 1 overleaf.

Table 1: Rehabilitation cost estimate, by Domain (Oct 2018 dollars)

Domain name	Domain number	Total costs ($M, Oct 2018)
Rail loop, receival conveyors	1	217.37
Stockyards	2	457.26
Seawall and transfer stations	3	57.50
Offshore	4	269.22
Water management	5	58.84
Quarry dam	6	12.10
Offices and workshops	7	48.97
Utilities	8	34.34
Tug Harbour	9	37.23
Ongoing costs	Monitoring and management costs	9.25 (captured within above Domains)
One-off costs	Distributables costs	24.52
	Studies costs (EIS, Stakeholder Engagement, Tug Harbour)	2.00
	Project management and governance costs	1.00
Total costs		**1,220**

The main contributors to our Rehabilitation Cost Estimate are the:

- Volume of concrete that needs to be demolished and crushed at the facility, and then disposed of. The Plan assuming that all coal terminals will be redundant at the end of the economic life of the Bowen Basin and will be rehabilitated at the same time as DBCT. Consequently, the disposal of crushed concrete from the terminals in particular Hay Point Coal Terminal (HPCT) and DBCT, will strain the capacity of landfill sites and supporting road infrastructure in Mackay and Bowen Basin generally. Options for disposal by barges and ships were considered during our analysis.
- Quarry Dam, which is built into the side of a hill at the facility. The large dam size requires significant drainage and decontamination to occur, and then significant void-filling activities to meet the PSA's requirement of returning the site to pre-existing condition.
- Removal of the rock-armour structures along the sea wall for the facility and deconstruction of the offshore infrastructure's pylons reflect significant costs, not accounting for disposal of the material. Overlaying these activities is the requirement to not adversely affect marine life on the rock-armour structure, pylons and berth pockets.

We note that the Rehabilitation Cost Estimate would change if the Zone 4 expansion is completed during the 2021 DAU period. With the relevant infrastructure inclusions, the Rehabilitation Cost Estimate would be higher.

Cost Escalation

As part of our engagement, DBCTM requested that we propose an appropriate escalation rate for the Rehabilitation Cost Estimates (in Oct 2018 dollars) to be expressed in April 2053 dollars (mid-point of October 2051 and October 2054[1]).

Based on our research on mining-industry norms for long-term cost-escalation assessments for rehabilitation activities, we consider a rate of **2.6 per cent per annum** to be appropriate. This escalation rate has been derived escalation rate of 3.11 per cent for labour costs (mid-point of the 15-year historical wage price index (WPI) for private-sector workers in Queensland[2] and Queensland Treasury's forecast of Queensland WPI) and 2.50 per cent for non-labour costs. The 3.11 per cent applies to about a fifth of total rehabilitation costs, reflecting the share of labour costs, and 2.50 per cent applies to the balance of costs.

[1] DBCTM has an obligation under the PSA to rehabilitate the Terminal within three years of the lease expiry.

[2] ABS, Table 3b, A2600379J, Quarterly Index ; Total hourly rates of pay excluding bonuses ; Queensland ; Private ; All industries (Sep 2003 to Sep 2018)

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1. Introduction

1.1 Background

Dalrymple Bay Coal Terminal (DBCT or the Terminal) is a declared coal-handling facility owned by the State Government of Queensland at the Port of Hay Point, located 38 km from Mackay. It is the largest single-terminal coal-handling facility in Queensland, with a current nameplate capacity of 85 million tonnes per annum (mtpa). It currently services mines within the Bowen Basin in Queensland.

The Terminal is leased to DBCT Management (DBCTM, owned by Brookfield Asset Management), with terminal operations subcontracted to DBCT Pty Ltd (DBCT P/L), a company owned by a majority of mining companies within the DBCT User Group.

North Queensland Bulk Ports Corporation (NQBP) is the relevant port authority that is responsible for the management of the Port of Hay Point, including management of the channel infrastructure, pilotage and the marine offloading facility (MOF).

DBCTM leased DBCT in 2001, via a series of long-term lease agreements (together, the long-term lease) between the Queensland Government and DBCTM. DBCT Holdings (DBCTH) is the counter-party to the long-term lease, as the agency that represents the Queensland Government. The initial lease term is 49 years expiring in September 2051, with a 50-year extension option.

The long-term lease is subject to the Port Services Agreement (PSA) between DBCTM and DBCTH. The PSA establishes DBCTM's obligations in respect of site rehabilitation at the expiry of the long-term lease. Under clause 22.3 of the PSA, DBCTM is required to provide DBCTH with a Rehabilitation Plan that details the scope of DBCTM's proposed rehabilitation works for the site.

The coal handling service at DBCT was declared for the purposes of third-party access prior to the lease of the Terminal. Access to the coal-handling services provided at DBCT is regulated under the Queensland Competition Act 1997 (Qld) (the QCA Act), by the Queensland Competition Authority (QCA). The QCA regulates access and pricing matters at DBCT through, among other things, the review of Draft Access Undertakings (DAUs) and approval of AUs.

The AU provides for an annual amount in the form of an annuity to fund the final cost of the rehabilitation. This is defined as the Rehabilitation Allowance (the Allowance) in this document, and is included in the Terminal Infrastructure Charge (TIC). The current allowance is $7.02 million annually, reflecting that the QCA approved a rehabilitation estimate of $439m for DBCTM's 2017 AU. Turner & Townsend (T&T) provided technical advice to the QCA on rehabilitation costs.

DBCTM engaged GHD Advisory (us) to develop a rehabilitation plan and cost estimate that reflects site rehabilitation outcomes that are consistent with DBCTM's obligations under the PSA. We understand that DBCTM's Allowance will be a component of the upcoming 2021 DAU submission to the QCA.

1.2 History of operations

1.2.1 Coal terminal history

The construction of DBCT began in 1981 and operations commenced in 1983. DBCT was initially constructed with a capacity of 14.55 mtpa and has been expanded 11 times over the following pathway:

- Stage 1 (1990): increased terminal capacity to 22.55 mtpa
- Stage 2 (1995): increased terminal capacity to 26.55 mtpa
- Stage 2A (1997): increased terminal capacity to 28.55 mtpa
- Stage 3 (1999): increased terminal capacity to 33.55 mtpa
- Stage 4 (1999): increased terminal capacity to 37.55 mtpa
- Stage 5 (2002): increased terminal capacity to 45.50 mtpa
- Stage 6 (2003): increased terminal capacity to 54.50 mtpa
- Short Gain: increased terminal capacity to 59 Mtpa
- Departure: Path Dredging increased terminal capacity to 60 Mtpa
- 7X Phase 1: increased terminal capacity to 68 Mtpa
- 7X Phase 2/3 Step A: increased terminal capacity to 72 Mtpa
- 7X Phase 2/3 Step B (2009): increased terminal capacity to 85 mtpa.

1.2.2 Rehabilitation history

DBCT has had small areas of progressive rehabilitation, following various expansions to the Terminal. Rehabilitation has been undertaken using a land-shaping and direct seeding or direct planting methods.

A number of trials have been undertaken using various revegetation methods. Global Soil Systems (2000) concluded that direct seeding has been the most successful method with high germination rates and survival rates of native species. The outcomes of the rehabilitation trials have been used to inform the proposed rehabilitation method for this plan.

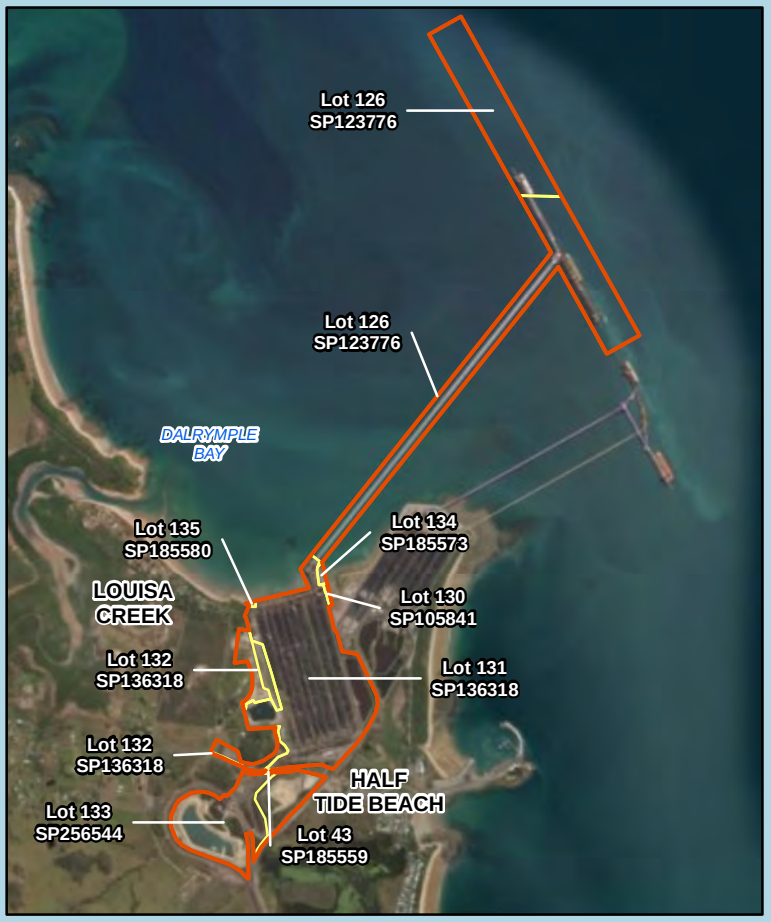
Areas where revegetation has been undertaken on the environmental bund using direct planting have not been as successful with significant losses of eucalypt species. Revegetation species have been indigenous to the local area (province 2 of the Central Queensland Bioregion) including eucalypt and acacia species.

Rehabilitation undertaken during expansions (Stage 2 and 3) around Horyu Maru Drive using direct seeding which has established and is now mature native vegetation. Tree planting was undertaken over approximately 25 hectares (ha) between 1998 and 2000 in the following areas:

- Rail loop and surrounds
- Port control area
- Louise Creek environmental bund
- Fringing remnant vegetation patches.

1.3 Infrastructure

The site location is shown in Figure 1-1 below.



Data Disclaimer
Based on or contains data provided by the State of QLD (DNRME 2018).
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 marketing or be used in breach of the privacy laws.

Paper Size ISO A3

0 0.7 1.4 2.1 2.8 3.5

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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DBCT Management
Rehabilitation Management Plan

Locality Plan

Project No. 91-10832
Revision No. 0
Date 04 Jun 2019

FIGURE 1-1

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Print date: 04 Jun 2019 - 15:28

Data source: © OpenStreetMap (and) contributors, CC-BY-SA
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. DNRME: Cadastre/2018. Created by: tmorton

DBCT covers an area of approximately 2.38 kilometres from the rail in-loading stations to the land-side end of the jetty. The wharves extend for approximately 3.8 kilometres offshore. The facility contains a significant amount of infrastructure, presented below.

Table 1-1 Infrastructure Register for each Domain

Domain	Infrastructure
Domain 1 – Rail Loop, Receival and Conveyors	• Rail line trackwork 1, 2 & 3 (3.2 km of balloon loop) • Rail line overhead catenary and support towers • Aurizon substation • Associated support structures and services • Receival pits and stations RRP1, RRP2, RRP3 • Pit conveyors C1, C2, BF11 • Associated support structures and services • Conveyors S1, S2, S11 • Towers T1, T2, T21 • Associated support structures and services
Domain 2 – Stockyards	• Surface roads and drainage • Stockpile pads rows 1, 2, 3, 4, 5, 6, 7 & 8 bulk earthworks and bedding coal • Bund walls 1, 2, 3, 4, 4A, 5, 5A, 6 • Stacker/reclaimer machines SR2, SR3A, SR4A, SR5, SR6 • Stacker machines ST1, ST2, ST3, ST4 • Reclaimer machines RL1, RL2, RL3 • Inloading Conveyors S3, S4, S13, S5, S6, S7, S8 • Outloading conveyors R1, R2, R3, R4, R5, R6, R7, R8 • Towers T3, T3A, T4, T4A, T5, T5A, T6, T6A, T8, T7, T9, T10, T11, T12, T20, T23, T23A, T25, T25A, T27, T29, T31 • Associated support structures and services

Domain 3 – Sea Wall & Transfer Stations	• Bulk earthworks • Hanbars • Outloading conveyors L1, L2, L3, L4, L6A, L11, L11A, L13, L15A, • Towers T13, T14, T15, T16, T17, T18, T19 • Surge bins SB1, SB2, SB3 • Belt feeders, BF5, BF6, BF7, BF8, BF15, BF17 • Sample stations 1, 2, 3 • Associated support structures and services

Domain 4 – Offshore	• Marine structures including:
	  ○ Berth 1, 2, 3 & 4 mooring points & jewellery
	  ○ Railings and ladders
	  ○ Decks
	  ○ Piling
	• Wharf ship loader machines SL1, SL2 & SL3 and integral conveyors L9, L10, L19
	• Wharf materials handling systems including:
	  ○ Conveyors L5, L6, L7, L8, L15, L17
	  ○ Main wharf transfer tower
	  ○ Towers L7, L8, L17
	• Associated support structures and services

Domain 5 – Water Management	• Industrial dam • Rail Loop dam • Rail Receival dam • Spindlers dam • Associated surface roads and drainage • Process water pump house, pumps and piping • Potable water treatment plant, tanks, pumps and piping • Fire water pump house, tanks pumps and piping

Domain 6 – Quarry Dam	• Quarry dam bulk earthworks, • Water pumping and pipelines • Associated surface roads and drainage
Domain 7 – Offices & Workshops	• Paved roads and carparks • Site fencing • Carpark cover structures • Buildings - including DBCT Corporate office, Operations Centre, Stores Warehouse, Q2 Coal building, L&D Training building, DBCT Administration building, Archives building, Learning Centre, CP Office, Old NQBP Tower, Fire Pump House, Sample Prep Building and the main and west gate security huts • Associated support services • Sewage mains connection to the Mackay Regional Council waste water plant • Diesel fuel storage and distribution
Domain 8 – Utilities	• Ergon 33/11kV Substation • 11kV overhead transmission line feeding main DBCT Substation • Main DBCT substation • In-plant substations SS1, SS1A, SS2, SS2A, SS2B, SS3, SS3A, SS3B, SS3C, SS4, SS4A, SS5, SS5A, SS6, SS6A, SS9 • Substation power feeds • Potable water connection mains to the Mackay Regional Council water treatment plant • Raw water connection mains to SunWater
Domain 9 – Tug Harbour	• Groyne and sea wall (to be retained and gifted to Mackay Regional Council) • MOF and boat ramps (to be retained and gifted to Mackay Regional Council) • Berths and other marine structures • Buildings, gates and fences

1.4 This report

This report sets out our Rehabilitation Plan for the rehabilitation works of DBCT at the end of the initial lease term. It also provides a Rehabilitation Cost Estimate.

We have developed our rehabilitation plan by:

- Clearly defining the targets and rehabilitation objectives to guide planning and required outcomes (Chapter 2)
- Establishing the pre- construction conditions and legislative restrictions associated with DBCT site (Chapter 3)
- Identifying the different areas of DBCT that require different demolition and rehabilitation approaches and activities. We refer to these areas as 'Domains'. We also reviewed the rehabilitation activities previously undertaken on DBCT site and at similar sites (Chapter 4)
- Articulating what the stakeholder consultation strategy for a rehabilitation project would entail (Chapter 5)
- Establishing the final land use that is consistent with the rehabilitation objectives (Chapter 6)
- Identifying appropriate rehabilitation methods (Chapter 7)
- Identifying appropriate decommissioning and demolition methods (Chapters 9 and 7).
- Outlining the key risks that would be faced during a rehabilitation project (Chapter 10)
- Key findings for the scope and cost of work for the relevant decommissioning, demolition, disposal, remediation and rehabilitation activities for each of the Domains (Chapters 11 to 19).
- Identifying the monitoring and maintenance triggers to ensure that the rehabilitation objectives are met (Chapter 20).[3]

Our Rehabilitation Plan and Rehabilitation Cost Estimate sets out indicative rehabilitation actions, in accordance with current legislation, leading practice guidelines and DBCTM's obligations under the PSA. DBCTM's rehabilitation obligations will not be required until at least the end of the current lease term in 2051, assuming there are no force majeure events that result in early termination of the PSA and that DBCTM does not exercise the 49 year optional extension on the existing lease.

Since rehabilitation will not be required for a number of years, we have not undertaken the assessments or investigations that are normally required as part of the preparation of a rehabilitation plan, including detailed design landform, specialist investigations or assessments associated with contamination, soil characteristics, coastal processes and morphology, aquatic assessments, seafloor and sediment transport assessment.

Although our Rehabilitation Plan and Cost Estimate is presented as final, it should not be relied upon as an indicator of actual future cost outcomes when DBCTM's rehabilitation obligations fall due. The Rehabilitation Plan and Cost Estimate will require updating as legislative requirements, leading practice guidelines change or Terminal expansion occurs as these factors may have a material impact on this plan or cost estimate.

This report is intended to be provided as part of DBCTM's submission to the QCA for the 2021 DAU. Although some of the information and findings in this report may be relevant to the rehabilitation of other coal- or bulk-terminal facilities, our Rehabilitation Plan and Cost Estimate conclusions are based on information that is specific to DBCT site. This report should not be used to determine the appropriate rehabilitation plan to apply at other port-terminal facilities.

[3] Other matters are addressed in Chapters 21 and 22.

2. Rehabilitation planning framework

Different levels of government in Australia have provided various frameworks for the rehabilitation of mine sites and associated infrastructure. These guidelines and frameworks are important to consider in the context of rehabilitating DBCT because they provide a useful benchmark from which to consider what the government would consider appropriate for rehabilitating port terminals. This section sets out the current guidelines, leading practice references and benchmarking of rehabilitation methods using case studies.

2.1 Guidelines and leading practice

A summary of guidelines and leading practices relevant to rehabilitation and closure planning is provided in Table 2-1. These guidelines represent current leading practice and provide a benchmark of the legislative requirements for relevant industries with comparable rehabilitation requirements for DBCT as there are no current guidelines or standards directly for the rehabilitation for port or coal terminal infrastructure. Hence, in developing our Rehabilitation Plan, we have considered how these guidelines apply to rehabilitating DBCT.

Table 2-1 Standards and Guidelines Relevant to the Project

Standard/ guideline requirements	Purpose
Strategic Framework for Mine Closure (ANZMEC / MCA 2000)	This document provides a framework of key considerations for developing a mine closure plan. It has been developed with regard to the following key objectives: • Stakeholder involvement • Planning • Financial provision • Implementation • Standards • Repurposing / Relinquishment
Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure (Australian Government, 2016a)	This handbook addresses mine closure and completion. It identifies the key issues that impact sustainable development in the mining industry and provides information and case studies that illustrate development that balances the needs of the present without compromising the future populations' needs.
Leading Practice Sustainable Development Program for the Mining Industry – Mine Rehabilitation (Australian Government, 2016b)	This handbook outlines the key principles and procedures that are recognised as leading practice for planning, implementing and monitoring rehabilitation for the mining industry. As mining activities and coal terminal operations are temporary land uses, the principles required to rehabilitate a mine site including the planning, implementation and monitoring required to rehabilitate are also relevant to rehabilitating a coal terminal.
Planning for Integrated Mine Closures: Toolkit (ICMM, 2008)	The toolkit provides a practical guide to closing a mine in an environmental and socially responsible manner. It uses a risk-and-opportunity based process to guide the practitioner through the iterative process of preparing for planned closure.

Standard/ guideline requirements	Purpose
Qld Department of Environment and Science (2018) Guideline Resource Activities, Rehabilitation requirements for mining resources activities	This guideline assists mining companies to propose acceptable rehabilitation outcomes and strategies during the planning stages of a mine, or when changes to the proposed rehabilitation outcomes and strategies become necessary during the operational stages of a mine.
Mine rehabilitation in the Australian minerals industry (MCA, 2016)	This publication showcases leading practice examples of mine rehabilitation in the form of case studies.
Exploration and mining rehabilitation fact sheet (DPI, 2016)	A fact sheet on exploration and mining rehabilitation including conditions and controls, leading practice regulation, final voids and derelict mines programme.

3. Agreements and legislative requirements

3.1 Port Services Agreement

The PSA is the framework agreement between DBCTM and the Queensland Government. It sets out the key obligations for DBCTM in respect of the ongoing ownership and management and operations of DBCT. The PSA contains a number of definitions and provisions that set out DBCTM's obligations to rehabilitate the site at the end of the long-term lease, which are summarised in Figure 3-1.

Figure 3-1 Summary of rehabilitation provisions in the Port Services Agreement

Rehabilitate	Rehabilitate is defined in the PSA as removing the plant and other structures, fixtures, fittings, plant and equipment from the Onshore and Offshore Land and dispose of them in accordance with applicable laws. It also defines that DBCTM must remediate the Onshore and Offshore Land to its natural state and condition as existed prior to any development or construction activity occurring.
Requirement to rehabilitate	DBCT Holdings must provide written notice to DBCTM at least five years prior to the expiration of the Term. Unless the Leases are terminated before this time, DBCTM is required to rehabilitate the Premises at its cost within three years of the end of the Term.
Rehabilitation Plan	120 days after receiving notice from DBCT Holdings, DBCTM must provide DBCT Holdings a Rehabilitation Plan that sets out the proposed scope of Rehabilitation works, a program for carrying out the rehabilitation, and provide any other information, as required by DBCT Holdings.
Carrying out rehabilitation	DBCTM is required to carry out rehabilitation works in accordance with any applicable laws, and in accordance with DBCT Holdings' reasonable conditions and requirements. DBCTM is also obligated to provide DBCT Holdings with reports regarding rehabilitation, as requested by DBCT Holdings.
Reducing the scope for rehabilitation	DBCT Holdings reserves the right to direct DBCTM to reduce the scope of the Rehabilitation Plan, provided that the cost of Rehabilitation does not increase.
Access rights	DBCT Holdings is required to provide DBCTM and its representatives access to the Premises perform the rehabilitation works. DBCTM is required to obtain the required insurances and public liabilities to conduct these works.

Source: DBCT Port Services Agreement

3.1.1 The rehabilitation requirement under the PSA

Section 22 of the PSA outlines the rehabilitation requirements for when DBCTM onshore sub-lease reaches its expiration. The rehabilitation objectives outlined in the PSA have been expanded on in Section 4.3 of this report.

The PSA defines rehabilitation as returning the site to its natural state and condition as existed prior to any development occurring on the site. This requirement is more onerous than other industry rehabilitation requirements, which typically oblige the owner of the infrastructure to rehabilitate to a safe, stable and productive ecosystem. We consider DBCTM's obligation in respect of rehabilitation is to rehabilitate the site to its preconstruction state and condition.

Under the PSA, DBCTM is also obligated to:

- Rehabilitate the site in accordance with relevant laws.
- Rehabilitate the site in accordance with DBCTH's reasonable requests and requirements.
- Provide reports to DBCTH on any matter it may reasonably require.

This is consistent with the QCA's Final Decision on the 2015 DAU.[4]

3.1.2 Other interpretations of the rehabilitation obligation under the PSA

The rehabilitation cost estimate developed by T&T was based on a less strict interpretation of DBCTM's obligations in respect of rehabilitation. T&T considered that DBCTH would require DBCTM to rehabilitate DBCT in accordance T&T's interpretation of "reasonable conditions and requirements", as opposed to its pre-construction state.[5] It considered the most likely rehabilitation requirement would be to return the site to a safe and stable condition, with an open land use. It arrived at this requirement by considering the then current industry standards, and stated that there was "no indication from a legislative perspective that DBCT cannot be rehabilitated to a stable condition that is suitable for all uses".[6]

We consider that T&T's view of DBCTM's rehabilitation obligations are inappropriate as it is not always evidence-based or based on DBCTM's obligations under the PSA. T&T has made significant assumptions regarding the views of Federal and State Government stakeholders, which also involve an assumed final land use that has no basis. Developing a Rehabilitation Plan and Cost Estimate that do not reflect DBCTM's actual obligations under the PSA, based on a contingency that future events may occur, significantly exposes the site to asset stranding risk if the costs being recovered are not sufficient. If the rehabilitation plan and cost estimate are not correct, DBCTM may not have the funds to rehabilitate the facility. This also exposes the Queensland Government to risk that it will have to contribute funds towards the rehabilitation task.

[4] Queensland Competition Authority (2016) *DBCT Management's 2015 draft access undertaking, pp. 143-144,* available at: http://www.qca.org.au/Ports/Access-to-Ports/DBCT-2015-Draft-Access-Undertaking/Final-Report/Initial-Undertaking-Notice

[5] Turner and Townsend (2015) *Review of proposed DBCT site rehabilitation costs,* pg 17. Available at: http://www.qca.org.au/getattachment/3dbc8b0c-e919-40e0-b5ff-8b3753fe52cb/Turner-Townsend-Review-of-proposed-DBCT-site-r.aspx

[6] Turner and Townsend (2015) *Review of proposed DBCT site rehabilitation costs,* pp 18-19. Available at: http://www.qca.org.au/getattachment/3dbc8b0c-e919-40e0-b5ff-8b3753fe52cb/Turner-Townsend-Review-of-proposed-DBCT-site-r.aspx

We acknowledge that the PSA provides that DBCTH may request DBCTM to rehabilitate the site to a different, defined final land use to pre-construction state and condition. For example, DBCTH may request DBCTM to rehabilitate the site to a final land use for residential housing and to retain some of the existing infrastructure (such as power lines) to support a redevelopment of the site. This request would reflect a variation from the rehabilitation requirement set out in the PSA.

To ensure that the rehabilitation plan accurately reflects DBCTM's obligations in respect of rehabilitation at the expiry of the current long-term lease, we consider that the final land use must be consistent with the definition of Rehabilitate in the PSA. That is, the final land use must reflect the pre-construction condition of the Battery Limits.

3.2 Consents and licences

DBCTM hold an Environmental Authority (EA) for environmentally relevant activities (ERAs) that are undertaken on site (permit number EPPR00504513). The ERAs include:

- ERA 50(2) Bulk material handling – loading or unloading 100 t or more of bulk materials in a day or stockpiling bulk materials
- ERA 63 Sewage treatment 1(b)(ii) – operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1500EP otherwise.

The EA held by DBCTM outlines site specific conditions for the values of air, water, noise, land, waste and general values that are required as part of undertaking the above ERAs. The general conditions include actions such as implementing reasonable and practicable measures to prevent and minimise environmental harm caused by the ERAs. The conditions for the values of land and waste do not outline specific monitoring requirements, however the conditions for air, water and noise do.

The EA conditions for air outline the requirements for an air monitoring program to monitor dust and/or particulate matter in order to achieve compliance. Ambient air quality limits for the applicable activities are identified in Table B1 of the EA.

The EA conditions for water allow discharging of contaminants to water for the EA activities. Condition number C1 identifies that release of contaminants to water must not exceed the release limits outlined in Table C1 when measured at the monitoring points specified in Table C2 of the EA.

The EA conditions for noise identify that noise produced from the EA activities must comply with the noise levels identified in Table D1 of the EA.

3.3 Relevant legislation

Legislation that is referenced in this Plan and is triggered by the decommissioning and rehabilitation activities includes, but is not limited to:

- *Biosecurity Act 2015 (Cth)*
- *Coastal Protection and Management Act 1995 (Qld)*
- *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
- *Environmental Protection Act 1994 (Qld)*
- *Environmental Protection Regulation 2008 (Qld)*
- *Great Barrier Reef Marine Park Act 1975 (Cth)*
- *Marine Parks Act 1992 (Qld)*
- *Nature Conservation Act 1992 (Qld)*
- *Planning Act 2016 (Qld)*
- *Transport Operations (Marine Pollution) Act 1995 (Qld)*
- *Transport Operations (Marine Safety) Act 1994 (Qld)*
- *Vegetation Management Act 1999 (Qld)*
- *State Development and Public Works Organisation Act 1971 (Qld)*
- *Sustainable Ports Development Act 2015 (Qld)*
- *Waste Reduction and Recycling Act 2011 (Qld)*
- *Water Act 2000 (Qld)*
- *Workplace Health and Safety Act 1995 (Qld)*

4. Approach

4.1 Our approach

In developing our rehabilitation plan, we have undertaken a desktop study which has involved a full review of all relevant information, as provided by DBCTM. The information we have reviewed has included:

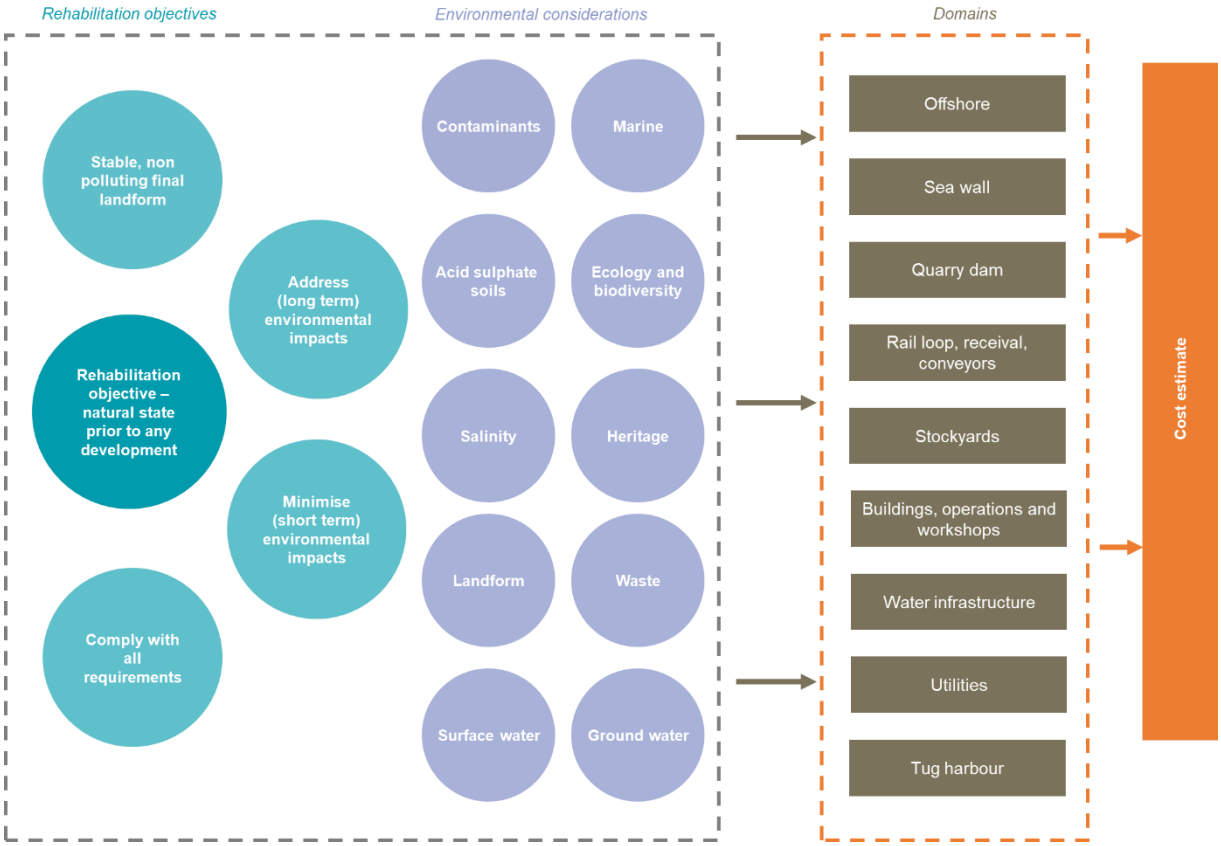
- Port Services Agreement
- The long-term lease agreements between DBCTM and DBCTH
- Environmental Impact Studies for all expansion pathways from 3X to 7X
- DBCT Management Master Plan 2018 – April 2018
- Rehabilitation DBCT Report Update – Rehabilitation Valuation 2015 – Hatch – Sept 2015
- Queensland Competition Authority: Review of proposed DBCT site rehabilitation Report - Turner & Townsend 28th - January 2016
- Queensland Competition Authority: Review of proposed DBCT site rehabilitation Addenda Report 1 - Turner & Townsend - October 2016
- Land Use Plan – Port of Hay Point – North Queensland Bulk Ports Corporation (NQBP) - April 2010
- Insurance Valuation – Dalrymple Bay Coal Terminal Pty Ltd 1st June 2017 – John Foord
- Dalrymple Bay – Port of Hay Point – Site Earthworks General Layout drawings 1980
- DBCT 7X Project drawings
- DBCT Quarry Dam Capacity Increase and Rail Loop Dam drawings
- DBCT LIDAR data (taken 20th Sept 2013)
- Underground Services Detail Plans.

Our team also undertook a two day site visit on 8 and 9 October 2018 for further information and clarification of the key features of the site. Our site visit did not include any surveying or testing of the site.

Figure 4-1 shows an overview of our approach. First, the rehabilitation objectives (refer to Section 4.2) and environmental considerations (refer to Section 7) relevant to the site are determined based on the information provided to us by DBCTM, public domain information and information collected during our site visit. The relevant environmental considerations are necessary to inform the appropriate scope of works to achieve the rehabilitation objectives, and broadly apply to the entire site.

The scope of works are then developed, and cover the necessary decommissioning, demolition, disposal, remediation and rehabilitation activities required to rehabilitate DBCT to its pre-construction land form. We have then separated the site into nine domains, which allowed us to determine the appropriate scopes and durations of rehabilitation works for each component of the site, which recognised the specific infrastructure, environment and other characteristics relevant to different sections of the site. For example, the onshore infrastructure has different rehabilitation activities that are required, compared to the stockyard rehabilitation activities. The domain specific rehabilitation activities have then been used to inform the cost estimate.

Figure 4-1 Approach to rehabilitation of DBCT



4.2 Rehabilitation objectives

Identifying the rehabilitation objectives is important to define the appropriate outcomes of any rehabilitation works. These objectives typically reflect the statutory or legislative obligations faced by an asset owner, as defined in the relevant lease or other agreement, and relevant legislation.

When identifying the rehabilitation objectives for DBCT, we have considered DBCTM's obligations under the PSA and the current rehabilitation guidelines.

For the purposes of developing the rehabilitation plan, we consider the principal objective for the rehabilitation of DBCT site is to return the site to a pre-construction condition, where its landform, hydrology, flora and fauna are self-sustaining and compatible with the surrounding land fabric and potential for future environmental harm is minimised.

To achieve this primary objective, it is important to consider current legislation and leading practice guidelines. This ensures that the Rehabilitation Plan and Cost Estimate are consistent with current standards for rehabilitating similar infrastructure.

The objective of the decommissioning and rehabilitation processes are to:

- Address potential environmental impacts.
- Create safe and stable, non-polluting post operational landform that is cognisant of the site constraints and allow achievement of the nominated post operational land uses.
- Return to previous condition and reinstate original ecosystem function.
- Minimise the potential for environmental impact during decommissioning and rehabilitation.
- Comply with all legislative and agency requirements, as well as community expectations.
- Hence, we consider that DBCT site must be returned to its pre-construction landform, unless doing so would result in adverse environmental impacts, not comply with relevant legislation or create an unstable, unsafe or polluting post-operational landform. We have assessed each component of the scope of required rehabilitation works to ensure consistency with the primary objective and these principles.

4.3 Key assumptions

To support the development of the rehabilitation plan and associated cost estimate, we have made a range of assumptions regarding the broader scope of works required to rehabilitate the site, and are outlined in section.

The specific and detailed assumptions that relate to each domain segment are identified in Sections 4.3 and 4.4.

4.3.1 The rehabilitation plan reflects the current infrastructure at DBCT

Our Rehabilitation Plan is based on rehabilitating DBCT based on its condition and operating/management model, current as at October 2018. We have not contemplated the rehabilitation effort that may be required if any expansion, or any other changes to the site, was to occur.

4.3.2 DBCT will not be repurposed for another commodity

Consistent with the rehabilitation objective under the PSA, we have assumed that DBCT will not be repurposed to handle another commodity type. We note that if DBCT was required to be repurposed, a significant amount of work would be required to ensure the infrastructure could be used to support another commodity.

4.3.3 Hay Point Coal Terminal (HPCT) will also cease coal trade operations around the same time as DBCT

We have assumed that Hay Point Coal Terminal will cease operations at the same time as DBCT (around 2051). This assumption is consistent with the QCA's DBCT 2005 DAU decision.[7]

[7] Queensland Competition Authority (2005) *Draft Access Undertaking,* pg 134. Available at: http://www.qca.org.au/getattachment/3781eb63-e342-4903-8b5f-3280d9f7b28f/2005-Decision-re-DBCT-Draft-Access-Undertaking.aspx

4.3.3.1 Goonyella rail network and associated balloon loop infrastructure

Since we have assumed that DBCT and HPCT will cease export operations within the same period the economic life of the Bowen Basin coal reserves are diminished, we acknowledge that the Goonyella rail network and associated rail balloon loop infrastructure will no longer be required to service the two terminals. Any repurposing or rehabilitation of the Goonyella rail system, excluding DBCT's balloon loop, as not been contemplated as part of our Rehabilitation Plan.

4.3.3.2 Other general assumption

We have assumed that:

- All infrastructure will be removed from site including foundations.
- The original landform has been assumed to be as per the topographical contours shown on the site Earthworks Layout drawings prepared by MacDonald Wagner & Priddle Consulting Engineers for the Harbours Corporation of Queensland in 1981.
- The current Terminal landform was determined from LIDAR performed for DBCTM in 2015, and Quarry Dam and Rail Loop Dam "as-built" drawings prepared by Cardno in 2015.
- We have relied on the 7X project "as-built" drawings to calculate the relevant quantities associated with the existing terminal.

4.4 Battery limits

The Battery Limits of a site define the boundaries that identify the scope of works required to achieve the objectives of a project (refer Figure 4-2). The Battery Limits determine which assets are included, which will be used to determine the means to rehabilitate those assets in a manner consistent with current industry best-practice and the objectives of the PSA.

The PSA provides that all onshore and offshore land within the boundaries defined by the long-term lease be rehabilitated to its natural state and condition prior to any development or construction having occurred. However, DBCTM has modified the environment that is not covered by geographic boundaries contained in the long-term lease, including the development of supporting infrastructure, such as rail and power infrastructure that has been developed exclusively to support the coal-handling services at DBCT. Hence, we consider that it would be inappropriate to define the Battery Limits by the boundaries of the long-term leases alone.

To appropriately capture the infrastructure and assets to be included within the Battery Limits of DBCT, we developed the following set of principles:

- All assets within the geographic boundaries defined by the long-term leases should be included.
- All assets within the geographic boundaries defined by the short-term leases should be included.
- Third-party assets that are within the geographic boundaries of the long-term or short-term leases, and are used to support the provision of coal-handling services at DBCT, should be included.
- Assets owned by a third-party that provide essential services to DBCT and are not within the boundaries of the relevant leases, and have been constructed exclusively for DBCTM and/or DBCT P/L's use should be included.
- An appropriate share of third-party assets that are shared between DBCT and HPCT and provide essential services to DBCT, or were constructed to support the provision of coal-handling services at DBCT (or the broader Port of Hay Point) should be included.
- An appropriate proportion of assets owned by government agencies and are shared between DBCT and HPCT should be included.

The assets that fall within the Battery Limits of DBCT following these principles in the sections below:

4.4.1 Land tenure

All assets within the geographic boundaries defined by the long-term lease are included in the Battery Limits shown in Figure 4-2. Assets that fall within the geographic boundaries defined by the short-term leases are also included as they contain assets that are critical in supporting the provision of coal-handling services at DBCT. In addition, the areas subject to short-term leases have had their landforms modified and hence will be required to remediate and rehabilitate this land under the existing lease agreements.

The list of long term and short term leases are:

Long term lease agreements with DBCTH

The land that are the subjects of the long-term leases held between DBCTM and DBCTH are:

- Lot 41 on SP136319 – Plant Lease
- Lot 42 on SP136319 – Plant Lease
- Lot 131 on SP136319 – Freehold Head Lease
- Lot 133 on SP136318 – Freehold Head Lease
- Lot 126 on SP136318 – Offshore Sub-Sub-Lease
- Lot 130 on SP136318 – Offshore Sub-Sub-Lease
- Lot 131 on SP136318 – Onshore Sub-Lease
- Lot 133 on SP136320 - Onshore Sub-Lease
- Lot 126 on SP123776 PPL 0/215031 – Perpetual Lease
- Lot 130 on SP105841 on PPL 0/214944 – Perpetual Lease
- Lot 41 on SP136319 TL 0/21623 – Novation and Security Deposit Deed, Road Sub-Sub-Lease
- Lot 42 on SP136319 TL 0/21623 – Novation and Security Deposit Deed, Road Sub-Sub-Lease.

Short term lease agreements with other parties

Land subject to short term leases are:

- Lease C in Lot 132 on SP136318
- Lease D in Lot 132 on SP136318
- Lease E in Lot 132 on SP136318
- Lease I in in Lot 132 on SP136318

4.4.2 Third-party assets within the long-term lease boundaries that are used to support the provision of coal-handling services at DBCT

Where assets exist within the boundaries of the long-term leases, and these assets are used to support the provision of coal-handling services at DBCT, these assets are included in the Battery Limits. These assets include the potable water and raw water connections (to Mackay Regional Council and SunWater respectively) and sewer connection (to Mackay Regional Council).

4.4.3 Third-party assets outside of all lease boundaries that are used to support the provision of coal-handling services at DBCT exclusively

There are assets that are owned by third-parties and exist outside of the lease boundaries that are used to support the provision of coal-handling services at DBCT. These assets were originally constructed with the primary purpose of supporting coal-handling services at DBCT. When the Terminal is remediated, and there is no longer a requirement for these assets, they become redundant. Hence, these assets should be included in the Battery Limits of DBCT.

These assets include the substations and 33 kV overhead power line owned by Ergon that provide 33 kV power to DBCT, and the rail balloon loop (and electrification) that feeds into the rail receival area, owned by Aurizon.

4.4.4 Third-party assets, shared between DBCT and HPCT and used by the public

This is the Tug Harbour and associated elements.

The Tug Harbour was specifically constructed to service the coal export facilities at the Port of Hay Point, through the Dalrymple Bay and Hay Point coal terminals. The breakwater structure was built from rock quarried from DBCT site (which is now the Quarry Dam), and provides a harbour for tug boats and ocean access for recreation vessels at the public boat ramp. It is the only structure within DBCT Battery Limits that is used by the public. It is currently owned and maintained by NQBP, and related costs are funded by harbour dues levied by NQBP on DBCT and HPCT. Because of the public use benefit derived from the tug harbour and associated breakwater structure, it would be inappropriate for DBCTM to rehabilitate this structure. We therefore consider that in lieu of rehabilitation, one-off payment to NQBP or the Queensland Government should be made to provide for thirty years of the maintenance of the facility. This payment should be split equally between DBCT and HPCT.

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

DBCT Management
Rehabilitation Management Plan

Battery Limits Area

Project No. 91-10832
Revision No. 0
Date 04 Jun 2019

FIGURE 4-1

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. DNRME: Cadastre/2018. Created by: tmorton

4.5 Domains

For the purposes of rehabilitation planning, and to best address the complexity of different land uses across the site, DBCT site has been divided into a series of management 'domains'. These domains are based on the rehabilitation requirements for mining resource activities Guideline (Department of Environment and Science 2018) and are illustrated in Figure 4-3 and Figure 4-4.

Primary domains are defined as operational or functional land management units within DBCT site, usually with unique purpose and therefore similar geophysical characteristics and rehabilitation treatment requirements. It is possible that the rehabilitation requirements for each Domain may be different. Secondary domains are based on post-operations land management units characterised by similar land use. They provide a defined final land use and basis for the completion criteria.

The site has been divided into nine primary domains and six secondary domains, as described in Table 4-1.

Table 4-2, respectively.

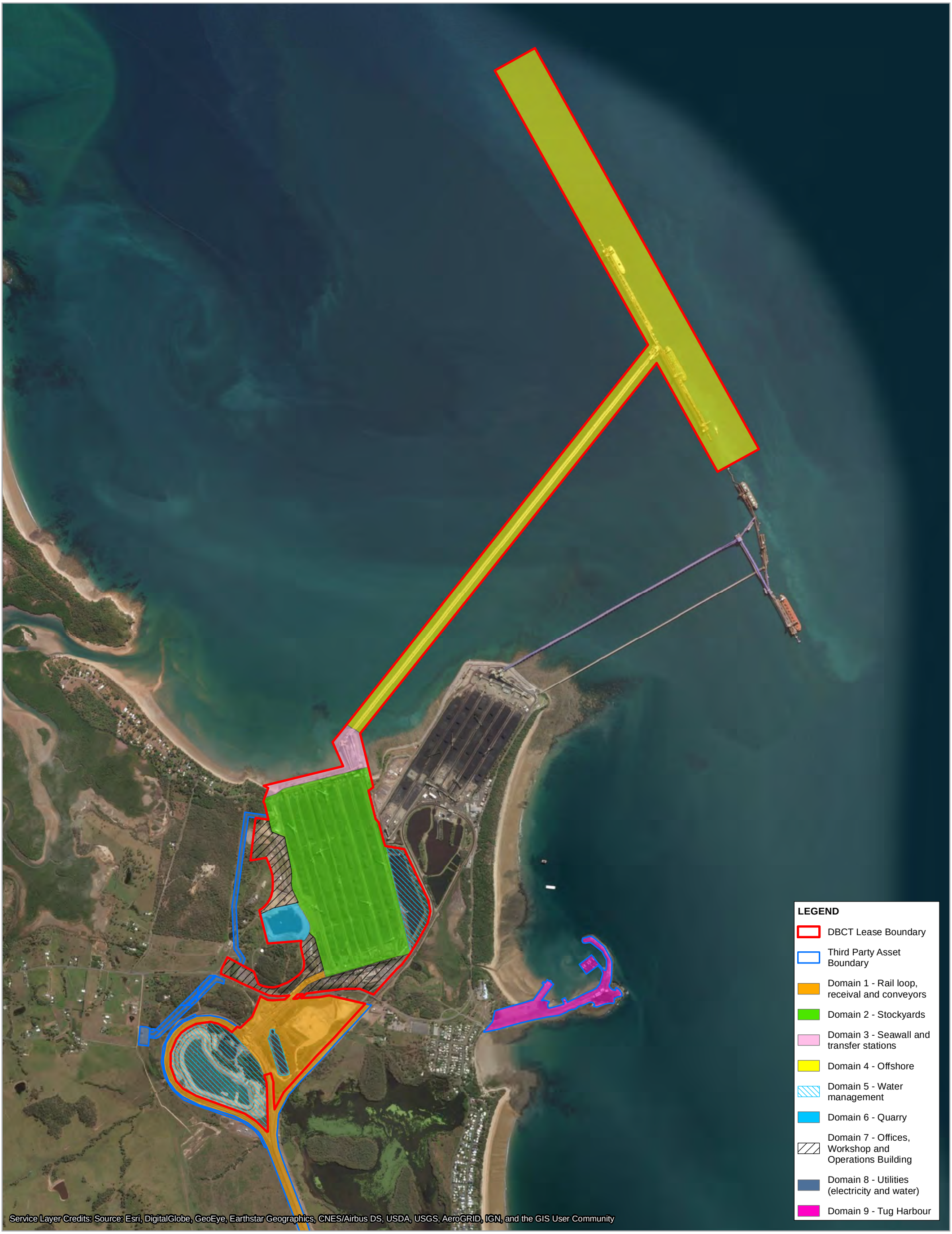
Table 4-1 Primary Domains

Domain	Name	Description
1	Rail loop, receival and conveyors	Rail line and loops, Rail line overhead catenary and support towers, Aurizon substation, Rail receival pits and stations, Pit conveyors, Receival conveyors, and Transfer towers
2	Stockyards	Stockpile pads, Stockyard bunds, Yard machines, Inloading Conveyors, Outloading conveyors, and Towers
3	Seawall and transfer stations	Sea wall structure and bulk earthworks, Hanbars, Outloading conveyors, Towers, Surge bins, Belt feeders, and Sample stations
4	Off shore	Marine structures, Wharf ship loader machines and integral conveyors, Wharf conveyors, Main wharf transfer tower and other towers
5	Water Management	Dams (not including the Quarry Dam) ; Industrial Dam, Rail Loop Dam, Rail Receival Dam, Spindlers Dam and associated water systems
6	Quarry Dam	Quarry Dam and associated infrastructure
7	Admin buildings, Operations and workshops	Paved roads and carparks, Site fencing, Carpark cover structures, Buildings, Sewage and Diesel fuel storage and distribution
8	Utilities (electricity and water)	Ergon 33kV OHL and substation, Main substation and in-plant electrical, Water mains connections
9	Tug Harbour	Incorporates the Groyne and seawall, publicly accessible boat ramps, berths and associated facilities.

Table 4-2 Secondary Domains

Domain	Name	Description
Domain A	Grassland	Suitable for cattle grazing
Domain B	Eucalypt Woodland to Open Forest	Mixed eucalypt vegetation community consistent with pre-existing vegetation community
Domain C	Beach foreshore	Consistent with the rocky platform along the coast
Domain D	Beach ridge	Consistent with pre-existing vegetation community of Coastal Sheoak (*Casuarina equisetifolia* var. *incana*), Breadfruit trees (*Pandanus sp*) and Cupania (*Cupaniopsis ancardiodides*) located as a narrow band on the exposed seaward side of the woodland community, with a sparse groundcover of Beach

		Spinifex (*Spinifex hirsutus*) and Dune Couch (*Zoisia macrantha*).
Domain E	Marine	Consistent with the pre-existing marine environment including offshore gradients and depths
Domain F	Tug Harbour	Not part of DBCT lease but purpose-built to service the terminals, not to be rehabilitated due to significant public use. In lieu of rehabilitation, a one-off payment for ongoing maintenance will be made. No change in land use



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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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DBCT Management
Rehabilitation Management Plan

Primary Domains

Project No. 91-10832
Revision No. 0
Date 04 Jun 2019

FIGURE 4-2

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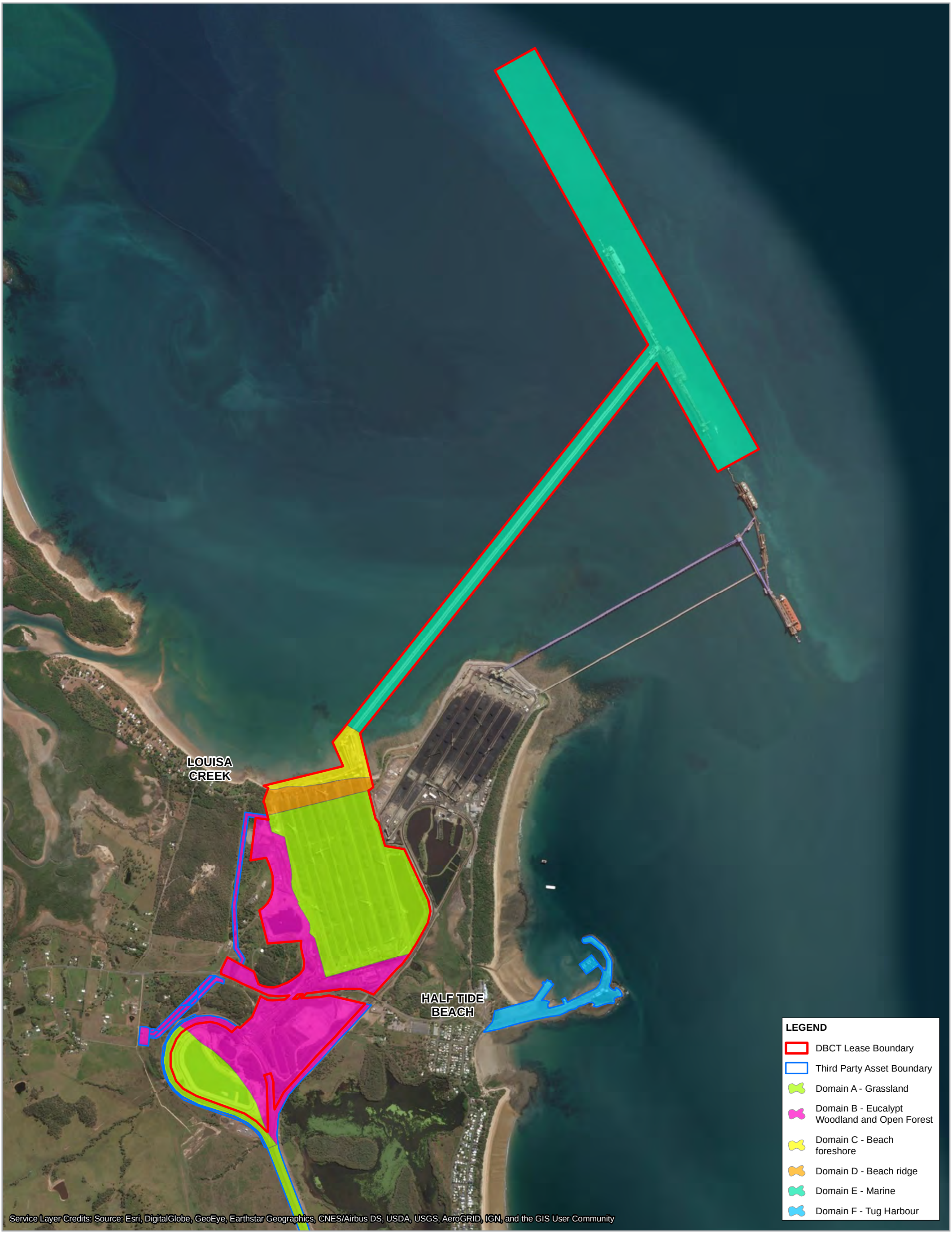
Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. DNRME: Cadastre/2018. Created by: ihamilton, tmorton



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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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DBCT Management
Rehabilitation Management Plan

Secondary Domains

Project No. 91-10832
Revision No. 0
Date 04 Jun 2019

FIGURE 4-3

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Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. DNRME: Cadastre/2018. Created by: ihamilton, tmorton

4.6 Completion Criteria

At the time the rehabilitation obligation falls due, DBCTM will be required to develop a set of completion criteria for the site. The criteria will include environmental indicators for each phase of rehabilitation and likely to include: growth medium establishment; ecosystem establishment; and ecosystem development.

Identifying criteria for completion is important to be able to define when successful rehabilitation has been achieved. The criteria will be measurable and be benchmarked on baseline or local surrounding data where possible and will be a range to be achieved not an absolute number.

The rehabilitation monitoring program (refer section 20) will monitor environmental aspects identified in the completion criteria to not only identify achievement of successful rehabilitation but also when any rehabilitation maintenance activities would be required to ensure successful rehabilitation. The completion criteria will identify the point at which the rehabilitation of the site has been achieved and DBCTM is no longer responsible for the ongoing rehabilitation monitoring or rehabilitation maintenance works of the site.

5. Stakeholder consultation strategy

This section provides the framework for all communication with key internal and external stakeholders when DBCTM's rehabilitation obligation falls due. This includes identification of stakeholders, key messaging, communication activities and an implementation schedule. This section sets out the key requirements for developing a stakeholder consultation strategy that reflects current leading practice, and has formed part of the Cost Estimate.

The stakeholder consultation strategy will ensure that all communication materials provide clear and consistent information regarding the key drivers of rehabilitation, the options that are being investigated by DBCTM and the options assessment process and criteria, as appropriate.

Prior to stakeholder consultation commences, communication and stakeholder engagement plan will be developed to identify the relevant issues, tools, stakeholders and an implementation schedule. This information will then be used to develop the overarching strategic approach to stakeholder consultation.

5.1 Stakeholder identification and assessment

Before the stakeholder consultation occurs, it is important to identify all stakeholders with a potential interest in the rehabilitation of DBCT and the nature of that interest. This allows the potential interest of each stakeholder to be proactively addressed, where possible. The level of engagement with each stakeholder will be determined by the level of impact and influence that stakeholder has in relation to the rehabilitation.

We note that the stakeholders may change by 2051 when DBCTM's rehabilitation obligation falls due. Notwithstanding, we consider the relevant stakeholders are likely include:

- *The Queensland government:* departments of Natural Resources, Mines and Energy, Treasury and Environment and Science. These stakeholders will also include the then current relevant Ministers and the Premier.
- *North Queensland Bulk Ports:* the Port Authority which oversees the strategic planning, environmental management and business and infrastructure development at the Port of Hay Point.
- *Hay Point Coal Terminal operators*: the rehabilitation of DBCT will impact operations in the lead-up to terminal closure, as well as the rehabilitation of HPCT, which is assumed to be concurrent with DBCT. Consultation with the operators of HPCT will facilitate the safe and efficient operation and rehabilitation of HPCT.
- *Users of DBCT facility*: DBCTM will be required to discuss the impact of rehabilitation on the then current users of DBCT facility. We anticipate these conversations will involve the finalisation of operations at the Terminal.
- *Local community groups*: we anticipate this will include the local residents and businesses that are proximally located to the site, as well as local environmental groups.
- *Local indigenous groups*: we note that while there are no active native title claims relating to the site, there are Indigenous groups that possess a claim over the Port of Hay Point land.
- *The Commonwealth government*: we anticipate that certain components of the rehabilitation may be declared as controlled actions under the Environmental Protection and Biodiversity Act 1999 (Cth). At the very least, DBCTM will be required to confirm with the Commonwealth Government whether its rehabilitation plan would be considered a controlled action.

- *Great Barrier Reef Marine Park Authority (GBRMPA)*: GBRMPA is responsible for managing the Great Barrier Reef. It provides a range of services including providing advice on marine management. GRBMPA reports to the Commonwealth Environment Minister. Since DBCT is located proximally to the Great Barrier Reef, we anticipate that GBRMPA, or its successors, would be a key stakeholder for the rehabilitation of the Terminal.
- *Media groups*: since the rehabilitation of DBCT will be a large project and located near the Great Barrier Reef, it is likely that the works will garner the attention of media groups. These groups should be consulted to ensure no misinformation is delivered in the public domain regarding the work.
- *Environmental groups*: the rehabilitation of DBCT will be a large project and some actions are likely to be deemed of national environmental significance, particularly for the rehabilitation of offshore infrastructure. It is likely that local, state and national environmental groups will be stakeholders for the rehabilitation. These groups should be consulted with to ensure no misinformation is being delivered in the public domain regarding the scope of works.

The stakeholder list will be developed by DBCTM when the terminal rehabilitation obligation falls due.

5.2 Issues identification

DBCTM will be required to undertake an issues identification process to evaluate the key issues that are important to the stakeholder groups. These issues typically include things such as employment opportunities for local employees that will lose their employment as a result of the shutdown of the Terminal, the funding of various community activities (such as donations by DBCTM to local community sports teams) and environmental issues, such as the protection of particular species endemic to DBCT region or issues relating to the Great Barrier Reef.

These issues will be used to inform key messages and shape the communication approach for the various stakeholder groups. We have not sought to undertake this kind of identification for the purposes of this Rehabilitation Plan, as we note these issues may be significantly different in September 2051 when DBCTM's rehabilitation obligation falls due.

5.3 Objectives

The key communication objectives of the rehabilitation works will be to:

- Ensure stakeholders are aware of the plan to rehabilitate, the key drivers for rehabilitating the Terminal and potential outcomes of rehabilitation.
- Create support for the project and DBCTM's approach to the development of the rehabilitation plan, as well as future implementation of any selected options for rehabilitation.
- Indicate a clear and transparent process to determine the preferred option to rehabilitate the Terminal.
- Ensure stakeholders understand that the key driver for rehabilitation is DBCTM's obligations under the PSA which reflect the public benefit on behalf of the State of Queensland (the owner of the Terminal).
- Minimise concern within the communities surrounding DBCT regarding rehabilitation.
- Reduce the spread of negative publicity and misinformation about the rehabilitation works.

It is critical that the process for determining a preferred option encompasses external stakeholder considerations and is regarded as transparent by all stakeholders. Given the sensitive nature of the process, it is also important that all messaging is clear, consistent and closely managed.

5.4 Social impact assessment

Social impact assessment is a study undertaken to determine the social impacts or effects of infrastructure projects, and how those projects may impact local populations, businesses and other groups. Social impact assessments enable the identification, evaluation, management and monitoring of the potential social impacts of a project. These assessments measure the direct and indirect impacts of a project over the entire project lifecycle. Currently, social impact assessments are required under the *State Development and Public Works Organisation Act 1971* and the *Environmental Protection Act 1994.* All projects that require an Environmental Impact Assessment require a social impact assessment. It is anticipated that the rehabilitation works of DBCT will require an Environmental Impact Assessment as well as a Social Impact Assessment.

As part of developing a social impact assessment, the proponent is required to embark on stakeholder and community engagement in order to:

- Understand the stakeholders that are likely to be affected as a result of the project and how they may be affected.
- Identify and evaluate the potential social impacts, both positive and negative, of the project.
- Develop strategies to maximise the social benefits of the project and minimise any potential adverse impacts to the community.
- Support the monitoring and reporting of the project's impacts.

DBCTM will be required to develop a Social Impact Assessment when its rehabilitation obligation falls through. DBCTM will be required to understand the potential lifestyle, cultural, community, quality of life and health impacts of the rehabilitation works. The EIS and stakeholder consultation is expected to cost $1.5 M (October 2018 dollars).

6. Land use

This section outlines the regional and local setting and DBCT site prior to development and construction of the terminal. It also describes the land uses for each of the Domains (as described in Section 4.5) which are consistent with land uses prior to the coal terminal construction. These have informed the basis of the rehabilitation activities and the demonstration of successful rehabilitation outcomes.

6.1 Regional and local setting

The key features of the regional and local environment setting for DBCT site are described below.

6.1.1 Regional

DBCT is approximately 40 km south of Mackay and is located in the Mackay, Isaac, Whitsundays region of Queensland. The Great Barrier Reef Marine Park (GBRMP) is located approximately 5 km off-shore from the Terminal.

Mining and mining support services are major economic contributors to the region. The terminals at the Port of Hay Point export coal from the Bowen Basin.

Agriculture is the traditional sector in the region. Sugar cane production, milling and associated products are the main agricultural commodity. The region is also known for horticultural products as it represents one of Australia's leading winter growing areas (Trade and Investment Qld).

Tourism is a major economic contributor to the region. The Great Barrier Reef Marine Park and the Whitsunday Island Group located to the north of Mackay are major tourist areas.

6.1.2 Local

6.1.2.1 Topography

The local setting is dominated by Mt Griffiths (RL 83 m) approximately 2 km south-west of Hay Point. The foot slopes and foothill ridges of Mt Griffiths extend to the south and south-west beyond DBCT site and to the north to Dalrymple Bay.

6.1.2.2 Waterways

Louisa Creek drains the area immediately west of DBCT and Hay Point into Dalrymple Bay. Further to the west, Sandy Creek, Sandringham Creek, Bell's Creek and Alligator Creek drain a larger catchment into Sandringham Bay.

Lake Barfield, an artificially created wetland, is located immediately south of DBCT between Hay Point and the township of Salonika. Grendon Creek, located in the southern sector of DBCT near the rail loop, drains into Lake Barfield. Surface water from the rail loop and in-loading conveyor area drains to Lake Barfield via settlement ponds.

6.1.2.3 Climate

The Mackay area has a tropical climate, receiving on average 1,585 mm of rain annually. The largest percentage of rainfall (in the order of 80%) falls during the cyclone season between December and April (Bureau of Meteorology).

6.1.2.4 Geology and soils

Some soils in low-lying and poor-draining areas, particularly in intertidal mangrove flats and alluvial flats, may include potential acid sulphate soil (PASS) conditions in the substrate. Generally, lands at an elevation below RL 5 m are considered to contain PASS.

6.2 Current and post closure land use options

6.2.1 Current Surrounding Land Uses

6.2.1.1 Communities

DBCT is located within the locality of Hay Point, with the proximate rural-residential area located approximately 1.3 km west of DBCT on Hay Point Road. Other residential areas communities within the suburb of Hay Point are located:

- Along the coastal lowlands immediately to the west of DBCT stockpile area and the environmental bund which runs along the western DBCT boundary, generally known as Louisa Creek.
- Immediately south-east of DBCT, north and east of Lake Barfield associated with Half Tide Beach and Salonika Beach.
- Tug Harbour, located approximately 2 km to the south of DBCT and HPCT. The harbour was constructed by forming artificial breakwaters around Half Tide Island and provides berths for tugs and various work boats. A recreational boat ramp is also located within Tug Harbour.

6.2.1.2 Conservation Area

DBCT is located in close proximity to a number of sensitive environmental areas and conservation areas as outlined in Table 6-1.

Table 6-1State and Commonwealth Listed Conservation Areas

Conservation area	General location from site
State listed	
Protected areas	Mt Hector Conservation Park, approximately 1.5 km north-west of the site.
Marine Park	The nearest marine park is the Great Barrier Reef Coast Marine Park (GBRMP), approximately 23 km north of the site in the vicinity of Slade Point.
Declared fish habitat area	Bassett Basin Fish Habitat Area, approximately 18 km north of the site in the vicinity of Mackay.
Wildlife habitat	Immediately west of the site, east of the HPCT site, and in association with Lake Barfield.
Regulated vegetation (category B)	West of the site, east of the HPCT site, and in association with Lake Barfield.
Regulated vegetation (category C)	Within DBCT rail loop, south of the HPCT rail loop, and on the north-western corner of the site.
Regulated vegetation (category R)	In association with the former creek/drainage line through DBCT rail loop.
Regulated vegetation (essential habitat)	East of HPCT, immediately west of the residential area at Half Tide Beach; and north, south and west of Mt Hector Conservation Park.
Coastal Management District	Immediately west and north of the site, and immediately east of the rail line associated with DBCT and HPCT.
High Ecological Value Water Areas	In association with Mt Hector Conservation Area, 1.5 km north-west of the site.

Conservation area	General location from site
Commonwealth Matters of National Environmental Significance	
Nationally Important Wetlands	Great Barrier Reef Marine Park: Approximately 500 metres south of Tug Harbour. Sandringham Bay – Bakers Creek Aggregation: Approximately 3.5 km north-west of the site.
World Heritage Properties	Great Barrier Reef: Immediately north of the site, and immediately surrounding the HPCT to the east, north and north-west.
National Heritage Places	Great Barrier Reef: Immediately north of the site, and immediately surrounding the HPCT to the east, north and north-west.
Great Barrier Reef Marine Park	Great Barrier Reef Marine Park: • Habitat protection: Approximately 500 metres south of Tug Harbour. • General use zone: Approximately 3.5 km from the northern boundary of the HPCT.

6.2.1.3 Industry

HPCT adjoins DBCT site to the north. The HPCT facilities include conveyors and ship berths, stockpiles on the northern tip and a rail loop on the southern boundary. The broader area to the west and inland from DBCT is primarily agricultural land.

6.2.1.4 Cultural

DBCT and its surrounding area form part of the traditional territory of the Yuibera (Yuwiburra) clan of the Birri Gubba tribe. A large number of Indigenous organisations represent the interests of local Aboriginal people in the area.

There is only one active Native Title claim registered with the National Native Title Tribunal Register. This is Claim QC2013/008 by the Yuwibara People. This claim covers an area from Cape Palmerston National Park in the south to Midgeton in north. The claim area includes Hay Point and DBCT area.

6.2.2 Post closure Land Use

An assessment of historic photos, previous environmental assessments and state government database searches where undertaken to establish the natural state and condition as existed on the site prior to any development or construction activity occurred on DBCT site. Between 1960 and 1972 large areas of DBCT site was cleared of vegetation for grazing purposes.

As such, the condition prior to DBCT site being developed is modified grassland associated with grazing and a number of remnant vegetation communities including mixed Eucalypt Woodland and open forest, dune/ beach ridge, riparian and gully vegetation. Remnant vegetation is associated with an ecosystem function land use.

Prior to the construction of the offshore infrastructure, Dalrymple Bay and Hay Point were an exposed, tropical area with a strong oceanic influence. Habitats surrounding Dalrymple Bay and Hay Point are described by CSIRO (1998) as comprising rocky shorelines, sand beaches, mangroves, sand and mud flats, and lower intertidal (e.g. covered at high tide and uncovered at low tide) rocky reefs. The Tug Harbour was formed by constructing to major breakwaters around Half Tide Island using natural rock material from within DBCT site.

The proposed land uses following closure of the coal terminal are provided in Table 6-2. These land uses are comparable with natural and pre-existing conditions and satisfy the rehabilitation objective for the site.

Table 6-2 Domains and Land Use to define the scope of rehabilitation work

Primary Domain	Name	Secondary Domain and Final Land Use Description
1	Rail loop, receival and conveyors	A – Grassland B – Eucalypt Woodland to Open Forest
2	Stockyards	A – Grassland
3	Seawall and transfer	C – Beach Foreshore D – Beach Ridge
4	Off shore	E - Marine
5	Admin buildings, Operations and workshops	B – Eucalypt Woodland to Open Forest
6	Water infrastructure	A – Grassland B – Eucalypt Woodland to Open Forest
7	Quarry Dam	B – Eucalypt Woodland to Open Forest
8	Utilities (electricity and water)	B – Eucalypt Woodland to Open Forest
9	Tug Harbour	F – Tug Harbour, no change

6.3 Final Landform

The topography and landform of DBCT site prior to any development or construction has been established via LIDAR and topographical mapping information. This was then used as a conceptual landform to calculate cut-and-fill volumes required to return the modified site to a topography similar to the pre-construction landform. A detailed landform design and cut-and-fill balance has not been undertaken at this time, however it is recommended that a detailed landform design and cut/ fill material balance be undertaken within five years of closure to better inform works schedule.

A conceptual landform for intertidal areas has not been established at this time. It is recommended that further investigation of coastal processes be undertaken when the timeframe for decommissioning and rehabilitation is known. Due to the dynamic nature of intertidal and marine environments, it is considered premature to determine final landform for the marine environment given that the potential timeframe for closure is greater than five years away.

7. Land use constraints and opportunities

This chapter sets out the main environmental aspects that have the potential to be an opportunity during rehabilitation or constraint to achieving the completion criteria and the rehabilitation objectives.

7.1 Contamination and hazardous materials

Potential sources of contamination at DBCT may include:

- Coal dust and particles from a number of sources including: rail load out operations, stacking, reclaiming and ship loading.
- Coal material at base of stockyard.
- Treatment and re-use of sewer effluent and septic tanks located on site.
- Small quantities of herbicides for weed management.
- The use and storage of hydrocarbons on site including two underground and an above ground storage tanks.

Coal is widely considered to be a relatively inert substance in marine environments. Coal spillage from coal terminals impacts marine benthos through physical, as opposed to chemical, disruptions to the benthic communities. Coal at the base of the stockyard is considered to be a contaminant and it may have the potential to pollute the environment, particularly groundwater sources. As such, all coal material at the base of the stockyard area in (Domain 2), will need to be removed for the purposes of rehabilitation.

The Industrial Dam collects all recycled operational water and high intensity stormwater run-off from the stockyard and out-loading conveyor systems. The sites primary water management objective is to minimise uncontrolled discharges from the Industrial Dam into the Sandfly Creek receiving environment, and to ensure that any water released contains Total Suspended Solids (TSS) lower than the allowable release limits. To achieve this DBCT have implemented coal fines recovery infrastructure that allows for detention, settlement and recovery of the settled coal fines outside of the historical wet season and constructed a flocculant plant to encourage the incoming coal fines to settle out quickly into the ID cells for later removal. The long term likelihood of water quality exceedances from the DBCT Industrial Dam is approximately 1 in 7 years.

Monitoring of groundwater quality undertaken by DBCTM to date has identified degradation of the groundwater due to the infiltration of leachate from the coal stockpiles, underground fuel storage tanks, waste oil storage areas or septic tanks. No specific remediation is required however continued groundwater monitoring will be undertaken. An assessment of groundwater quality at the time of decommissioning and rehabilitation will be required to assess whether any rehabilitation actions are required for groundwater.

Similarly, no areas of contaminated soil have been identified by DBCTM and therefore no offsite disposal of contaminated soils is proposed. An assessment of potential soil contamination at the time of decommissioning and rehabilitation will be undertaken to determine the extent of any soil contamination.

Based on the results of investigations to date, the areas of DBCT site that are considered to require remediation or management to reduce the risk of potential impacts to sensitive ecological receptors following closure include the coal material at base of stockyards (Domain 2).

7.2 Salinity

Soil salinity is the salt content in the soil and is estimated by measuring the electrical conductivity or EC of the soil. The EIS (2000) states that with the exception of the soils on the alluvial flats (in terrain units Qa1) which have low to moderate salinity, EC (1:5) in the range of 0.2 to 0.6 mS/cm. It also states that all other samples have nil to very low salinity levels with EC (1:5) <0.2 mS/cm, which represents no significant salinity problems for plant growth.

7.3 Landform

The construction of DBCT has modified the landform and topography of the site that existed prior to construction occurring on the site. Landforms include specific naturally formed features and the most significant changes to these have occurred on the eastern side of the low ridge that forms part of the foot slopes and foothill ridges of Mt Griffiths. The Quarry Dam (Domain 6) has been cut into the side of this landform, rock material removed and benches cut into the slope for stability undertaken to supply rock to the Tug Harbour to construct the breakwater.

The pre-construction landform of DBCT that has been identified via LIDAR, historical topographic maps and project EIS reports is summarised in Table 7-1. This information supports the assessment of the work that needs to be undertaken to return to the site to pre-construction conditions, consistent with the rehabilitation objectives.

Table 7-1 Pre construction landform based on terrain units for each Domain

Domain	Landform and Slope Gradient
1 – Rail loop, receival and conveyors	Ranges from near flat to gently sloping with some areas of undulating lower slopes and rolling to low hills 2-10% slope
2 - Stockyards	Has not been described however based on the location and surrounding topography is predicted to have been nearly flat slightly elevated
3 – Seawall and transfer	Beach and coastal flats. Near flat slightly elevated. This area has been reclaimed and stabilised using a seawall.
4 – Off Shore	Includes intertidal and marine areas
5 – Admin buildings, operations and workshops	Mix of low hilly to hilly lands with undulating lower slopes and rolling to low hills Mostly 5-20% slope
6 – Water management	Ranges from near flat to gently sloping with some areas of undulating lower slopes and rolling to low hills 2-10% slope
7 – Quarry Dam	Low hilly to hilly lands 5-20% slope
8 - Utilities	Undulating lower slope and rolling to hilly land. 5-10% slope
9 – Tug harbour	Built structure out into the ocean

A conceptual final landform consistent with the topography and landform of DBCT site prior to development and construction of DBCT site was undertaken using LIDAR and historical topographical mapping to enable cut and fill calculations to be made. By comparing the existing landform and topography and historical topographic information, we calculated an approximate extent of earthworks, including a conceptual material balance, to achieve a final landform consistent with the pre-development state. The conceptual landform was based on the information in Table 7-2. These assumptions will need to be refined and a detailed landform design developed prior to closure.

Table 7-2 Landform assumptions

Component	Design Assumption
Batter slopes	All slopes are to have a maximum final gradient no greater than 1 (vertical) to 3 (horizontal) (1V:3H: approximately 18°).
Carbonaceous material	Will be removed from the base of the stockyard area.
Roads and tracks	Where roads and tracks are to be removed, all road base, asphalt or concrete will be removed. The tracks will then be ripped and ameliorated to promote vegetation regrowth from adjacent areas.
Survey data	The conceptual final landform design was developed from currently available survey data.
Base fill material	Imported fill material will be deemed suitable if it has soil characteristics consistent with local soil types including, stony and sandy loam to fine sandy clay loam and silty clay.
Growth medium	Material will be sourced for use as a growth medium with some amelioration. Amelioration rates will be dependent on the soil characteristics of the source material. Growth medium is to be spread to a thickness of 100 mm and then amelioration measures undertaken to increase nutrient capacity and to stabilise the material. Growth medium is proposed to either include All growth medium will be: • Screened of the waste rock to remove larger rocks (larger than 100 mm). • Blending of the screened material with fertiliser and organic matter (including bio-solids and/or composted vegetation from site clearing works) to improve soil fertility.
Drainage design	The landform design would be generally free-draining landform, except where local depressions would be retained for the purposes of improving local soil moisture and improving vegetation establishment. Where surface water flows are expected to be concentrated, suitably armoured flow paths would be established. Once vegetation coverage is established, the quality of the surface water runoff would be comparable to similarly vegetated areas within the vicinity of the site (i.e. grasslands and woodlands).
Vegetation	The site would be revegetated to include areas of grasslands, beach foreshore and open woodland, depending on the location and expected final land use.
Infrastructure	All infrastructure would be removed from the site prior to filling, regrading and revegetation activities.
Road and rail ballast	Road and rail ballast would be removed except is the ballast is tested and is proven to be clean.
Dams	Where water storage dams are to be removed, the dams would first be drained, coal fines removed and the dam walls pushed in to partially fill the dam prior to being regraded, capped and revegetated. Two options for the quarry dam are considered and include the following methodology: 1. Doze Dam wall into Quarry void – no crushed concrete placement Empty water, push wall into quarry void to create a final landform as per design that doesn't have additional material needed. Will depend on closure criteria and the ability to create a safe and stable solution. 2. Fill Quarry void – crushed concrete placement Empty water, store concrete waste in void, use dam wall material to cap concrete. Complete final shaping as per design and then place final topsoil and revegetate.
Fill material	Fill material would be placed in layer(s), contoured and track rolled between layers. A growth medium about 100 mm thick would then be placed, or ameliorants added to the fill material to create a growth medium prior to the application of a suitable vegetation seed mix.

A conceptual material balance was developed for the earthworks associated with the final landform. The material balance identified the cut and fill volumes for each Domain and is detailed in Table 7-3.

Material needed to meet the fill requirements of each Domain will be met by those Domains that are in material excess and from imported material.

During the staged expansions of DBCT site, any excess material has been stockpiled in areas either side of Horyu Maru Drive near the main road within Domains 1 and 7. The volume and suitability of this excess material is unknown, and stockpiles have been re-vegetated. The material used to fill the reclaimed area of the seawall and transfer area in Domain 3 originated from the grading and levelling of the stockyard area and construction of the Industrial Dam. This material will be able to be reused to fill other areas onsite.

Table 7-3 Preliminary Material Balance Estimates

Domain	Cut (m^3)	Fill (m^3)
Domain 1 - Rail loop, receival and conveyors	8,400	800,000
Domain 2 - Stockyards	-	4,218,000
Domain 3 – Seawall and transfer	1,341,000	-
Domain 4 - Offshore	-	-
Domain 5 – Water Management	66,100	810,100
Domain 6 - Quarry Dam		1,200,000
Domain 7 – Offices and Workshops	730,700	125,200
Domain 8 - Utilities	-	-
Domain 9 – Tug Harbour	-	-

Note: the estimates have been rounded

The Quarry Dam was used to source rock material for the sea wall at Tug Harbour. As such, the Quarry Dam will require to filled and reshaped by one of two proposed methods, as described in Table 7-2.

Suitable clean fill material will be required to be sourced and transported to site for reshaping and use as a growth medium.

During demolition activities the steel reinforcement will be removed and concrete will be crushed prior to disposal off-site. Crushed concrete to a size less than 100 mm is considered as clean earth material and will be used in select locations as fill material. It has been assumed that all of the crushed concrete can be used strategically as fill material in the Stockyards (Domain 2) and Quarry Dam (Domain 6). Use of large volumes of crushed concrete as fill material can impact a number of factors affecting successful rehabilitation which have been considered, including:

- Alkaline leaching
- Permeability characteristics
- Negative impact on growth of plants and trees
- Settlement and stability issues

Scheduling of the earthworks will need to consider the wet season and ensure that disturbed areas have a protective cover (either vegetation, soil binder or other) in place prior to the commencement of the wet season during the summer months.

7.4 Surface water

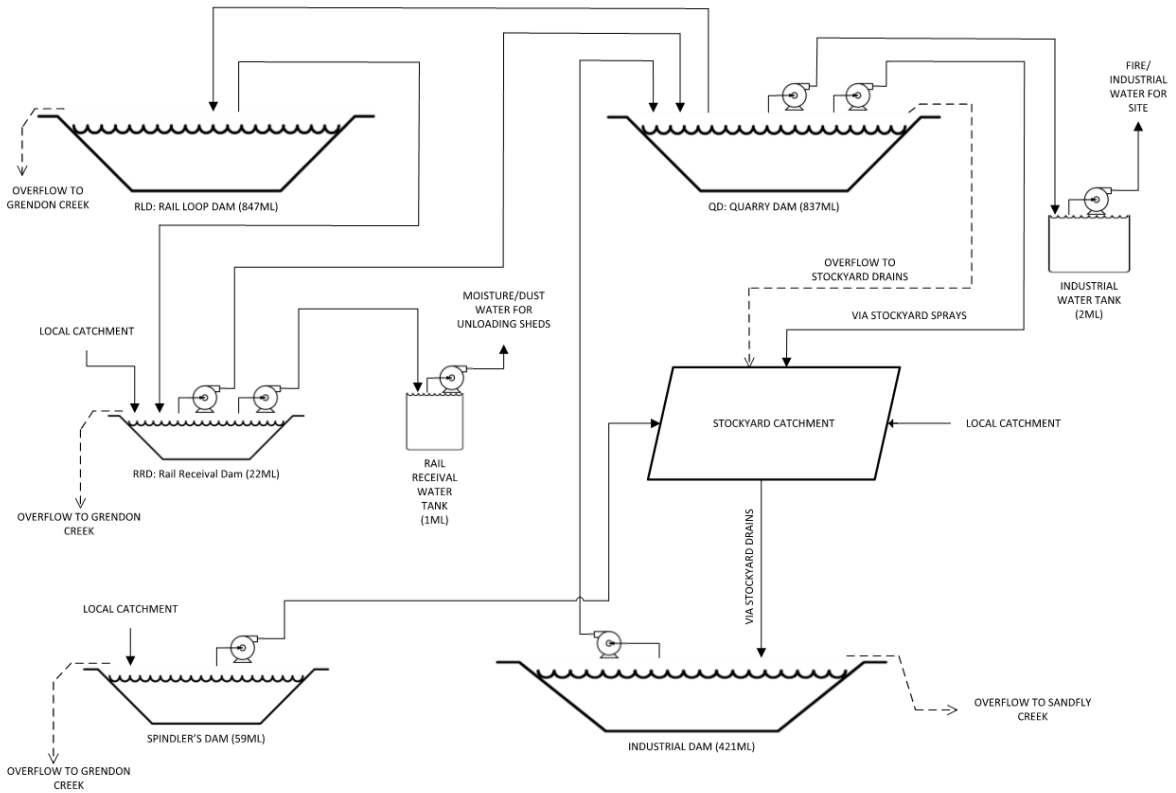
Site infrastructure has been developed to control the flow of surface water at the site. Three reservoirs have been constructed on site to harvest runoff for re-use on site. These are Quarry Dam, Industrial Dam and Raw Water Dam. Industrial Dam is the main storage reservoir (Domain 5). Quarry Dam is used as a storage area for Industrial Dam with water pumped between the two.

Stormwater in the north-west corner of the site, including the scrapyard, quarry, the eastern side of the environmental bund and substation 1, flows under the road at the north-west corner of the site and discharges onto the beach to the east of Louisa Creek Township.

Surface water in the stockpile area is directed via drains to sedimentation ponds where coal fines settle out. Water from the sedimentation ponds is directed to the Industrial Dam. The Industrial Dam is maintained at minimum water levels to maximise the terminals buffer storage. High flow pumps transfer water to the Quarry Dam at a rate up to 1,100 litres per second. The Quarry Dam serves as the primary operation water storage dam at the terminal. Overflow from the Quarry Dam is stored in the Rail Loop Dam which transfers water back to the Quarry Dam as required. Water in the terminal is used for dust suppression and wash down water. Water from the Industrial Dam overflows into Sandfly Creek, then ultimately Tug Harbour.

To the south of the site near the in-loading conveyors, water drains to the Rail Receival and Spindlers' Dam of which receives runoff from their local catchments and returns water into the water system. In heavy rain events, these dams overflow into Grendon Creek and hence onto Lake Barfield. In high rainfall events, overflow from Lake Barfield flows into the ocean south of Tug Harbour.

Figure 7-1 DBCT water system flow diagram



7.5 Marine and coastal

Site infrastructure is located within the intertidal and marine areas specifically the seawall and transfer infrastructure (Domain 3), jetty and loading facility (Domain 4) and Tug Harbour (Domain 9).

The Port of Hay Point lies within the boundaries of the Great Barrier Reef World Heritage Area and there are numerous sensitive marine environments within Dalrymple Bay and Hay Point area as identified in specialist studies undertaken during environmental impact assessments for the site, including:

A number of threatened and protected species have been recorded utilising the off-shore, sub-tidal inter-tidal zone, estuarine and shoreline habitats in the area.

Sand beaches in the area, such as Louisa Creek Beach to the west of DBCT, provide habitat for shorebirds and waders, crabs and flat back turtles. Sightings of green turtles has also been recorded on local beaches from November to April. No night works would be prudent from October to February to minimise impacts on nesting turtles (EIS Table 20.9). Hence, DBCTM will not be permitted to perform any night works to conform to this requirement.

- Large stands of mangroves are located in Sandringham Bay to the west of DBCT, together with Louisa Creek, Breens Creek and small remnant areas at Hay Point.
- No coral reef development has been identified in the Hay Point region, although soft corals and isolated small colonies of sediment-tolerant hard corals are present on some of the lowermost exposed parts of the intertidal platforms and occur on the inshore rocky shoals (EIS 2000).
- Whale species including sei whales and fin whales occasionally visit the local waters, together with several dolphin species.

Hay Point is a rocky promontory that separates the south end of Dalrymple Bay from a string of beaches that pass southward for 5 km to Breens Creek and then Point Victor a further 2 km south. Sandy beaches and bands of low relief rocky platforms are common along the coastline.

While the outer Great Barrier Reef is approximately 120 km off-shore it still influences the wave climate and tidal propagation characteristics (EIS 2000). The DBCT site is also subject to influences of tropical cyclones with elevated water levels and severe waves. The general depth of water around the berths is approximately 12 to 13 m below LAT (lowest astronomical tide).

The actions associated with removing or partially removing the marine infrastructure, including the piers and loading berths and reclaimed areas, would require significant engineering controls to minimise impacts on marine ecology.

The original shoreline to the north of the stockyards has been reclaimed and stabilised with 10 m high assemblies of 5 tonne hanbars to allow for the transfer station infrastructure and provide protection from storm surge and cyclones. The material used to fill this area has originated from the grading and levelling of the stockyard area and construction of the Industrial Dam. Prior to construction, the upper intertidal sand beaches in this area were generally associated with low relief broken rocky platforms that occupy the mid-tidal and lower intertidal zones. Complete removal of the seawall area in Domain 3 poses a potential constraint to rehabilitation and requires assessment on a risk based approach to ensure that any impacts are adequately understood. Potential impacts include:

- Changes to coastal processes including nearshore sediment transfer and impacts to coastal alignment.
- Mobilisation of sediments to the sensitive receiving environment.
- Sea level rise.

It is not considered appropriate to undertake detailed assessment of these impacts at this time due to the dynamic nature of the coastal environment and the uncertainty of the timing of closure. Any detail design of the profile of the beach area following removal of the seawall would be subject to further investigation with a view to further optimising the design at the time of closure.

As such, for the purposes of this plan, the seawall and reclaimed area will be removed to the beach toe of the seawall to provide an artificial rock platform. This approach seeks to provide a similar profile to the bands of low relief rocky platforms which are common along the coastline.

The off-shore infrastructure includes 1,706 1200 mm diameter steel piles associated with the berths and trestle jetty which is approximately 3.7 km long. Each pile has been driven to the point of refusal and are therefore at varying depths within the seabed. The two options for demolition and rehabilitation include full removal of the pile or partial removal.

Benchmarking against other demolition projects resulted in no similar projects being found which matched the scale or varying locations with the marine environment at DBCT site. It was also identified that there is no leading practice method or preferred environmental option accepted by government agencies. It was concluded that the most appropriate removal method and environmental option of piles would be determined by the characteristics and coastal processes that influence each site. (We consider that the recent jetty removal at HPCT is not a suitable benchmark, as the process did not involve all terminal areas, only the redundant offshore area. The scope of the HPCT is not the same as the DBCT; piles have only been cut off at sea bed level and not extracted as required in the DBCT provisions).

The HPCT has been used to understand the complexities and benchmark for demolition only, however as the whole project is not complete, we cannot use it to compare costs.

The jetty piles are located within intertidal, nearshore and offshore zones. Both removal methods have the potential to negatively impact on all zones within the marine environment. To ensure that the most appropriate method of removal in regards to potential short and long term impacts to the marine environment a detailed assessment will be undertaken to assess these potential impacts of each option on sediment movements, water quality and benthic and seagrasses in the area prior to selection of the preferred removal option. It was therefore considered necessary to include two options for demolition. The two options considered include full removal of all 1,706 piles or partial removal of each pile to a depth of approximately 1 m below the seabed. In both instances, cutting below seabed level is necessary to reinstate the coastal processes, including associated sand and benthic communities that would have existed in the pre-construction status quo at DBCT.

Based on our assessment of EIS documentation for the site, the Tug Harbour was specifically constructed to service both DBCT and HPCT at the Port of Hay Point. The breakwater structure was built from rock quarried from DBCT site (which is now the Quarry Dam), and provides a harbour for tug boats and ocean access for recreation vessels at the public boat ramp. It is the only structure within the Battery Limits that is used by the public. We have proposed that the Tug Harbour would remain; see chapter 19 for the analysis on this.

7.6 Terrestrial Ecology and Biodiversity

It should be acknowledged that an artificially created vegetation community cannot fully replace the structure and diversity of the naturally occurring vegetation communities that existed on DBCT site prior to construction due to the effects of variation in substrate and drainage conditions. However, species that are indigenous to the local area and representative of vegetation communities will be used in revegetation of DBCT site.

8. Decommissioning and demolition

This section sets out, the works required to cease operations and remove the infrastructure from the site. It includes the decommissioning, demolition and disposal of the infrastructure.

8.1 Approach

In developing the strategic approach to decommissioning/demolition, we have considered:

- Industry practice for the demolition/decommissioning based on activities on comparable sites, including mines and other large infrastructure projects, such as power stations.
- Information (including drawings) provided by DBCTM and gathered on the two day site visit.
- Current relevant legislation, regulations and controls.
- Equipment availability and capacity of the existing structures (such as the wharf and jetty) to support the demolition equipment.

Decommissioning and demolition are two distinct phases of a closure project requiring different equipment and labour skill sets. Decommissioning activities are the works required to make redundant equipment and infrastructure safe, including the removal of stored energy prior to demolition works commencing. This phase allows the demolition crew to enter and work on structures and services infrastructure safely and without impacting other uses that may be connected to the live services (see Section 9.1.1 on safety-related considerations (e.g. fatigue-management requirements)). Demolition refers to the removal of the infrastructure once the decommissioning has occurred. Removal of hazardous building material, such as asbestos will occur prior to demolition and for the purposes of this estimate has been included in decommissioning costs.

The key difference between the decommissioning/demolition activities and rehabilitation of the site is that decommissioning and demolition is focused on the built infrastructure, whereas rehabilitation is focused on the environment and landform.

Given DBCTM's rehabilitation obligation falls due in 2051, we note that the strategic approach to decommissioning and demolition may change in-line with evolutions in technology, industry practice, legislation, regulations and controls. Hence, the decommissioning and demolition scope of works in this Rehabilitation Plan may need to be adjusted to reflect any future developments in respect of equipment, technology, industry practice or legislative requirements and controls.

8.2 Overview of decommissioning/demolition works

The decommissioning and demolition works (D&D works) will be completed in a staged process. The decommissioning stage will consist of de-energisation and decontamination works to make the facilities safe for the demolition works. The demolition works will consist of the removal and disposal of the infrastructure and waste generated by the project.

8.3 Decommissioning

Decommissioning, for the purposes of this report, is defined as the works required to make safe the redundant equipment and infrastructure, including the removal of stored energy. Based on our assessment of the site, we anticipate the following works will be required during the decommissioning phase:

- Removal of all coal on site from bins, conveyors and infrastructure.
- Drainage and removal of fluids such as chemicals, hydrocarbons and water.
- Degassing refrigerants.
- Isolation and disconnection of electrical services.
- Isolation and disconnection of reticulated services, including flushing and capturing waste, where required.
- Release of suspended energy (gravity) and tension.
- Removal of pneumatic systems including deregistration of registered or regulated equipment.
- Installation of temporary and/or the modification of existing services as required for ongoing maintenance and demolition works.

Once the decommissioning has been completed and prior to the commencement of the demolition phase, the removal of any hazardous building materials, such as asbestos, as far as reasonably practicable will be required.

The decommissioning phase will be complete when the infrastructure is in a safe state with stored energy sources, so far as reasonably practical, released. Upon completion, the demolition phase of work can begin.

8.4 Demolition

The demolition methodologies outlined in this section and in the domain specific commentary are based on current demolition practices and do not exclude the use of other methods as appropriate. The methods outlined in each domain have formed the basis of the cost estimate only. It is understood that new technologies may be developed to aid the safety and efficiency of the demolition by the time the demolition works actually occur and these should be considered when updating future cost estimates.

The scope of demolition work includes removal of:

- Buildings and structures.
- Machines, equipment and coal handling and processing infrastructure.
- Services and associated infrastructure e.g. pipework, tanks, substations etc.
- Footings, foundations and basements associated with the removed infrastructure.

The demolition of the infrastructure will be undertaken in accordance with industry practice, using methods readily available in the market. It is likely to involve the use of machines, as far as reasonably practicable to remove the infrastructure.

The demolition methods employed to complete these works will use a combination of mechanical demolition, deconstruction and induced collapse. Induced collapse methods include pre-weakening cut and pull methods or explosive demolition. A basic description of these techniques is provided in sections 8.4.1 to 8.4.3. The infrastructure specific demolition methods will be discussed further in sections 11 to 18.

8.4.1 Deconstruction techniques

Deconstruction techniques involves the manual cutting and lifting of sections of the building or infrastructure. This technique is labour intensive and requires the use of cranes to execute the lifts. This method is typically used where salvage of equipment from the buildings is required or where there are space constraints that limit other demolition methods. In particular this method may be required for some buildings and machines on the wharf where controlling dropped objects is particularly important.

However, as this is a labour intensive process, this method exposes the work crew to high-risk activities such as working at height, hot works at height, lifting and dropped objects. The higher risk activities and the additional cost of the crane usage means this technique is less favourable compared to other techniques.

8.4.2 Mechanical demolition

Mechanical demolition techniques are generally considered one of the safest methods of demolition. This method involves using excavators with attachments such as shears, hammers/pulverisers, grabs and buckets to shear through steelwork, crush concrete and process material to size for disposal. This method removes people from the immediate vicinity of the demolition works. For steel material, with plate thicknesses up to 30 mm, 36 tonne machines have the capacity to process the scrap in readiness for removal from site. The capacity and geometric constraints of the wharf and jetty will limit the amount of mechanical demolition that can be completed on the offshore infrastructure.

8.4.3 Induced collapse

Induced collapse techniques are commonly used in combination with mechanical demolition. This technique is used to collapse the structure down to a safe height for mechanical processing. This is used where there is sufficient clearance to adjacent infrastructure to be protected or maintained. Two types of induced collapse are Cut and Pull and Explosive demolition.

8.4.3.1 Cut and pull

Cut and pull demolition involves preparing the structure by pre-weakening the structural support system and cutting columns so that when the force is applied from the pull cables the columns fail and the structure collapses in the planned direction. Cut and pull techniques are generally appropriate for lighter structures where excess structural capacity can be removed to weaken the structure such that the force applied from pull cables and excavators will be sufficient to induce the collapse. Once on the ground the structure is then mechanically processed.

Cut and Pull techniques will not be applicable for the offshore infrastructure. Some of the surge bins and taller structures will be subject to cut and pull techniques.

8.4.3.2 Explosive demolition

When carefully planned, explosive demolition may be the safest way to complete a demolition. The demolition can be set up so that cutting and kicking charges are used to complete the final cuts and induce the collapse of the structure such that people are remote from the collapse. This method of demolition is typically used where the structure is heavy and pre-weakening the structure to a state suitable for cut and pull collapse is difficult to achieve safely. Once on the ground, the structures will then be mechanically processed.

This technique is typically used for stackers and reclaimers where the removal of a section of the machine could cause the structural system to become unstable resulting in a premature collapse.

8.5 Disposal

Disposal of the waste generated from the demolition works is a key component of the decommissioning and demolition stage.

Disposal of the waste generated from the demolition works at DBCT will be in accordance with the regulations, company polices, licencing requirements and the project specific waste management plan.

The following disposal options will be considered:

- Salvage
- Recycling
- Disposal to onsite landfills, including crushing of concrete for disposal into voids, or to offsite landfills.

Based on our review of drawings provided by DBCTM and our site visit, we understand that all concrete present on the site will be able to be crushed for disposal in voids and as fill material on site. Any material additional to that calculated will be disposed of at an offsite landfill unless a recycling option is available such as road base for a road upgrade project at the time of demolition.

Salvage of equipment and machines is not considered to be a feasible option. The facility will be at the end of its useful life and as such the machines are also expected to be at the end of their operational life and not retain any residual value. At the time of closure, a waste management plan will be required to identify where each of the waste streams can be disposed of. Typical waste streams and disposal options are identified in Table 8-1.

Table 8-1 Disposal Options

Item	Disposal option	Comments
Structural Steel (non-contaminated)	Recycle	N/A
Structural Steel (contaminated)	Offsite disposal	Lead and/or antifouling paint, and changes in market conditions and regulations may result in limited disposal options. Refer to section 9.5
Asbestos	Offsite disposal	At licenced asbestos disposal facility
Rubber	Offsite disposal	At licenced disposal facility
Timber (contaminated)	Offsite disposal	At licenced disposal facility capable of accepting contaminated timber.
Synthetic Mineral Fibre (SMF)	Offsite disposal	At licenced disposal facility
Copper and high value metals	Recycled	Will be separated into ferrous and non-ferrous metals
Concrete	Onsite voids	After crushing to <100 mm
Residual product	Salvage	Sell product with final shipments where possible
Chemicals	Offsite	At licenced disposal facility for chemicals, e.g. cleaning products
Gas	Offsite	At licenced disposal facility (e.g. refrigerants)
Hydrocarbons	Offsite	At licenced disposal facility (e.g. gear box oil, lubricants)

9. Decommissioning and demolition constraints and opportunities

There are a number of constraints that are applicable to the planning and execution of the decommissioning and demolition works. The sections below outline the constraints and opportunities at each stage of the works.

9.1 Access

During the decommissioning and demolition phase of work, access will be required to both onshore and offshore infrastructure contained within the Battery Limits. The demolition and decommissioning strategy has been developed based on unrestricted access to the site.

9.1.1 Resources

The demolition contractor will require a demolition licence and experienced labour to complete the works. As such it is unlikely that all the labour required to complete the works will be available from the local area. The contractor will need to use a fly in fly out workforce with an approximate 3 weeks on 1 week off roster to execute the works on and manage fatigue of the workforce. The cost estimate has also assumed that the site operates 6 days a week.

9.1.2 Road access

Access to the site is via road Hay Point Road, off the Bruce Highway. Hay Point Road crosses a number of creeks and a cane train rail line. Vehicles entering the site via road will have to comply with the local authority and Main Roads regulations. BMA shares Hay Point Road as an access to Hay Point Coal Terminal, as do the local farmers and residents. Therefore, DBCTM will be required to maintain the road such that their activities do not cause deterioration to the road beyond normal usage or be responsible for repairs of the road.

Access to the tug harbor is also via Hay Point Road, via a section which crosses over the existing DBCT and BMA rail lines. Load restrictions will apply to these culverts and bridges, which limits the size of equipment that can be brought to site without modifications or temporary strengthening works to the infrastructure. The load restrictions would also apply for waste removal.

9.1.3 Wharf access

Access to the wharf is via DBCT site and jetty, or barge and ship access. Access via the jetty will be restricted by the width and capacity of the jetty. Machines and demolition equipment required for the wharf and jetty could be mobilised and used off barges where the capacity of the offshore structures is insufficient.

9.1.3.1 Other offshore infrastructure access

Access to other offshore infrastructure will be via DBCT site and jetty while the jetty is still in place. Once the jetty deck has been removed, or where the capacity of the jetty is insufficient, access via barges is the alternative option. However, close to shore there may be insufficient depth to operate a barge, therefore the capacity of the jetty will limit the methodology and equipment that can be used in this area.

9.2 Staging and sequence

When entering the execution phase, several staging options can be used to realise efficiency benefits during the decommissioning/demolition phase. Some of these include:

- Full scope of work delivered in a single contract
- Multiple contracts based on domain areas
- Separation of de-energisation and demolition scopes of work
- Staged demolition as areas become redundant

We consider the most appropriate option for estimating purposes to be a single head contract with multiple work fronts. This allows for efficiencies in site management and a reduction to the overall time required to execute the works. With the whole site available to the contractor, they are able to have unimpeded access to the site and structures. To complete the demolition while adjacent structures and interconnected services are live would increase the cost of separation and protection of the remaining infrastructure.

To keep the delivery of the project cost effective, a sequence has been developed that takes advantage of the existing site buildings and amenities for as long as possible before they have to be demolished and temporary facilities established for the remainder of the project.

9.3 Decommissioning

During the decommissioning stage there will be a number of considerations that may impact the sequencing and extent of demolition works completed. These are outlined below.

9.3.1 Decommissioning of energy sources

The Contractor will be required to isolate, disconnect and remove stored energy sources such that the demolition activities can proceed safely and minimise the potential for environmental impacts. We note that some services will not be able to be removed until later stages of the demolition project, such as high voltage electricity to substations (to run new temporary power), fire systems, stormwater management and potable water.

The electrical services supplying equipment and buildings etc. will be isolated and removed, however high voltage services will need to remain such that temporary power supplies can be run from the existing substations.

9.3.2 Decommissioning of water sources

The stormwater and dirty water drainage systems operating around the site will be required to continue operation until the demolition activities have been completed and the contouring allowing the site to return to natural drainage have been installed. The stormwater and dirty water drainage systems will be required to operate so that environmental licence conditions are not breached by the release of water containing sediment or potentially polluting substances. The drainage system will need to be progressively modified and removed to achieve the final state.

Reticulated water services will need to be isolated around the site, however water supply for wash-down and dust suppression will be required. Potable water services may need to be retained for cribs and offices, if the quality of the water can be guaranteed with the reduced demand on the water line.

9.4 Demolition

Mackay is located in a cyclonic region of Queensland. As a result any demolition activities occurring over the cyclone season (November to April) will have to be completed in such a way as to maintain stability of the structure for cyclonic conditions. This may include staging the demolition activities such that they can be stopped and the site secured prior to a potential cyclone, and/or temporary works to strengthen the structures against cyclonic winds.

The different constraints that apply to onshore and offshore infrastructure demolition are outlined below.

9.4.1 Onshore

Constraints that may impact the demolition of the onshore infrastructure include:

- Identification of previously unidentified hazardous materials. The initial infrastructure was constructed in the early 1980s. As such, it is assumed that asbestos and other Hazardous Building Materials may have been used in the construction of the site. A survey suitable for demolition will be required prior to commencing works.
- Wildlife nesting and breeding may impact the approvals to commence works and sequence of works if they are identified as endangered or protected.
- Water management systems to control erosion and runoff will be required to remain in place throughout the demolition project. Therefore the sequence and methodology of works will be required to protect the water management system (pipework and retention basins).

9.4.2 Offshore

The key constraint for the demolition of offshore infrastructure will be tides, swell and weather conditions. It is likely that the demolition of offshore infrastructure will require some demolition activities to occur from barges. The demolition programme will have to allow for significant down time where barges are required, to allow for the marine conditions to be suitable for the demolition activities. Where demolition activities can occur progressively from the wharf, the demolition equipment used will be limited by the capacity of the wharf.

Closer to shore, access may become difficult for barges and the jetty may have to be used to progressively demolish back to the shore. The jetty will have equipment size restrictions that will be able to operate on the deck, both in weight and width.

Environmental controls will be required to prevent release of contaminants into the ocean. Sources of contaminants could be:

- The existing infrastructure to be demolished, for example hydraulic fluids stored in vessels and gear boxes etc. that may not have been appropriately drained and cleaned during decommissioning, or
- Spills from demolition equipment during refuelling activities or mechanical failures.

The infrastructure may also contain hazardous building material that will need to be removed and/or controlled during demolition. Given the construction date of the early 1980s, it is possible that asbestos is present in the off shore infrastructure. It is also possible that lead paint or tributylin (antifouling paint) could have been used in the coating system and therefore any activities that may result in disturbance to the coating system will need to be controlled to prevent release into the environment.

9.5 Disposal

Currently, disposal of demolition waste on site is limited to crushed concrete, where it can be used as fill for voids. The calculations based on the available drawings indicates that all the concrete can be disposed of on site.

In accordance with current regulations, asbestos waste must not be exported, and must be disposed of at a licenced facility. Waste that can currently be exported offshore includes scrap steel and recyclable building material. This includes steel classified as “export” grade. Export grade steel includes steel that has been coated with lead paint.

It is anticipated that at the time of closure some changes to these regulations and markets may occur. Therefore we have costed 2 scenarios. The first scenario is in accordance with the current regulations and markets, while the second scenario allows for the possibility that the current markets accepting the lead contaminated scrap steel may have closed, resulting in alternative disposal methods, which would likely increase the cost of disposal. Such methods may require the removal of lead paint and other hazardous materials prior to recycling. With current technology the cost of treating steelwork to remove hazardous material is cost prohibitive and would likely be disposed of at a landfill facility. Therefore, we have allowed for the option of disposal of all waste to a landfill facility in the second scenario.

10. Management of risks

A risk assessment for specific decommissioning, demolition, disposal, remediation and rehabilitation will be undertaken by DBCTM when the rehabilitation obligation falls due, to identify and assess any potential impacts arising from key aspects of the final landform rehabilitation and construction. Outcomes from this risk assessment should be reviewed continuously, with any additional risks identified during stakeholder works being considered as part of the rehabilitation plan. This section identifies the key risks associated with each phase of rehabilitation works and how they have been addressed.

10.1 Pre-planning and approvals phase

The key risks of this phase include:

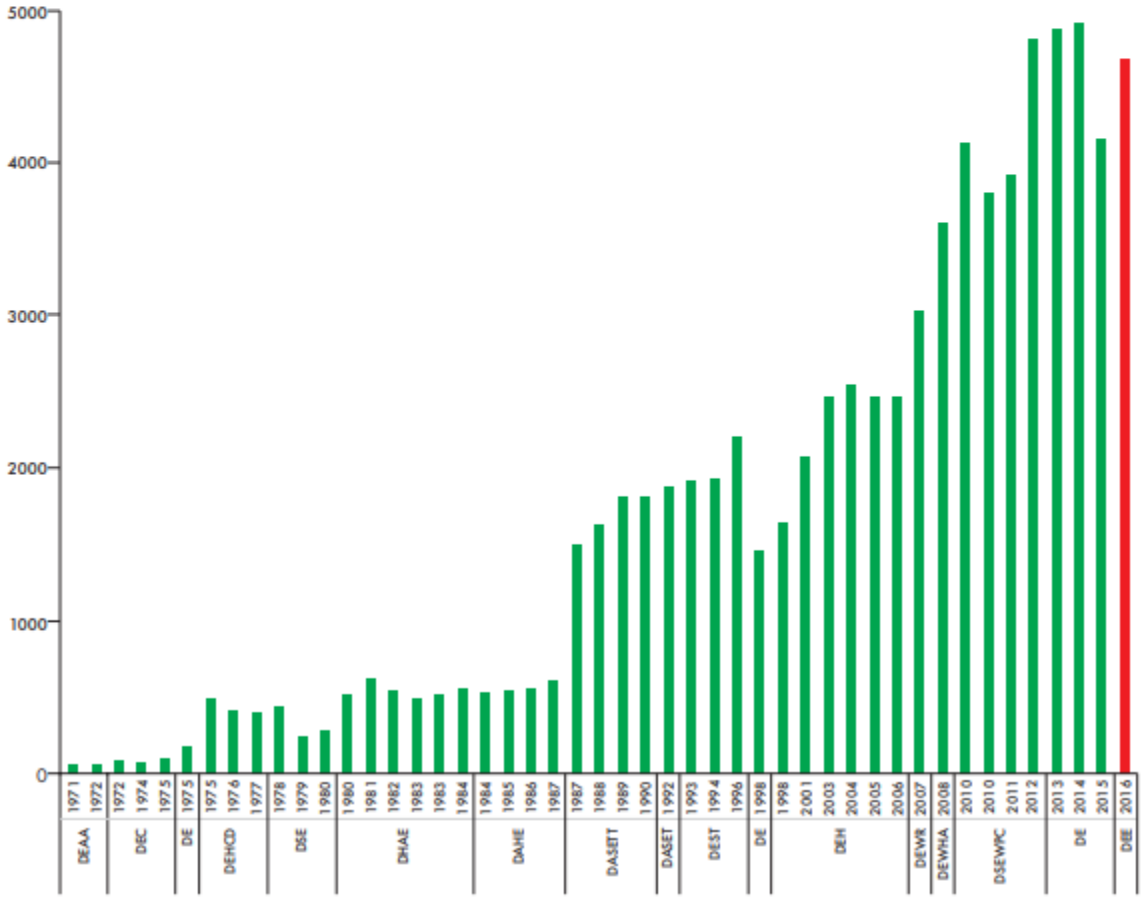
10.1.1 Delay in approvals

Under the PSA, DBCTM has an obligation to rehabilitate the Terminal within three years of the expiry of the long-term lease. One of the key risks to the project is a failure to obtain extension of existing approvals within an appropriate timeframe. This has the potential to delay the commencement of the decommissioning and demolition stages and ultimately delay the fulfilment of PSA conditions.

10.1.2 Legislative risk

One of the main risks to the rehabilitation plan is that the legislation governing demolition, decommissioning, disposal, remediation and rehabilitation changes. Figure 10-1 shows the increase in the number of pages of federal environmental law over the period 1971 to 2016, as published by the Institute of Public Affairs. It shows that there has been a significant increase in the regulatory burden of Commonwealth environment law.

Figure 10-1 Increase in number of pages of Commonwealth environmental legislation, 1971 to 2016

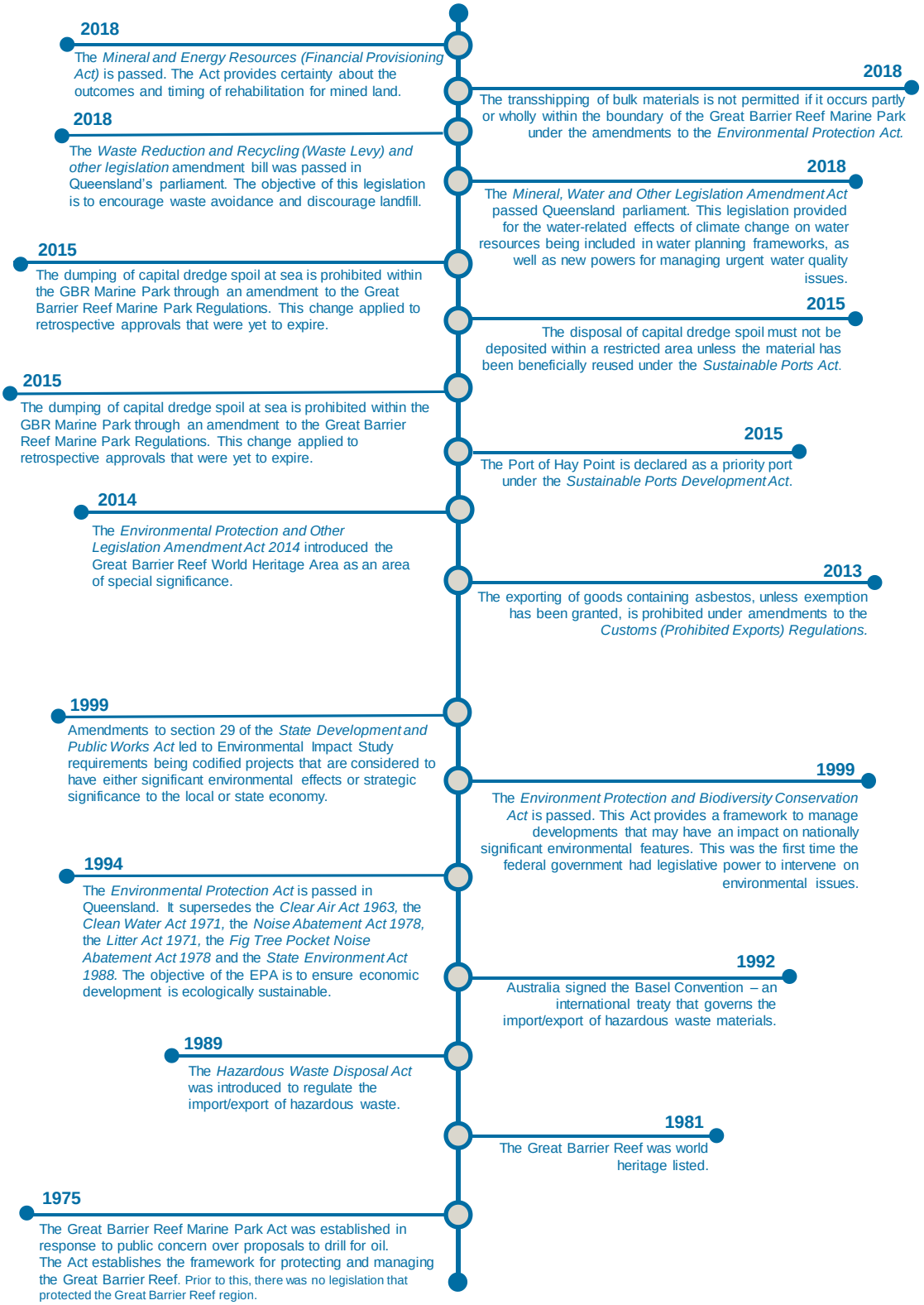


Source: Australian Institute of Public Affairs (2017) *The Growth of Federal Environmental Law 1971 to 2016,* available at: https://www.ipa.org.au/wp-content/uploads/2017/05/IPA_Report_Growth_Of_Federal_Environmental_Law_170430.pdf

The legislation that governs environmental considerations has become more stringent since the 1970s, particularly in respect of activities that may impact the GBRWHA. Figure 10-2 depicts some of the changes in key legislation governing activities that are related to the rehabilitation of DBCT through time.

Our rehabilitation plan is based on current legislative requirements in respect of rehabilitation. In the event that legislation changes, the plan will need to be revised to reflect the new requirements, which may significantly alter the scope for the decommissioning, demolition, disposal, remediation and rehabilitation phases. For example, in 2013, changes to *Customs (Prohibited Exports) Regulations* meant that it was no longer legal to export asbestos without special approval. If a similar change was to be enacted to any of the materials on site, the disposal method would be required to change which may have a material impact to the cost estimate and scope of works required to rehabilitate the Terminal.

Figure 10-2 Changes to key environmental legislation through time



Source: GHD Advisory compiled from State and Commonwealth legislation and regulations

10.2 Decommissioning phase

There are a number of risks associated with decommissioning the site. The key risks include:

- *The loss of site knowledge and "as-built" information:* the key risk associated with decommissioning resulting from the loss of site knowledge and "as built" information is incomplete decommissioning, resulting in safety and environmental hazards during the decommissioning and demolition phases.
- *Premature decommissioning of systems (such as storm water management)*: if the decommissioning of systems occurs prematurely, there will be additional costs to reinstate an equivalent system on site.
- *Unknown/undocumented interdependencies between domains and/or adjacent operations:* these interdependencies may result in a requirement to remediate or rehabilitate areas that have already been rehabilitated, detract from the success of already complete rehabilitation activities (such as damaging grass or trees) or may result in efficiency losses to the overall rehabilitation staging.
- *Unidentified quantities of hazardous chemicals:* this will result in an additional decommissioning and/or remediation requirement.

10.3 Demolition phase

The key risks associated with demolishing the site include:

- *Loss of site knowledge and "as-built" information:* similarly to the decommissioning risk, a loss of site knowledge and "as-built" information presents a risk of safety hazards resulting from incomplete knowledge of building material and structural systems.
- *Unidentified hazardous materials:* the discovery of unidentified hazardous materials poses a risk to the demolition phase because it exposes workers to hazardous materials and potential delays to modify methodology and variations of cost.
- *Access to site restricted by local authorities or operations of other road users:* if access to the site becomes restricted, there could be delays in the timing of the demolition.
- *Difficult working environment, particularly offshore: weather events, such as excessive swell and cyclones resulting in delays to the program and therefore increased project cost.*
- *Failure of extraction systems for piles: increased difficulty when cutting off below sea bed level resulting in incomplete removal of piles and inability to meet closure criteria. This will result in an increased cost to the project.*
- *Tides and swell for marine demolition activities: resulting in delays to the program and cost increases.*

10.4 Disposal phase

The key risks associated with disposal of the demolition waste include:

- *Reduced disposal locations:* if there is a reduction in the number of locations that can handle the disposal from the demolition and decommissioning activities, the cost of disposal will increase.
- *Reduced markets for recyclable materials:* if there is a reduction in the market for recyclable materials, the risk to the project is an increase in disposal costs.

10.5 Remediation phase

There is currently limited remediation activities required for the site however a key risk associated with remediation include:

- *Unforeseen contamination discovered onsite:* if there is an unknown contaminated area for example, hydrocarbon contamination which requires bioremediation or disposal

10.6 Rehabilitation phase

The key risks associated with the rehabilitation phase include:

- *Failure to obtain appropriate approvals in time*: potential for delays to rehabilitation activities and the overall schedule associated with the need to undertake specialist studies and obtain approval for rehabilitation activities
- *Additional approvals to the existing approval for rehabilitation:* potential for additional approvals to undertake rehabilitation activities and specialist studies and the associated costs and legislative timeframes for approval.
- *Inadequate material volumes available for fill and growth medium:* potential to be unable to source suitable material to for use as fill and growth medium to reshape the site and provide a suitable growth medium for successful revegetation activities.
- *Failure to achieve closure criteria (refer to section 4.6) and stable landform within the planned timeframe:* DBCT will have a continued commitment to undertake monitoring and rehabilitation maintenance. Failure to achieve the closure criteria will result in a continued cost commitment and inability to relinquish the site.

11. Domain 1 rail loop, receival and conveyors

This section describes the scope of works required to return the rail loop, receival and conveyors to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

11.1 Summary Table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 1.

Table 11-1 Summary of the key demolition and rehabilitation aspects for Domain 1

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Rail line and loops • Rail line overhead catenary and support towers • Aurizon substation • Rail receival pits and stations • Pit conveyors • Receival conveyors • Transfer towers • Associated support structures and services • Internal domain roads
Total area of disturbance	• 88 ha
Final land use	• Eucalypt Woodland-Open forest • Rural land use (ie Grassland, with grazing)
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment. • Rehabilitation works to Eucalypt Woodland-Open forest and grassland suitable for rural land use • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area • Rail lines and ballast to be removed
Monitoring requirements	• Earthworks monitoring and inspections • Soil characteristics • Soil amelioration requirements • Rehabilitation monitoring

Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$144.6M**, covering:
	  ○ $2.12M of decommissioning costs
	  ○ $6.69M of demolition costs
	  ○ $86.19M of disposal (and pre-processing for disposal)
	  ○ $43.06M of remediation costs
	  ○ $6.59M of rehabilitation costs
	• Refer to Attachment 2 for total cost breakdown and detail

11.2 Present conditions

At present, the rail loop, receival and conveyors Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. Specifically, the Domain has the following infrastructure:

- Rail line trackwork 1, 2 & 3 (3.2 km of balloon loop)
- Rail line overhead catenary and support towers
- Aurizon substation
- Receival pits and stations RRP1, RRP2, RRP3
- Pit conveyors C1, C2, BF11
- Conveyors S1, S2, S11
- Towers T1, T2, T21
- Associated support structures and services
- Domain internal roads

11.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site. The proposed final land use and landform for Domain 1 is consistent with the primary rehabilitation objective of returning the Domain to its natural state and condition as existed prior to any development occurring on the site.

Box 1: proposed final land use and landform for Domain 1

The final land use and landform for Domain 1 includes grassland, with grazing potential and eucalypt woodland-open forest.

To achieve these land use outcomes, decommissioning and rehabilitation activities include:

- All hazardous materials and contaminated material will be removed from the domain.
- All infrastructure and assets removed will be removed from the domain.
- The remaining land will be revegetated with grassland and eucalypt woodland-open forest vegetation.
- Earthworks to ensure landform blends in with the surrounding landscape and is stable.

11.4 Decommissioning and Demolition Actions – Scope of Work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a Rehabilitation Cost Estimate (RCE) for Domain 1.

11.4.1 Decommissioning

The infrastructure included in Domain 1 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Removal of remaining coal in bins and on conveyors.
- Isolation and disconnection of services including, water, fire water, electricity and communications.

- Releasing stored energy:
  - Lowering of gravity units or suspended energy such as raised counter weights for conveyors.
  - Releasing tension such as that contained in conveyor belts.
  - Removal of chemicals stored in buildings. We anticipate these chemicals will include Fuel and hydrocarbons, and cleaning chemicals.
  - Degassing and capturing refrigerants contained within air conditioning systems.
  - Releasing pressure from pneumatic and hydraulic systems.
  - Capturing and removing hydrocarbons from equipment and storage vessels.
- Removing hazardous materials contained in the building materials, plant and equipment for disposal, such as:
  - Asbestos.
  - PCBs.
  - Radioactive materials, such as that contained in weighing equipment.
- Installing temporary infrastructure to support the demolition project:
  - Temporary power, which could be run off generators or existing substations.
  - Stormwater management systems.
  - Dust management systems.

The decommissioning phase of work has been designed with reference to existing legislation and regulations to ensure a safe workplace from a people and environmental perspective. It has also been designed to ensure that any short-term environmental impacts that are associated with rehabilitation are addressed and minimised to achieve the rehabilitation objectives identified in section 4.1 of this report.

11.4.2 Demolition

The demolition scope for Domain 1 is based on requirements under current legislation and regulations. We have developed our scope to maximise the efficiency in demolition, while having regard to short- and long-term environmental impacts, so as to be consistent with the rehabilitation objectives we identified in section 4.1 of this report.

Once the plant has been decommissioned, demolition can commence. The infrastructure contained in Domain 1 has reasonably low height structures, meaning that demolition of this area will predominately occur using mechanical means, such as excavators with shear attachments. Rock breaking attachments and earthmoving equipment may also be used.

The infrastructure will be prepared for demolition by removing high value items, such as copper cabling, wherever it is practical to do so. Once any high value items are removed, mechanical demolition will commence.

The receival building has a deep pit under the structure, and therefore any demolition activities in this area will be restricted by the pit. Cranes will be required to lift equipment out of the tunnels. The cranes will need capacity to get a long reach so that it can be set up away from the edge of the building to avoid overloading the pit walls, which will increase the size of the crane for this activity. The metal clad building structure could be sheared once the equipment has been removed, or it could also be lifted out by the crane.

Once all equipment is removed from the building, the receival area will consist of heavy construction concrete walls (approximately 1 m thick in places). The most efficient method to remove the concrete from this area is likely to be explosives set into the concrete walls at a specified grid pattern. Once exploded, earthmoving equipment can then be used to excavate into the resulting pit to extract the building material for further processing (to maximum 100 mm) for disposal either on site in designated areas, or off site. It is understood that the surrounding area is sensitive to vibration and therefore explosives may not be an option. As such chemicals injected into the concrete which expand and split the concrete may be a more appropriate option.

11.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to a processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal.

Processing the demolition waste will be undertaken via manual cutting using oxy torches, further mechanical shearing and magnetic attachments on excavators to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate, and in accordance with current legislative requirements.

Some of the anticipated waste streams include:

- Inert waste, such as concrete.
- Hazardous waste such as asbestos, PCBs, lead based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel, copper and some HDPE pipe.

Concrete crushed to 100 mm or less can be buried on site. All other waste will be transported off site to the relevant recyclable markets or disposal facilities. Using crushed concrete from the demolition waste allows efficiencies to be realised in the scope of works, as it means DBCTM will not be required to source this material from alternative sources. Appropriate disposal of waste materials, including surplus crushed concrete that cannot be used onsite, is consistent with the rehabilitation objectives of minimising and addressing any short- and long-term environmental impacts that may arise as a result of rehabilitating this Domain.

11.5 Rehabilitation actions – Scope of work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. This scope has been used as the basis of a Rehabilitation Cost Estimate (RCE) for Domain 1.

11.5.1 Contaminated Sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be required following decommissioning and demolition activities. If any contaminated material is identified within the Domain, it will be excavated and removed to a designated waste facility. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

11.5.2 Civil Earthworks and Landform

A detailed landform design will be prepared five years prior to the cessation of operations. The conceptual landform design developed by GHD estimated that approximately 800,000 m^3 of material is required for fill material and growth medium. The top 100 mm of the fill material will be processed to form a growth medium.

A capping design will be developed for the coal receival pits, where crushed concrete will be used fill the receival pit. This will ensure that potential short- and long-term issues associated with use of crushed concrete as fill can be mitigated. These issues may include:

- Subsidence and settlement
- Altered infiltration rates and influence of groundwater, and
- Unsuitability of substrate for trees growth and stability.

Fill material will be placed in layers and tracked rolled between layers. A growth medium layer approximately 100 mm thick will be placed prior to being seeded with a suitable vegetation mix.

Soil testing of site material or imported material will be undertaken throughout the execution and maintenance phases to determine amelioration requirements for future rehabilitation areas. It is anticipated that amelioration will include superfine agricultural gypsum to treat dispersion, fertilisers to increase nutrient levels and compost to increase soil organic carbon.

Earthworks and surface preparation will involve a number of approaches to achieve final landform design:

- Excavation of material of disturbed slope areas to reduce batter slopes to less than or equal to 10% slope.
- Ripping of hard pack areas to provide medium for roots to penetrate.
- Redistribution of excess material.
- Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
- Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

These activities are consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

11.5.3 Revegetation

Domain 1 will be rehabilitated to include:

- Eucalypt Woodland-Open forest
- Rural land use (i.e. Grassland, with grazing)

The species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area. These lists will include grasses and groundcovers, canopy and mid-storey species. The species mixes shall be drawn from those nominated on this these lists dependent upon seasonal and/or commercial availability.

Two vegetation types will form the basis of the rehabilitation; eucalypt woodland to open forest and grassland/ pastures.

(1) The desired diversity of species in the eucalypt woodland to open forest rehabilitation areas will aim to achieve 70 per cent species richness compared to the eucalypt woodland to open forest reference sites. The revegetation species will include a mix of trees, shrubs, sub-shrubs and grasses.

(2) The species diversity in grassland rehabilitation areas will aim to achieve 70% species richness compared to the grassland/ pasture reference sites. The species seeded onto the grassland/ pasture will be a mixture of native and exotic species. Native perennial reeds and grasses and introduced legumes and grasses that are suitable for sowing onto pasture rehabilitation areas.

Seeding will generally be via ground spreading directly into a prepared and ameliorated seedbed. Some hydromulching may be required on steep or otherwise inaccessible areas.

The revegetation activities are consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function

11.5.4 Surface Water

Landform would be graded so that it is free draining generally towards Lake Barfield. A drainage path may be constructed and will be shaped in undulating informal profiles to align with natural landforms of the surrounding environment. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform.

Erosion and sediment controls will be undertaken in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008). This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform.

12. Domain 2 stockyards

This section describes the scope of works required to return the stockyard to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

12.1 Summary Table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 2.

Table 12-1 Summary of the key demolition and rehabilitation aspects for Domain 2

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Stockyard surface roads & drainage • Stockpile pads • Stockyard bunds • Yard machines • Inloading Conveyors • Outloading conveyors • Towers • Associated support structures and services
Total area of disturbance	101 ha
Final land use	• Rural land use (i.e. Grassland, with grazing) • Beach Ridge
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment. • Rehabilitation works to grassland suitable for rural land use and beach ridge • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area • Remove all coal material
Monitoring requirements	• Earthworks monitoring and inspections • Soil characteristics • Soil amelioration requirements • Rehabilitation monitoring
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$304.05M**, covering: ○ $5.66M of decommissioning costs ○ $15.34M of demolition costs ○ $98.06M of disposal (& pre-processing for disposal) costs ○ $177.65M of remediation costs ○ $7.34M of rehabilitation costs. • Refer to Attachment 2 for total cost breakdown and detail

12.2 Present conditions

At present the Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. In this instance, the area currently contains the following infrastructure:

- Stockyard domain surface roads & drainage
- Stockpile pads rows 1, 2, 3, 4, 5, 6, 7 and 8 bulk earthworks and bedding coal
- Stockyard bunds 1, 2, 3, 4, 4A, 5, 5A, and 6
- Stacker/reclaimer machines SR2, SR3A, SR4A, SR5, SR6
- Stacker machines ST1, ST2, ST3, ST4
- Reclaimer machines RL1, RL2, RL3
- Inloading Conveyors S3, S4, S13, S5, S6, S7, S8
- Outloading conveyors R1, R2, R3, R4, R5, R6, R7, R8
- Towers T3, T3A, T4, T4A, T5, T5A, T6, T6A, T8, T7, T9, T10, T11, T12, T20, T23, T23A, T25, T25A, T27, T29, T31
- Associated support structures and services

12.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site. The proposed final land use and landform for Domain 2 is consistent with the primary rehabilitation objective of returning the Domain to its natural state and condition as existed prior to any development occurring on the site.

Box 2: proposed final land use and landform for Domain 2

The final land use and landform for Domain 2 includes grassland, with grazing potential.

To achieve this land use outcome decommissioning and rehabilitation activities include:

- All hazardous materials and contaminated material removed
- All infrastructure and assets removed
- Landform generally blends in with the surrounding landscape and is stable
- Revegetated with grassland and beach ridge vegetation

12.4 Decommissioning and demolition actions – Scope of work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a RCE for Domain 2.

12.4.1 Decommissioning

The infrastructure included in Domain 2 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Isolation and disconnection of services including, water, fire water, electricity and communications
- Releasing stored energy:
  - Lowering of gravity units or suspended energy, such as raised counter weights for conveyors
  - Releasing tension such as that contained in conveyor belts
  - Releasing pressure from pneumatic and hydraulic systems
  - Capturing and removing hydrocarbons from equipment and storage vessels
- Removing hazardous materials contained in the building materials, plant and equipment, such as:
  - Asbestos
  - PCBs
  - Radioactive materials, such as those found in weighing equipment contained within the conveyors
- Installing temporary infrastructure to support the demolition project:
  - Temporary power, which could potentially run off generators
  - Stormwater management systems
  - Dust management systems

The decommissioning phase of work has been designed with reference to existing legislation and regulations to ensure a safe workplace from a people and environmental perspective. It has also been designed to ensure that any short-term environmental impacts that are associated with rehabilitation are addressed and minimised achieve the rehabilitation objectives identified in section 4.1 of this report.

12.4.2 Demolition

Once the plant has been decommissioned, demolition can commence. The infrastructure contained in Domain 2 consists of higher transfer stations, large stacker and reclaimers, concrete foundations and ground module and elevated conveyors. Therefore, demolition of this area will occur using a variety of demolition methods including, induced collapse (cut-and-pull), explosive demolition, mechanical shearing and rock breaking.

The infrastructure will be prepared for demolition by removing high value items such as copper cabling, where it is practical to do so. Once this activity has been completed, then demolition will commence.

Mechanical demolition such as shearing will be used for conveyors and low level structures. Induced collapse using cut-and-pull methods is likely to be used for taller steel framed structures. This method involves manually preparing the structure by removing redundant supports from the building and executing pre-weakening cuts so that a force applied through cables attached to excavators can induce the building collapse. Once the building is on the ground, mechanical shearing to the structure to process it into manageable sizes will commence.

The stackers and reclaimers will be prepared for an explosive induced collapse. The structural system of the stackers and reclaimers means that the safest method of demolition is to use explosives to bring the structures to ground level where they can be mechanically processed into manageable sizes. Excavators with rock breaking equipment will be used to demolish the civil structures and foundations in the stockyard.

The demolition scope for Domain 2 is based on requirements under current legislation and regulations. We have developed our scope to maximise the efficiency in demolition, while having regard to short- and long-term environmental impacts. We consider the above scope to be the most appropriate for achieving a pre-construction landform that is safe, stable and non-polluting, in accordance with the rehabilitation objectives we identified in section 4.1 of this report.

12.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to a processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal. Processing the demolition waste could be in the form of manual cutting using oxy torches, further mechanical shearing and magnetic attachments on excavators to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate. Some of the anticipated waste streams include:

- Inert waste, such as concrete.
- Hazardous waste such as asbestos, PCBs, lead based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel, copper and some HDPE pipe.

Concrete crushed to 100 mm or less can be buried on site, with the maximum volume being determined by rehabilitation requirements. All other waste will be transported off site to the relevant recyclable markets or disposal facilities. Using crushed concrete from the demolition waste allows efficiencies to be realised in the scope of works required, as it means DBCTM will not be required to source this material from alternative sources. Appropriate disposal of waste materials, including surplus crushed concrete that cannot be used on-site is consistent with the rehabilitation objectives of minimising and addressing any short- and long-term environmental impacts that may arise as a result of rehabilitating this Domain.

12.5 Rehabilitation Actions – Scope of Work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a RCE for Domain 2.

12.5.1 Contaminated Sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be required following decommissioning and demolition activities. If contaminated material is identified within the Domain, it will be excavated and removed to a designated waste facility. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

All coal material will be removed from the base of the stockyard area. We anticipate that 229,000 tonnes of coal will need to be removed from the base of the stockyard area.

12.5.2 Civil Earthworks and Landform

A detailed landform design will be prepared five years prior to the cessation of operations. The conceptual landform design developed by GHD estimated that approximately 4,218,000 m^3 of material will be required as fill material for this Domain.

The top 100 mm of the fill material will be processed to form a growth medium. Fill material would be placed in layers and tracked rolled between layers. A growth medium layer about 100 mm thick would be placed prior to being seeded with a suitable vegetation mix.

Soil testing of site material or imported material will be undertaken throughout the execution and maintenance phases to determine amelioration requirements for future rehabilitation areas. It is anticipated that amelioration will include superfine agricultural gypsum to treat dispersion, fertilisers to increase nutrient levels and compost to increase soil organic carbon.

Earthworks and surface preparation will involve a number of approaches to achieve final landform design:

- Redistribution of excess material
- Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
- Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

12.5.3 Revegetation

Domain 2 will be rehabilitated to include:

- Rural land use (i.e. Grassland, with grazing)
- Beach Ridge

The species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area and will include grasses, groundcovers, creepers and canopy species.

- Species diversity in grassland rehabilitation areas will aim to achieve 70 per cent species richness compared to the grassland/ pasture reference sites. The species seeded onto the grassland/ pasture will be a mixture of native and exotic species.
- Species diversity in beach ridge rehabilitation areas will aim to achieve a species richness of 70 per cent species richness compared to the beach ridge reference sites. The species seeded onto the beach ridge will be a mixture of native species.

Seeding will generally be via ground spreading directly into a prepared and ameliorated seedbed. Some hydromulching may be required on steep or otherwise inaccessible areas.

This is consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

12.5.4 Surface Water and Groundwater

Landform would be graded so that it is free draining generally towards the beach ridge and foreshore domains and Dalrymple Bay. Erosion and sediment controls will be undertaken in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008).

13. Domain 3 seawall and transfer stations

This section describes the scope of works required to return the seawall and transfer stations to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

13.1 Summary table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 3.

Table 13-1 Summary of the key demolition and rehabilitation aspects for Domain 3

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Sea wall structure and bulk earthworks • Hanbars • Outloading conveyors • Towers • Surge bins • Belt feeders • Sample stations • Associated support structures and services
Total area of disturbance	9 ha
Final land use	Beach Foreshore
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment. • Rehabilitation works to beach foreshore • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion, water pollution and siltation
Monitoring requirements	• Earthworks monitoring and inspections • Rehabilitation monitoring
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$36.99M**, covering: ○ $2.61M of decommissioning costs ○ $19.63M of demolition costs ○ $0.92M of disposal (& pre-processing for disposal) costs ○ $12.25M of remediation costs ○ $1.58M of rehabilitation costs. • Refer to Attachment 2 for total cost breakdown and detail

13.2 Present conditions

The Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. The Domain itself has been reclaimed and consists of fill material and stabilised with a rock and hanbar seawall.

In this instance, the area currently has the following infrastructure:

- Sea wall structure and bulk earthworks
- Hanbars
- Outloading conveyors L1, L2, L3, L4, L6A, L11, L11A, L13 and L15A
- Towers T13, T14, T15, T16, T17, T18 and T19
- Surge bins SB1, SB2 and SB3
- Belt feeders, BF5, BF6, BF7, BF8, BF15 and BF17
- Sample stations 1, 2 and 3
- Associated support structures and services

13.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site, hence, the proposed final land use and landform for Domain 3 is consistent with the primary rehabilitation objective of returning the Domain to its pre-construction state and condition.

Box 3: proposed final land use and landform for Domain 3

The final land use and landform for Domain 3 includes beach foreshore and beach ridge.

To achieve the land use outcomes decommissioning and rehabilitation activities include:

- All hazardous materials and contaminated material removed
- Landform generally blends in with the surrounding landscape and is stable
- Revegetated with beach ridge vegetation

13.4 Decommissioning and demolition actions – Scope of work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a RCE for Domain 3.

13.4.1 Decommissioning

The infrastructure included in Domain 3 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Isolation and disconnection of services including, water, fire water, electricity and communications.
- Releasing stored energy:
  - Lowering of gravity units or suspended energy, such as raised counter weights for conveyors.
  - Releasing tension, such as in conveyor belts.
  - Degassing and capturing refrigerants contained in the air conditioning units within the sample station buildings.
  - Releasing pressure from pneumatic and hydraulic systems.
  - Capturing and removing hydrocarbons from equipment and storage vessels.

- Removing Hazardous Materials contained in the building materials, plant and equipment, such as:
  - Asbestos.
  - PCBs.
  - Radioactive materials, such as those in weighing equipment.
- Installing temporary infrastructure to support the demolition project:
  - Temporary power, which could potentially run off generators.
  - Stormwater management systems.
  - Dust management systems.

The decommissioning phase of work has been designed with reference to existing legislation and regulations to ensure a safe workplace from a people and environmental perspective. It has also been designed to ensure that any short-term environmental impacts that are associated with rehabilitation are addressed and minimised achieve the rehabilitation objectives identified in Section 4.1 of this report.

We consider the dust management systems will need to be carefully designed to mitigate any dust run-off into the ocean which may have significant adverse impacts on local ecosystems.

13.4.2 Demolition

Once the infrastructure has been decommissioned, demolition can commence. The infrastructure contained in Domain 3 consists of higher transfer stations, elevated conveyors and seawall construction. Therefore, demolition of this area will occur using a variety of demolition methods including induced collapse (cut-and-pull), mechanical shearing and mechanical works to remove the hanbars.

The infrastructure will be prepared for demolition by removing high value item such as copper cabling, where it is practical to do so. Once removed, the infrastructure has been prepared, demolition will commence.

Mechanical demolition such as shearing will likely be used for low level structures and where taller structures have been collapsed. Induced collapse via cut-and-pull methods is likely to be used for taller steel framed structures. This method involves manually preparing the structure by removing redundant supports from the building and executing pre-weakening cuts so that a force applied through cables attached to excavators can induce the building collapse. Once the building is on the ground, mechanical shearing to the structure to process it into manageable sizes will commence.

Excavators with rock breaking equipment will be used to demolition the civil structures and foundations in Domain 3.

The removal of the seawall will be completed using excavators to remove the hanbars back to shore where they will then be crushed for disposal into the on-site voids.

The demolition scope for Domain 3 is based on requirements under current legislation and regulations. We have developed our scope to maximise the efficiency in demolition, while having regard to short- and long-term environmental impacts. We consider the above scope to be the most appropriate for achieving a pre-construction landform that is safe, stable and non-polluting, in accordance with the rehabilitation objectives we identified in Section 4.1 of this report.

13.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to a processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal.

Processing the demolition waste will be undertaken through a manual cutting approach using oxy torches. Further mechanical shearing and magnetic attachments on excavators will be used to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate.

Some of the anticipated waste streams include:

- Inert waste, such as concrete.
- Hazardous waste such as asbestos, PCBs, lead based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel, copper and some HDPE pipe.

All waste will be transported off site to the relevant recyclable markets or disposal facilities.

13.5 Rehabilitation actions – Scope of work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a RCE for Domain 3.

13.5.1 Contaminated sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be required following decommissioning and demolition activities. If contaminated material is identified within the Domain it will be excavated and removed to a designated waste facility. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

13.5.2 Civil earthworks and landform

A detailed landform design will be prepared five years prior to the cessation of operations. The conceptual landform design developed by GHD estimated that approximately 1,341,000 m^3 of material will be removed from this domain.

The detailed landform will aim to replicate a rocky platform with the remaining base of the seawall and beach ridge moving further inland. The top 100 mm of the fill material will be processed to form a growth medium for the beach ridge area and placed prior to being seeded with a suitable vegetation mix.

Earthworks and surface preparation will involve a number of approaches to achieve final landform design:

- Excavation of fill material behind the existing seawall.
- Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
- Redistribution of excess material.
- Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

13.5.3 Revegetation

Domain 3 will be rehabilitated to include beach foreshore vegetation.

The species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area and will include grasses and groundcovers. Species diversity in beach foreshore rehabilitation areas will aim to achieve a species richness of 70 per cent species richness compared to the beach foreshore reference sites. The species seeded onto the beach ridge will be a mixture of native species.

Seeding and tube stock planting will generally be via ground spreading and planting directly into a prepared and ameliorated seedbed. This is consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

14. Domain 4 offshore

This section describes the scope of works required to return the Offshore Domain to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

14.1 Summary table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 4.

Table 14-1 Summary of the key demolition and rehabilitation aspects for Domain 4

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Marine structures • Wharf ship loader machines and integral conveyors • Wharf conveyors • Main wharf transfer tower and other towers • Assoc. support structures and services
Total area of disturbance	160 ha
Final land use	Marine environment
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment. • Remove all coal material
Monitoring requirements	• Seabed profile • Contamination status of the marine sediments • Recruitment of invertebrate and associated communities • Seagrass • Turtle nesting • Habitat use of the area by protected species such as inshore dolphins and marine turtles • Habitat use of the foreshore area by shorebirds • Presence and abundance of invasive marine species (IMS)
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$169.13M**, covering: ○ $6.91M of decommissioning costs ○ $160.14M of demolition costs ○ $2.08M of disposal (& pre-processing for disposal) costs ○ $0.00M of remediation costs ○ $0.00M of rehabilitation costs • Refer to Attachment 2 for total cost breakdown and detail

14.2 Present conditions

At present, the Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. In this instance, the area currently has the following infrastructure:

- Marine structures including:
  - Berth 1, 2, 3 and 4 mooring points and associated equipment
  - Railings and ladders
  - Decks
  - Piling
- Wharf ship loader machines SL1, SL2 and SL3 and integral conveyors L9, L10 and L19.
- Wharf materials handling systems including:
  - Conveyors L5, L6, L7, L8, L15 and L17
  - Main wharf transfer tower
  - Towers L7, L8 and L17
- Associated support structures and services.

14.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the pre-construction environment. We do not consider it appropriate to undertake any engineered or other activities to return the sea bed floor levels to the pre-dredged heights due to the potential environmental impacts of such an activity. To rehabilitate the sea bed to its pre-construction state will involve introducing foreign soil which will disturb natural currents and sand flow patterns. It also presents a potential short and/ or long term risk to the existing sensitive ecosystems endemic to and adjacent this Domain.

Hence, we consider that rehabilitation for this Domain will be limited to the removal of the existing infrastructure and remediation of any contamination or hazardous materials.

Box 4: proposed final land use and landform for Domain 4

The final land use and landform for Domain 4 is a marine environment.

To achieve the land use outcomes decommissioning and rehabilitation activities include:

- All hazardous materials and contaminated material removed including coal.
- All infrastructure and assets removed.
- Partial remove of piles to below 1 m of seabed or complete removal. Depending on the size of the resulting hole in the seabed following the complete or partial removal of piles, some limited scraping of surrounding seabed material may be undertaken to reduce the void left by full removal.
- Reliance on natural processes and sediment movement to aid return of seabed to natural condition.

14.4 Decommissioning, demolition and disposal actions – Scope of work

This section specifies the various decommissioning and demolition activities for the Domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of the RCE for the Domain.

The offshore infrastructure represents a high cost domain for decommissioning, demolition and disposal. The condition of the jetty and wharf structures at the time of closure/demolition will significantly impact the equipment available to demolish the structures. We have assumed that the structures will have been maintained in reasonable condition, meaning that decommissioning and demolition activities can occur from the wharf, rather than solely from barges and marine equipment.

14.4.1 Decommissioning

The infrastructure included in Domain 4 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Removal of any minor coal associated with Offshore.
- Isolation and disconnection of services including, water, fire water, electricity and communications.
- Releasing stored energy:
  - Lowering of gravity units or suspended energy such as raised counter weights for conveyors.
  - Releasing tension, such as in conveyor belts.
- Removal of chemicals stored in the Offshore offices and buildings:
  - Degassing and capturing refrigerants.
  - Releasing pressure from pneumatic and hydraulic systems.
  - Capturing and removing hydrocarbons from equipment and storage vessels.
- Removing hazardous materials contained in the building materials, plant and equipment, including:
  - Asbestos.
  - PCBs.
  - Radioactive materials, such as those used in weighing equipment.
- Installing temporary infrastructure to support the demolition project:
  - Temporary power, which may be run off generators.
  - Dust management systems.

The decommissioning phase of work has been designed with reference to existing legislation and regulations to ensure a safe workplace from a people and environmental perspective. Given the infrastructure is located offshore, we have had particular regard to the most appropriate mechanisms for decommissioning infrastructure and minimising adverse impacts on benthic and coral communities. It has also been designed to ensure that any short-term environmental impacts that are associated with rehabilitation are addressed and minimised achieve the rehabilitation objectives identified in Section 4.2 of this report.

14.4.2 Demolition

Once the infrastructure has been decommissioned, demolition can commence. The demolition techniques used in this area will be significantly different to the onshore infrastructure demolition. More controls will need to be in place to prevent spills of chemicals, stormwater and sediment from the wharf during the demolition process, as not doing so will lead to contamination around the offshore infrastructure and potential adverse impacts on the marine life in the vicinity.

Induced collapse method will not be applicable to this infrastructure. The most likely form of demolition will be deconstruction through lifting modules with either a wharf- or barge-mounted crane. Any works completed from a barge will require reasonably flat ocean conditions and a fast lifting crane to minimise dynamic loading on the crane.

Any loose equipment and smaller structural modules will be transported to an onshore processing facility for additional processing for offsite transport and disposal. The ship loaders are planned to be deconstructed using a large ship crane to lift the shiploader onto the heavy load carrier in a single module. To achieve this some smaller items may have to be removed to reduce the weight of the shiploader to within the capacity of the ship's crane. The shiploader will then be transported to an appropriate facility for processing and disposal. Indications at this stage is that a heavy lift vessel would be appropriate to complete the lift and transport of the shiploaders.

Temporary structural support and transport frames may be required for the demolition of the wharf and jetty decks and superstructure. The temporary structural support frames would be purpose-built items that may be reused for the superstructure modules. The superstructure modules would likely be transported back to an onshore processing facility to minimise the use of barge-mounted equipment.

Once the superstructure has been removed, the pile system can then be removed. We understand that the piles have been driven to refusal in rock. There are two conditions for the demolition of the piles that have been considered: the complete removal of the piles, including extraction from rock; and the cutting off of piles 1 m below sea-bed level.

Full extraction of the piles will be difficult given the size of the piles and the geotechnical conditions. A potential method of extraction is to:

- Use a barge-mounted drill rig to drill around the piles and loosen the foundation material. The pile may then be extracted using vibration techniques. Note that this method does not guarantee full extraction.
- Abrasive water jet cutting using internal cutting rigs to cut the piles at a sub sea level. Under this extraction method, the piles will have to be drilled out through the centre so that the internal rig could be dropped down the centre of the pile.

We consider that completely removing the piles is the most appropriate means to maximise the long-term rehabilitation of this Domain. While complete removal poses short-term environmental risks and considerations, including impacts on species endemic to the Domain, complete removal will enable the natural coastal processes and sand flows to provide a great long-term environmental benefit. This will also create a better long-term ecosystem for species endemic to the region and benthic communities.

We consider the above scope to be the most appropriate for achieving a pre-construction landform that is safe, stable and non-polluting, in accordance with the rehabilitation objectives we identified in section 4.1 of this report.

14.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to an onshore processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal.

Processing of the demolition waste may include manual cutting using oxy torches, with further mechanical shearing and magnetic attachments on excavators to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate. Some of the anticipated waste streams include:

- Inert waste, such as concrete.
- Hazardous waste such as asbestos, PCBs, lead-based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel, copper and some HDPE pipe.

All waste will be transported off site to the relevant recyclable markets or disposal facilities.

15. Domain 5 water management

This section describes the scope of works required to return the on-site water management infrastructure to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

15.1 Summary table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 5.

Table 15-1 Summary of the key demolition and rehabilitation aspects for Domain 5

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • All dams (not including the Quarry Dam) • Water Systems
Total area of disturbance	50 ha
Final land use	• Eucalypt Woodland-Open forest • Rural land use (i.e. Grassland, with grazing)
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment • Rehabilitation works to grassland and Eucalypt woodland to open forest • Drain and discharge of stored water in accordance with existing discharge licence conditions • Remove any coal fine sediment from dams • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion, water pollution and siltation
Monitoring requirements	• Continued water quality and discharge monitoring • Earthworks monitoring and inspections • Rehabilitation monitoring
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$39.29M**, covering: ○ $0.08M of decommissioning costs ○ $0.17M of demolition costs ○ $2.87M of disposal (& pre-processing for disposal) costs ○ $32.50M of remediation costs ○ $3.67M of rehabilitation costs • Refer to Attachment 2 for total cost breakdown and detail

15.2 Present conditions

At present the Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. In this instance, the area currently has the following infrastructure:

- Industrial Dam
- Rail Loop Dam
- Rail Receival Dam
- Spindlers Dam
- Associated surface roads and drainage
- Process water pump house, pumps and piping
- Potable water treatment plant, tanks, pumps and piping
- Fire water pump house, tanks pumps and piping

15.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site. The proposed final land use and landform for Domain 5 is consistent with the primary rehabilitation objective of returning the Domain to its natural state and condition as existed prior to any development occurring on the site.

Box 5: proposed final land use and landform for Domain 5

The final land use and landform for Domain 5 includes grassland, with grazing potential and eucalypt woodland-open forest.

To achieve the land use outcomes decommissioning and rehabilitation activities include:

- Water discharged in accordance with licence conditions or if water quality suitable then re-used on site for rehabilitation purposes.
- All hazardous materials and contaminated material removed.
- Earthworks to fill the water dams and reshape to blend in with the surrounding landscape and is stable.
- Revegetated with grassland and eucalypt woodland- open forest vegetation.

15.4 Decommissioning and demolition actions – Scope of work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of the RCE for Domain 5.

15.4.1 Decommissioning

The infrastructure included in Domain 5 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Removal of any remaining coal, coal fines and coal contaminant sediment.
- Isolation and disconnection of services including, water, fire water, electricity, communications.
- Removal of any stored water.
- Installing temporary infrastructure to support the demolition project:
  - Temporary power, which may potentially run off generators.
  - Stormwater management systems.

15.4.2 Demolition

Once the plant has been decommissioned, demolition can commence. The infrastructure contained in Domain 5 is reasonably low height structures or civil infrastructure. Therefore, demolition of this area will predominately occur using mechanical means, such as shearing and earth moving equipment.

The infrastructure will be prepared for demolition by removing high value item such as copper cabling, where practical to do so. Once removed the infrastructure has been prepared, mechanical demolition will commence.

15.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to a processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal. Processing the demolition waste could be in the form of manual cutting using oxy torches, further mechanical shearing and magnetic attachments on excavators to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate. Some of the anticipated waste streams include:

- Inert Waste, such as Concrete.
- Hazardous Waste such as asbestos, PCBs, lead based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel, copper, some HDPE pipe.

All waste will be transported off site to the relevant recyclable markets or disposal facilities.

15.5 Rehabilitation actions – Scope of work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of the RCE for Domain 5.

15.5.1 Contaminated sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be undertaken following decommissioning and demolition activities. If contaminated material is identified within the Domain it will be excavated and removed to a designated waste facility.

Coal fine sediments will be removed from the bottom of each dam prior to commencement of earthworks to ensure that all potential contaminants are removed from site. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

15.5.2 Surface water

Stored water will be drained from each dam and either discharged in accordance with the existing water discharge licence conditions or used onsite for demolition and rehabilitation purposed dependent on suitability of water quality. The Industrial Dam will be maintained throughout the civil earthworks and revegetation activities to manage sediment. The timing of the removal and rehabilitation of the Industrial Dam will be determined by rehabilitation monitoring parameters pertaining to vegetation cover and water quality and achievement of a stable and non-polluting catchment.

Landform would be graded so that it is free draining generally towards Lake Barfield, Grendon Creek or Sandfly Creek. A constructed drainage path may be constructed and will be shaped in undulating informal profiles in keeping with natural landforms of the surrounding environment.

Erosion and sediment controls will be undertaken in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008).

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

15.5.3 Civil earthworks and landform

A detailed landform design will be prepared five years prior to the cessation of operations. The conceptual landform design developed by GHD estimated that approximately 66,100 m^3 of material will be cut and 810,000 m^3 will be required as fill. The top 100 mm of the fill material will be processed to form a growth medium.

Fill material would be placed in layers and tracked rolled between layers. A growth medium layer about 100 mm thick would be placed prior to being seeded with a suitable vegetation mix.

Soil testing of site material or imported material will be undertaken throughout the execution and maintenance phases to determine amelioration requirements. It is anticipated that amelioration will include superfine agricultural gypsum to treat dispersion, fertilisers to increase nutrient levels and compost to increase soil organic carbon.

Earthworks and surface preparation will involve a number of approaches to achieve final landform design:

- Water dams would be filled using material from the dam embankments and other fill material.
- Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
- Ripping of hard pack areas to provide medium for roots to penetrate.
- Redistribution of excess material.
- Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

15.5.4 Revegetation

Domain 5 will be rehabilitated to include:

- Eucalypt Woodland-Open forest.
- Rural land use (i.e. Grassland, with grazing).

Species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area. These lists will include grasses and groundcovers, canopy and mid-storey species.

Species mixes shall be drawn from those nominated on this these lists dependent upon seasonal and/or commercial availability.

Two vegetation types will form the basis of the rehabilitation; eucalypt woodland to open forest and grassland/ pastures.

The desired diversity of species in the eucalypt woodland to open forest rehabilitation areas will aim to achieve 70% species richness compared to the eucalypt woodland to open forest reference sites. Revegetation species will include a mix of trees, shrubs, sub-shrubs and grasses.

Species diversity in grassland rehabilitation areas will aim to achieve 70% species richness compared to the grassland/ pasture reference sites. The species seeded onto the grassland/ pasture will be a mixture of native and exotic species. Native perennial reeds and grasses and introduced legumes and grasses that are suitable for sowing onto pasture rehabilitation areas.

Seeding will generally be via ground spreading directly into a prepared and ameliorated seedbed. Some hydro-mulching may be required on steep or otherwise inaccessible areas. This is consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

16. Domain 6 quarry dam

This section describes the scope of works required to return the Quarry Dam Domain to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes against the rehabilitation objectives.

16.1 Summary table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 6.

Table 16-1 Summary of the key demolition and rehabilitation aspects for Domain 6

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Quarry Dam and associated infrastructure
Total area of disturbance	8 ha
Final land use	• Eucalypt Woodland-Open forest
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment • Rehabilitation works to Eucalypt woodland to open forest • Drain and discharge of stored water in accordance with existing discharge licence conditions • Remove any coal fine sediment from dams • The Dam wall will be either dozed/ pushed into the quarry void to create a landform or crushed concrete placed into void and dam wall material utilised as capping material. • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion, water pollution and siltation
Monitoring requirements	• Continued water quality and discharge monitoring • Earthworks monitoring and inspections • Rehabilitation monitoring
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$8.08M**, covering: ○ $7.46M of remediation costs ○ $0.61M of rehabilitation costs • Refer to Attachment 2 for total cost breakdown and detail

16.2 Present conditions

The Quarry Dam Domain contains infrastructure (and plant) that would require decommissioning and removal in order to permit the rehabilitation of the area. The area has the following infrastructure:

- Quarry Dam bulk earthworks
- Water pumping and pipelines
- Associated surface roads and drainage

16.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site. The proposed final land use and landform for Domain 6 is consistent with the primary rehabilitation objective of returning the Domain to its natural state and condition as existed prior to any development occurring on the site.

Box 6: proposed final land use for Domain 6

The final land use for Domain 6 includes eucalypt woodland to open forest.

To achieve the land use outcomes, decommissioning and rehabilitation activities include:

- Water discharged in accordance with licence conditions or if water quality suitable then re-used on site for rehabilitation purposes.
- All hazardous materials and contaminated material removed.
- Revegetated with grassland and eucalypt woodland- open forest vegetation.

There are two options have been considered for the final landform of the Domain which include the following methodology:

1. Doze Dam wall into Quarry void – no crushed concrete placement

- Empty water, push wall into quarry void to create a final landform as per design that does not have additional material needed.

2. Fill Quarry void – crushed concrete placement

- Empty water, store concrete waste in void, use dam wall material to cap crushed concrete. Complete final shaping as per design.

We have proposed two options for the Quarry Dam Domain, so that a lower- and upper-bound cost estimate can be produced for DBCTM's consideration (Option 1 and Option 2, respectively). We have nominated two options because it is unclear what final land use and land form the Quarry Dam would take after the outcomes of the stakeholder engagement process for the rehabilitation of DBCT are known.

Both options are consistent with the rehabilitation objective of creating a stable, non-polluting final landform.

16.4 Decommissioning and demolition actions – Scope of work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of the RCE for Domain 6.

The Quarry Dam will have minimal decommissioning and demolition activities. Any services supplying Quarry Dam equipment (such as pumps) will need to be isolated, disconnected and removed. Any small items will be removed from the area using telehanders to remove to a processing area.

Larger infrastructure may be mechanically sheared to manageable sizes before removing to the processing facility. Any demolition waste will then be recycled where possible or transported to an appropriate disposal facility.

16.5 Rehabilitation actions – Scope of work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of the RCE for Domain 6.

16.5.1.1 Contaminated sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be undertaken following decommissioning and demolition activities. If contaminated material is identified within the Domain, it will be excavated and removed to a designated waste facility.

Coal fine sediments will be removed from the bottom of the Quarry Dam prior to commencement of earthworks to ensure that all potential contaminants are removed from site. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

16.5.1.2 Surface water

Stored water will be drained from the Quarry Dam and either discharged in accordance with the existing water discharge licence conditions or used onsite for demolition and rehabilitation purposes dependent on suitability of water quality. We anticipate that a maximum of approximately 837 megalitres of water will be required to be discharged or reused.

Landform would be graded so that it is free draining generally towards Sandfly Creek and Dalrymple Bay.

Erosion and sediment controls will be undertaken in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008).

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

16.5.2 Civil earthworks and landform

A detailed landform design will be prepared five years prior to the cessation of operations. The conceptual landform design developed by GHD estimated that approximately 1,200,000 m^3 of material to fill and reshape the Quarry Dam (Option 2). It has been assumed that the dam would be filled with crushed concrete and either excess material from onsite or imported material used to reshape the surface.

The top 100 mm of the fill material will be processed to form a growth medium.

Fill material would be placed in layers and tracked rolled between layers. A growth medium layer about 100 mm thick would be placed prior to being seeded with a suitable vegetation mix.

Soil testing of site material or imported material will be undertaken throughout the execution and maintenance phases to determine amelioration requirements for future rehabilitation areas. It is anticipated that amelioration will include superfine agricultural gypsum to treat dispersion, fertilisers to increase nutrient levels and compost to increase soil organic carbon.

Earthworks and surface preparation will involve a number of approaches to achieve final landform design. Either of the two options described below will be used:

1. Doze Dam wall into Quarry void – no crushed concrete placement:
    - Empty water, push wall into quarry void to create a final landform as per design that does not have additional material needed.
2. Fill Quarry void – crushed concrete placement:
    - Empty water, store concrete waste in void, use dam wall material to cap crushed concrete. Complete final shaping as per design.
    - Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
    - Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

16.5.3 Revegetation

Domain 6 will be rehabilitated to include Eucalypt Woodland-Open forest. Species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area. These lists will include grasses and groundcovers, canopy and mid-storey species. Species mixes shall be drawn from those nominated on the lists, dependent upon seasonal and/or commercial availability.

The desired diversity of species in the eucalypt woodland to open forest rehabilitation areas will aim to achieve 70% species richness compared to the eucalypt woodland to open forest reference sites. Revegetation species will include a mix of trees, shrubs, sub-shrubs and grasses.

Seeding will generally be via ground spreading directly into a prepared and ameliorated seedbed. Some hydromulching may be required on steep or otherwise inaccessible areas.

This is consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

17. Domain 7 offices and workshops

This section describes the scope of works required to return the Offices and Workshops Domain to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

17.1 Summary table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 7.

Table 17-1 Summary of the key demolition and rehabilitation aspects for Domain 7

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Paved roads and carparks • Site fencing • Carpark cover structures • Buildings • Sewage • Diesel fuel storage and distribution
Total area of disturbance	31 ha
Final land use	Eucalypt Woodland-Open forest
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment. • Rehabilitation works to Eucalypt Woodland-Open forest • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area
Monitoring requirements	• Earthworks monitoring and inspections • Soil characteristics • Soil amelioration requirements • Rehabilitation monitoring
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$32.56M**, covering: ○ $1.48M of decommissioning costs ○ $0.72M of demolition costs ○ $16.23M of disposal (& pre-processing for disposal) costs ○ $11.89M of remediation costs ○ $2.24M of rehabilitation costs • Refer to Attachment 2 for total cost breakdown and detail

17.2 Present conditions

At present the Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. In this instance, the area currently has the following infrastructure:

- Paved roads and carparks.
- Site fencing.
- Carpark cover structures.
- Buildings - including DBCT Corporate office, Operations Centre, Stores Warehouse, Q2 Coal building, L&D Training building, DBCT Administration building, Archives building, Learning Centre, CP Office, Old NQBP Tower, Fire Pump House, Sample Prep Building and the main and west gate security huts.
- Sewage mains connection to the MRC wastewater treatment plant.
- Diesel fuel storage and distribution.
- Associated support services.

17.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site. The proposed final land use and landform for Domain 7 is consistent with the primary rehabilitation objective of returning the Domain to its natural state and condition as existed prior to any development occurring on the site.

Box 7: proposed final land use and landform for Domain 7

The final land use and landform for Domain 7 includes eucalypt woodland-open forest

To achieve these land use outcomes decommissioning and rehabilitation activities include:

- All hazardous materials and contaminated material removed
- All infrastructure and assets removed
- Landform generally blends in with the surrounding landscape and is stable
- Revegetated with eucalypt woodland-open forest vegetation.

17.4 Decommissioning and demolition actions – Scope of work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a RCE for Domain 7.

17.4.1 Decommissioning

The infrastructure included in Domain 7 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Isolation and disconnection of services including, water, fire water, electricity and communications.
- Removal of chemicals stored in buildings.
- Degassing and capturing refrigerants (such as those from air conditioning units).
- Releasing pressure from pneumatic and hydraulic systems (such as air compressors).
- Capturing and removing hydrocarbons from equipment and storage vessels (such as any fuel handling).
- Removing Hazardous Materials contained in the building materials, equipment etc:
  - Asbestos
  - PCBs
- Installing temporary infrastructure to support the demolition project:
  - Temporary power, which may potentially run off generators
  - Stormwater management systems
  - Dust management systems

17.4.2 Demolition

Once the infrastructure has been decommissioned, demolition can commence. The infrastructure contained in Domain 7 consists of offices, workshops and low height infrastructure. Therefore, demolition of this area will predominantly occur via mechanical shearing.

The infrastructure will be prepared for demolition by removing high value item such as copper cabling, where practical to do so. Once removed the infrastructure has been prepared, demolition via relevant methods will commence.

Mechanical demolition, such as shearing, will be used for low level structures to process to manageable sizes. Excavators with rock breaking equipment will be used to demolition the civil structures and foundations in Domain 7.

17.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to a processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal. Processing the demolition waste could be in the form of manual cutting using oxy torches, further mechanical shearing and magnetic attachments on excavators to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate. Some of the anticipated waste streams include:

- Inert Waste, such as Concrete.
- Hazardous Waste such as asbestos, PCBs, lead based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel and copper.
- All waste will be transported off site to the relevant recyclable markets or disposal facilities.

17.5 Rehabilitation actions – Scope of work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a RCE for Domain 7.

17.5.1 Contaminated sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be undertaken following decommissioning and demolition activities. If contaminated material is identified within the Domain it will be excavated and removed to a designated waste facility.

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

17.5.2 Civil earthworks and landform

A detailed landform design will be prepared five years prior to the cessation of operations.

The conceptual landform design developed by GHD estimated that approximately 730,700 m^3 of material will be cut and 125,200 m^3 of that material will be used to reshape and fill this Domain.

The top 100 mm of the fill material will be processed to form a growth medium. Fill material would be placed in layers and tracked rolled between layers. A growth medium layer about 100 mm thick would be placed prior to being seeded with a suitable vegetation mix.

Soil testing of site material or imported material will be undertaken throughout the execution and maintenance phases to determine amelioration requirements. It is anticipated that amelioration will include superfine agricultural gypsum to treat dispersion, fertilisers to increase nutrient levels and compost to increase soil organic carbon.

Earthworks and surface preparation will involve a number of approaches to achieve final landform design:

- Excavation of material of disturbed slope areas to reduce batter slopes to less than or equal to not greater than a 1V:3H gradient.
- Ripping of hard pack areas to provide medium for roots to penetrate.
- Redistribution of excess material.
- Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
- Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

17.5.3 Revegetation

Domain 7 will be rehabilitated to include:

- Eucalypt Woodland-Open forest.

The species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area. These lists will include grasses and groundcovers, canopy and mid-storey species.

Species mixes shall be drawn from those nominated on this these lists dependent upon seasonal and/or commercial availability.

The desired diversity of species in the eucalypt woodland to open forest rehabilitation areas will aim to achieve 70% species richness compared to the eucalypt woodland to open forest reference sites. Revegetation species will include a mix of trees, shrubs, sub-shrubs and grasses.

Seeding will generally be via ground spreading directly into a prepared and ameliorated seedbed. Some hydromulching may be required on steep or otherwise inaccessible areas.

This is consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

17.5.4 Surface water

Landform would be graded so that it is free draining generally towards Lake Barfield, Grendon Creek or Sandfly Creek. A constructed drainage path may be constructed and will be shaped in undulating informal profiles in keeping with natural landforms of the surrounding environment. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform.

Erosion and sediment controls will be undertaken in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008).

18. Domain 8 utilities

This section describes the scope of works required to return the Utilities Domain to the pre-construction state and condition. It sets out the current infrastructure within the Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes.

18.1 Summary table

The following table summarises the key demolition and rehabilitation aspects relevant to Domain 8.

Table 18-1 Summary of the key demolition and rehabilitation aspects for Domain 8

Key Aspect	Domain Specific Information
DBCT Area/ Third Party Asset Area	This area comprises a modified landform and contains: • Ergon 33kV OHL and substation • Main substation and in-plant electrical • Water mains connections
Total area of disturbance	10 ha
Final land use	Eucalypt Woodland-Open forest
Key obligations	• Removal of all infrastructure/assets, machinery, plant or equipment. • Rehabilitation works to Eucalypt Woodland-Open forest • Ensure regular maintenance of rehabilitation is undertaken • Rehabilitation of ground surface after removal of infrastructure/ assets, machinery, plant or equipment • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area
Monitoring requirements	• Earthworks monitoring and inspections • Soil characteristics • Soil amelioration requirements • Rehabilitation monitoring
Rehabilitation Cost Estimate (Oct 2018 dollars)	• Total direct costs of **$22.87M**, covering: ○ $0.48M of decommissioning costs ○ $0.69M of demolition costs ○ $12.67M of disposal (& pre-processing for disposal) costs ○ $8.35M of remediation costs ○ $0.68M of rehabilitation costs • Refer to Attachment 2 for total cost breakdown and detail

18.2 Present conditions

At present the utilities Domain contains plant and infrastructure that would require decommissioning and removal in order to permit the rehabilitation of the area. Specifically, the Domain contains:

- Ergon 33/11kV Substation.
- 11kV overhead transmission line feeding main DBCT Substation.
- Main DBCT substation.
- In-plant substations SS1, SS1A, SS2, SS2A, SS2B, SS3, SS3A, SS3B, SS3C, SS4, SS4A, SS5, SS5A, SS6, SS6A and SS9.
- Substation power feeds.
- Potable water connection mains to the MRC water treatment plant (which is different from the sewage facility identified in the Offices & Workshops Domain).
- Raw water connection mains to SunWater.

18.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the land use prior to construction of DBCT site. The proposed final land use and landform for Domain 8 is consistent with the primary rehabilitation objective of returning the Domain to its natural state and condition as existed prior to any development occurring on the site.

Box 8: proposed final land use and landform for Domain 7

The final land use and landform for Domain 8 includes grassland, with grazing potential and native woodland-open forest.

To achieve these land use outcomes decommissioning and rehabilitation activities include:

- All hazardous materials and contaminated material will be removed from the domain
- All infrastructure and assets removed will be removed from the domain
- The remaining land will be revegetated with eucalypt woodland-open forest vegetation
- Earthworks to ensure landform generally blends in with the surrounding landscape and is stable

18.4 Decommissioning and demolition actions – Scope of work

This section specifies the various decommissioning and demolition activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of the RCE for Domain 8.

18.4.1 Decommissioning

The infrastructure included in Domain 8 will need to be decommissioned prior to demolition occurring. Decommissioning activities will consist of:

- Isolation and disconnection of services including, water, fire water, electricity, communications.
- Releasing Stored energy:
  - Removal of chemicals stored in buildings
  - Degassing and capturing refrigerants
- Removing Hazardous Materials contained in the building materials, equipment etc:
  - Asbestos
  - PCBs
- Installing temporary infrastructure to support the demolition project:
  - Temporary power (potentially run off generators)
  - Stormwater management systems
  - Dust management systems

As the utilities area will require disconnection from the main grid system, the works will have to be coordinated with the relevant authority and utility to disconnect the High Voltage (HV) supply from the network, notably with Ergon and Aurizon (e.g. rail overhead wires for balloon loops for electric trains).

18.4.2 Demolition

Once the infrastructure has been decommissioned, demolition can commence. The infrastructure contained in Domain 8 consists of low rise buildings, civil infrastructure and power infrastructure. Therefore, demolition of this area will occur using predominantly mechanical shearing and excavators to remove civil and buried infrastructure.

The infrastructure will be prepared for demolition by removing high value item such as copper cabling, where practical to do so. The HV lines will be pulled through conduits and overhead structure and rolled up. Once removed the infrastructure has been prepared, demolition via relevant methods will commence.

18.4.3 Disposal

Once the infrastructure has been demolished, the resulting demolition waste will be transferred to a processing yard for further segregation into waste streams and processing to sizes suitable for transport and disposal. Processing the demolition waste could be in the form of manual cutting using oxy torches, further mechanical shearing and magnetic attachments on excavators to separate ferrous materials. The demolition waste will be segregated into waste streams for recycling and disposal as appropriate. Some of the anticipated waste streams include:

- Inert Waste, such as Concrete.
- Hazardous Waste such as asbestos, PCBs, lead based paint, radioactive waste and ozone depleting substances.
- Recyclable material such as steel and copper.

All waste will be transported off site to the relevant recyclable markets or disposal facilities.

18.5 Rehabilitation actions – Scope of work

This section specifies the various rehabilitation activities for the domain. It includes a description of the works to be undertaken. It is intended that this will form the basis of a Rehabilitation Cost Estimate (RCE) for Domain 8.

18.5.1 Contaminated sites

A site assessment to identify the presence, nature and extent of potential soil, sediment and groundwater contamination issues will be required following decommissioning and demolition activities. If any contaminated material is identified within the Domain it will be excavated and removed to a designated waste facility. This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and complying with legislative requirements.

18.5.2 Civil earthworks and landform

Earthworks and surface preparation will involve a number of approaches to achieve final landform design:

- Ripping of hard pack areas to provide medium for roots to penetrate.
- Redistribution of excess material.
- Recontouring / regrading to allow for surfaces applicable to final land use classifications, allow for controlled of surface water movements and to minimise the risk of erosion.
- Contour ripping to incorporate soil ameliorates into the plant rooting zone. A roughened soil surface also increases rainfall infiltration, reduces runoff and provides micro-habitat for plant germination and establishment.

  This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform and providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

18.5.3 Revegetation

Domain 8 will be rehabilitated to include:

- Eucalypt Woodland-Open forest

The species list for revegetation will be developed to replicate the nature of the endemic vegetation communities of the area. These lists will include grasses and groundcovers, canopy and mid-storey species.

The species mixes shall be drawn from those nominated on this these lists dependent upon seasonal and/or commercial availability.

The desired diversity of species in the eucalypt woodland to open forest rehabilitation areas will aim to achieve 70% species richness compared to the eucalypt woodland to open forest reference sites. Revegetation species will include a mix of trees, shrubs, sub-shrubs and grasses.

Seeding will generally be via ground spreading directly into a prepared and ameliorated seedbed. Some hydromulching may be required on steep or otherwise inaccessible areas.

This is consistent with the rehabilitation objective of providing a growth medium to return the vegetation to the previous condition and reinstate the original ecosystem function.

18.5.4 Surface Water

Erosion and sediment controls will be undertaken in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008).

This is consistent with the rehabilitation objective of creating a stable, non-polluting final landform.

19. Domain 9 Tug Harbour

This section describes the current infrastructure within the Tug Harbour Domain and summarises the key obligations, risks and monitoring requirements for rehabilitation purposes in the context of the rehabilitation objectives. The section then concludes with a cost estimate for the Domain.

Although the Tug Harbour Domain is outside the lease boundaries of DBCT site, it falls within the Battery Limits for rehabilitation as it was specifically constructed to facilitate coal trading through the Port of Hay Point. The Tug Harbour also provides a boat ramp for recreational boating activities and its jetty allows for the public to undertake leisure activities, such as fishing. Hence, we considered two options for how the final use of the Tug Harbour Domain should be determined in this Rehabilitation Plan, namely:

- Remove the structures
- Retain the structure to enable public uses

Of the two options, we considered retaining the structure would be the preferred outcome that would emerge from the stakeholder-engagement process. This is because:

- The Queensland Government and relevant communities are likely to prefer for the Tug Harbour to continue provide recreational and leisure options for the public.
- There would be less adverse environmental impacts on marine life in the vicinity of the Tug Harbour from leaving the structure as is than removing it.
- It would be more cost effective from a social perspective to maintain and operate the Tug Harbour structure for public-use purposes than to remove the structure.

We considered that NQBP would reach an agreement with DBCT and HPCT for a one-off fee to be paid by both terminal operators that reflects the maintenance and operations costs of the Tug Harbour for a period after closure. We expect this agreement be reached because it would be less costly for DBCT and HPCT (and ultimately, the port terminals' users) to pay the fee instead of incurring the demolition- and rehabilitation-related costs.

Importantly, we note that that the Tug Harbour Domain, and its marine off-loading facility (MOF), will be required to support DBCT with the Offshore Infrastructure Domain D&D works. This includes the use of the Tug Harbour (and tug boats) by barges (with high-speed cranes) to enable the demolition and disposal of the Offshore Infrastructure. The fees that NQBP would levy on the barges are reflected in the cost estimate for the Offshore Infrastructure Domain, and hence is not captured by the cost estimate for the Tug Harbour Domain. The cost estimate for the Tug Harbour Domain solely relates to the present value of costs for maintaining and operating the Tug Harbour for public-use benefits after the rehabilitation of DBCT has been completed.

19.1 Summary table

The following table summarises the aspects relevant to Domain 9.

Table 19-1 Summary of the key demolition and rehabilitation aspects for Domain 9

Key Aspect	Domain Specific Information
DBCT Area	This area comprises a modified landform and contains: • Tug Harbour
Total area of disturbance	15 ha
Final land use	No change to current land use
Rehabilitation Cost Estimate (Oct 2018 dollars)	$37.23M (all direct, indirect and contingency costs) $0.5M (one-off study cost)

19.2 Present conditions

The Tug Harbour Domain currently contains plant and infrastructure that would require decommissioning and removal to permit the rehabilitation of the area. The Domain has the following infrastructure:

- Groyne and sea wall (to be retained and gifted to Mackay Regional Council (MRC))
- MOF and boat ramps (to be retained and gifted to MRC)
- Berths and other marine structures
- Buildings, gates and fences

19.3 Proposed final land use and landform

The final land use outcomes for this Domain were based on the current use of the infrastructure.

The Tug Harbour was specifically constructed to service the coal trade at the Port of Hay Point, through DBCT and HPCT. The breakwater structure was built from rock quarried from DBCT site (which is now the Quarry Dam), and provides a harbour for tug boats and ocean access for recreation vessels at the public boat ramp. It is the only structure within the Battery Limits that is used by the public. It is currently owned and maintained by NQBP.

Because of the public use benefit derived from the tug harbour and associated breakwater structure, it would be inappropriate for the structure to be rehabilitated by DBCTM alone. The Tug Harbour Domain disposition will be resolved when DBCTM's rehabilitation obligation falls due. We note that the Tug Harbour may be used by barges during the rehabilitation process of DBCT facility, and potentially the Hay Point facility. Hence, the exact timing of disposition is unknown.

As part of the disposition of the Tug Harbour, a payment will be required to the owners of the facility. This payment should cover the cost of maintenance for the facility for 30 years after the rehabilitation of DBCT, as well as an allowance for insurance. The insurance component will reflect the payment required to insure the facility against cyclones and severe storm events.

The deterioration of the infrastructure contained within the Tug Harbour Domain is time-based, as opposed to utilisation-based. Therefore, we initially considered a 50/50 split of the costs between DBCT and HPCT to be appropriate. However, the Central Queensland Coal Associates Agreement Act 1918 (Qld), No. 55[8], provides that where the harbour/harbour works (i.e. Tug Harbour) need to be extended to meet the needs of the community, but not those of BMA (then owned as part of the Utah Development Company), then BMA (as the owner of HPCT) should not be charged for the operating, management and maintenance costs of that extension. Given this, it would be reasonable for DBCTM to consider having to bear the full costs of the Tug Harbour disposition as a default position. Hence, we have assumed that DBCTM will incur all costs associated with the Tug Harbour disposition.

Prior to the disposition of the Tug Harbour, the Domain will need to undergo an engineering inspection to determine any maintenance or repair works required on the facility. This will determine the appropriate annualised maintenance cost over the thirty year period. We estimate that this one-off study (which may include diving personnel assessing the extent of maintenance and repair works required) will cost DBCTM approximately $500,000 (October 2018 terms.

We estimate that the current facility will require an annualised maintenance cost of approximately $1.2 m. This has been based on quantities derived from measuring satellite images of the site, the Port Designers Handbook, maintenance dredging requirements (where dredge spoil is disposed of offshore) per NQBP maintenance dredging reports, an allowance of 2 per cent for breakwater and causeway rockwork on armour layers and an assumption that fenders will need to be replaced every 10 years (i.e. three replacements required over the 30 year period). We have also assumed that storm events are insured, meaning that there would be no major reconstruction costs associated with these events.

Our cost estimate of $1.2 m per annum incorporates a 40 per cent allowance over and above direct costs. The allowance comprises: 20 per cent for indirects and overheads; and 20 per cent for contractor margins. We note the 40 per cent is lower than what we have allowed for Domains where demolition is required; in those instances, the figure is closer to 60 per cent (see Attachment 2).

The Tug Harbour will need to also be insured. By considering DBCTM's 2018 coverage of the jetty installation, we estimated the premium by converting DBCTM's insurance coverage (confidential) to a per metre basis and applied this to the derived length of the tug facility. The approach yielded an insurance premium figure of $4,575.

We have applied a discount rate of 2.28% per cent, reflecting the most recent QCA draft decision on the 10-year-term risk-free rate (for Queensland Rail's 2020 DAU), and an inflation assumption of 2.5 per cent, reflecting the mid-point of the Reserve Bank of Australia's inflation target, over the thirty year period from October 2051 to October 2081 to determine the present value of the cash payment that DBCTM would need to make for the maintenance and insurance costs associated with the disposition of the Tug Harbour.

Based on the above, we estimate the total cost for the Tug Harbour Domain to be **$37.23 M**, in present value (October 2018) terms. Note that this amount excludes any studies costs.

[8] Part V, Clause 7.2 (b)

20. Monitoring and maintenance

A monitoring and maintenance program will be developed and implemented throughout the rehabilitation of DBCT site. This program will be key to demonstrating that the rehabilitation objectives have been met and the successful rehabilitation has been achieved.

The monitoring program will:

- Compare results against rehabilitation objectives and criteria.
- Identify possible trends and continuous improvement.
- Link to records of rehabilitation to determine causes and explain results.
- Assess effectiveness of environmental controls implemented.
- Where required, identify modifications required for the monitoring program, rehabilitation practices or areas requiring research.
- Compare flora species present against original seed mix and/or reference sites.
- Assess vegetation health.
- Assess vegetation structure (e.g. Upper, mid and lower storey).
- Where applicable, assess native fauna species diversity and the effectiveness of habitat creation.

The monitoring program will identify reference sites within the surrounding locality within land uses and vegetation communities comparable with the rehabilitation objectives. The reference sites will provide a range of values and data from similar vegetation communities. Rehabilitation areas are compared to the analogue sites that best represent the final land use, vegetation community and management conditions they will be subjected to. Reference sites also allow evaluations of climatic and seasonal influences that may affect rehabilitation progress.

In order to demonstrate rehabilitate success or succession toward rehabilitation success, indicators are used to demonstrate a positive trend towards target values and demonstrate long-term sustainability i.e. being self-sustaining. As such, the monitoring program will be developed to incorporate monitoring methodologies including flora, fauna, and landscape function (LFA) and habitat values aimed at assessing ecosystem function in remnant vegetation and rehabilitation areas.

The rehabilitation program will allow for adaptive management by reviewing substandard performance from a rehabilitation area and establishing the cause; evaluating the probability of substandard performance continuing; evaluating the consequence; and using a risk basked approach to determine trigger levels (both upper and lower) where response or action is required. A Trigger Action Response Plan (TARP) will be implemented to respond in the event of poor rehabilitation performance or an unexpected result.

The following section describes rehabilitation aspects and the indicators associated with them which are likely to be included in the monitoring and maintenance program. Total direct monitoring and maintenance costs are estimated to be **$9.25M** (Oct 2018 dollars).

20.1 Earthworks

20.1.1 Monitoring

Monitoring and inspections of earthworks activities will be undertaken in accordance with an Inspection, Test Plan (ITP). The ITP will detail include inspection, testing, hold points and approval process for verification and monitoring of earthworks. The ITP may include monitoring and inspections for the following:

- Surface preparation (ripping depth)
- Thickness
- Compaction / settlement
- Adherence to final landform design
- Moisture content
- Size of material
- Material quality
- Survey control.

20.1.2 Maintenance

Management and rehabilitation maintenance actions will be undertaken as required and in accordance with the ITP and Trigger Action Response Plan (TARP) during earthworks activities.

20.2 Growth medium

20.2.1 Monitoring

Soil monitoring will be undertaken prior to use as a growth medium and as part of the rehabilitation monitoring program.

Monitoring will assess:

- Soil quality – Soil characteristics (pH, EC and ESP, nitrogen and phosphorus).
- Amelioration requirements to provide a suitable range of properties for revegetation.
- Landscape organisation and soil surface.
- Surface cover – Ground cover percentages (vegetation, leaf litter, mulch) are comparable to that of analogue sites.
- Nutrient recycling – Evidence of nutrient recycling (e.g. presence of fungi) is present within rehabilitation areas.

20.2.2 Maintenance

Management and rehabilitation maintenance actions will be undertaken as required and in accordance with the TARP and may include:

- Amelioration of growth medium
- Additional tree planting
- Importation of rocks, logs and woody debris

20.3 Vegetation cover

20.3.1 Monitoring

The rehabilitation monitoring program will continue within rehabilitation areas until all closure criteria are satisfied.

Permanent monitoring sites will be established throughout DBCT site and adjacent sites to provide reference sites to monitor flora, fauna, landscape function and habitat values aimed at assessing ecosystem function in remnant vegetation and rehabilitation areas.

Monitoring of these sites will be undertaken annually until rehabilitation areas reach acceptable levels of establishment, and then monitoring will be undertaken periodically.

Monitoring of these sites assesses:

- Plant community structural attribute.
- Cover, species density, height and structural diversity.
- Species richness (the number of plant species present in each structural layer of each vegetation community).
- Landscape function.
- The presence and abundance of any weed species.
- Assessment of natural regeneration/recruitment of new species.
- Maintenance.

Management and rehabilitation maintenance actions will be undertaken as required and in accordance with the TARP and may include:

- Weed control, involving targeted weeding on an annual basis.
- Feral animal control.
- Re-seeding and/ or supplementary planting.
- Application of appropriate ameliorates to improve stability, fertility etc.
- Repair of erosion or stability of areas.
- Maintenance of fences and gates.

20.4 Marine environment

20.4.1 Monitoring

The marine environment monitoring program will continue annually within rehabilitation areas until all closure criteria are satisfied.

Monitoring sites will be established within the rehabilitation area, and at suitable reference locations in the region to enable comparative analysis of the performance of key relevant marine indicators. These include:

- Seabed profile.
- Contamination status of the marine sediments in the rehabilitation area, inclusive of coal particulates, heavy metals, and any other pollutants of concern.
- Recruitment of invertebrate and associated communities to the foreshore habitat.
- Assessment of the presence and persistence of seagrass meadows in the Hay Point region.

- Ongoing turtle nesting at nearby known nesting locations.
- Assessment of the habitat use of the area by protected species such as inshore dolphins and marine turtles.
- Assessment of the habitat use of the foreshore area by shorebirds.
- Assessment of the presence and abundance of invasive marine species (IMS).

Management and rehabilitation maintenance actions will be undertaken as required and in accordance with the TARP and may include:

- Establishment of temporary exclusion zones to minimise impactful activities (such as trawling) in the rehabilitation area.
- Additional works to stabilise seabed profiles, such as bed levelling.
- Removal of contaminated sediments.
- Transplanting of seagrasses.
- Implementation of tailored IMS response actions.
- ‘Seeding’ of invertebrate communities at the foreshore habitat.

21. Preliminary program

The preliminary program has been based on the following overall sequence:

- Decommissioning
- Demolition
- Disposal
- Remediation
- Rehabilitation.

We have based our preliminary program on engaging a single head contractor to complete the works once the whole facility has closed. We have not allowed for staged closure of the site. We would anticipate that there would be multiple work fronts operating on the site to optimise the program.

We have assumed that dedicated work crews would be assigned to specific work packages. We have assumed that the decommissioning works for onshore and offshore works will take up to 18 months to complete. However, after six months of decommissioning works, the demolition crews could commence on the domains that have been fully decommissioned.

The demolition works have been split into onshore and offshore infrastructure which will occur concurrently. The critical path is the offshore infrastructure which is anticipated to take 7.5 years to complete. This allows for two barges to be operational for the pile removal and approximately 30 per cent down time for the barges due to unsuitable marine conditions. We acknowledge the PSA requires that rehabilitation of the Terminal occur within three years, but we consider this not plausible in light of the demolition tasks that DBCTM must take to meet the rehabilitation objectives in this Rehabilitation Plan.

The Onshore works have been estimated at four years to complete the demolition works. Once these works have been complete some of the overheads associated with overall decommissioning and demolition project can be reduced. We acknowledge the PSA requires that rehabilitation of the Terminal occur within three years, but we consider this not plausible in light of the demolition and decommissioning steps that DBCTM must take to meet the rehabilitation objectives in this Rehabilitation Plan.

Any remediation that may be required and rehabilitation of the site can commence once demolition has been completed. Bulk earthworks and any remediation activities will occur following demolition and therefore concurrently with demolition works in other Domains.

Rehabilitation activities have been estimated at four years to complete including soil amelioration, seeding and tube stock planting. Rehabilitation activities can be carried out in Domains were bulk earthworks have been complete.

We have assumed a 10 year monitoring and maintenance program once the site has been initially rehabilitated. It is assumed a two person team will be engaged on a full time basis for the duration to conduct regular monitoring and stakeholder reporting. The monitoring team will engage maintenance contractors on an as required basis to repair landforms, maintain required soil chemistry and reseed/replant where initial rehabilitation planting has been unsuccessful.

22. Comparison to previous approaches

As part of the 2015 DAU process, DBCTM proposed an increase to the Allowance to ensure it was recovering sufficient funds to cover its rehabilitation obligations at the end of the lease period. We understand that the QCA engaged T&T to develop a rehabilitation cost estimate based on the DBCT User Group's submissions on DBCTM's proposed rehabilitation costs. The T&T estimate was not guided by a Rehabilitation Plan provided by DBCTM, which is the party accountable for the rehabilitation of the facility. Importantly, we note that T&T acknowledged that it had prepared its advice for the QCA without any rehabilitation plan for the Terminal having been developed.

The T&T cost estimate was based on a desktop study and one day site tour of the DBCT site. T&T's core environmental objective was to rehabilitate the site to a safe and productive condition, which is fundamentally different to DBCTM's obligations under the PSA, as well as the QCA's view on the rehabilitation objective under the 2015 DAU.

Our Cost Estimate has been developed based on the set of actions required to rehabilitate each Domain to its pre-construction natural state and condition, having regard to whether these actions would promote a safe, stable and sustainable criteria. A comparison of our approach with T&T's approach is set out below.

Table 22-1 Comparison of GHD's approach with T&T's approach

Item	T&T approach	GHD approach	Comparison
General approach	• One day site tour with one staff person and desktop review of relevant information requested of DBCTM	• Two day site visit with four staff people and desktop review of key information provided by DBCTM • Review of current rehabilitation standards and relevant legislation	• Provides a more detailed understanding of potential constraints and opportunities for rehabilitation. It also provides a more informed basis for progressing into the future for rehabilitation planning.
General approach – Environmental aspects of the DBCT site	• No specific consideration was given to the environmental aspects of the site, other than to recommend that DBCTM undertake a study to determine the best approach to removal of offshore infrastructure.	• Identified a range of environmental aspects that require detailed assessment prior to closure to provide adequate information to inform any additional approvals, demolition methods and growth media amelioration rates.	• Provides a more informed basis for progressing into the future for rehabilitation planning which is reflective of the actual work required when the rehabilitation obligation falls due.

Item	T&T approach	GHD approach	Comparison
General approach – accommodating site constraints into the rehabilitation plan	• Some consideration was given to the potential constraints for rehabilitation, such as considering high-level factors relating to the appropriateness of complete removal of structures, the filling of voids and the removal of any sub-terrain foundations of assets.	• Accommodated key elements of rehabilitation and the DBCT site constraints relating the existing environmental approval, site conditions, legislative requirements relating to waste, pollution, biodiversity, leading practice methods for rehabilitation and suitability for application on the DBCT site and a basic interpretation of existing vs original topography and landform.	• Provides a more detailed understanding of potential constraints and opportunities for rehabilitation which is reflective of the actual scope of works required when the rehabilitation obligation falls due.
Rehabilitation approach - rail lines and sleepers	• Upon removal of the rail lines and sleepers, the ballast will be excavated and used as fill material in the larger voids	• A contamination assessment of the ballast will be required • If contaminated, the ballast may be cleaned so it can be used as fill material. • If not contaminated, the ballast can be used as fill material in gabion structures and rip-rap structures to dissipate water energy in slopes.	• Our approach is compliant with contamination standards and guidelines.

Item	T&T approach	GHD approach	Comparison
Decommissioning and demolition of jetty infrastructure	• Jetty and wharf concrete beams will be saw cut into 12m lengths and cross-sectional post-tensioning strands will be mechanically cut to allow lifting of deck beam units • Once cut, the components will be transported onshore	• Temporary structural support and transport frames may be required for the demolition of the wharf, jetty decks and superstructure. • The temporary structural support frames would be purpose-built items that may be reused for the superstructure modules. • The superstructure modules will be transported back to an onshore processing facility to minimise the use of barge-mounted equipment. • Once the superstructure has been removed, the pile system can then be removed.	• Complete removal of the jetty piles is the most appropriate means to maximise the long-term rehabilitation of the jetty infrastructure. While complete removal imposes short-term environmental risks and considerations, including impacts on species endemic to the offshore Domain, complete removal will enable the natural coastal processes and sand flows to provide significant long-term environmental benefit. It will also create a better long-term ecosystem for species endemic to the region and benthic communities. • Strict controls will be required for the removal of offshore infrastructure to prevent spills of chemicals, stormwater and sediment from the wharf during the demolition process. • Our approach to demolition is more consistent with providing these controls than the T&T approach.

References

ANZMEC / MCA (2000) Strategic Framework for Mine Closure

Australian Government, Department of the Environment and Energy (2019) International hazardous waste Conventions, available at: https://www.environment.gov.au/protection/hazardous-waste/conventions

Australian Government (2016a) Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure

Australian Government (2016b) Leading Practice Sustainable Development Program for the Mining Industry – Mine Rehabilitation

Australian Government, Great Barrier Reef Marine Park Authority (2019) *Heritage,* available at: http://www.gbrmpa.gov.au/the-reef/heritage

Dames and Moore Pty Ltd (1996) Port of Hay Point Draft Impact Assessment Study for Dalrymple Bay Coal Terminals Stage 3 Expansion and Hay Point Coal terminal Upgrade; prepared for Ports Corporation of Queensland and Hay Point Services Pty Ltd

ICMM (2008) Planning for Integrated Mine Closures: Toolkit

MCA, 2016 Mine rehabilitation in the Australian minerals industry

NSW Department of Primary Industries DPI (2016) Exploration and mining rehabilitation fact sheet

Port Services Agreement, DBCT Holdings and DBCT Management

Queensland Competition Authority (2019), Draft Decision on Queensland Rail's 2020 Draft Access Undertaking, page 27

Qld Department of Environment and Science (2018) Guideline Resource Activities, Rehabilitation requirements for mining resources activities

Queensland Competition Authority (2016) DBCT Management's 2015 draft access undertaking: final decision

Queensland Competition Authority (2016) DBCT Management's 2015 draft access undertaking: draft decision

Turner and Townsend (2016) Review of proposed DBCT site rehabilitation costs for DBCT Management's 2015 DAU Queensland Competition Authority, January 2016

Turner and Townsend (2016) Review of proposed DBCT site rehabilitation costs for DBCT Management's 2015 DAU Queensland Competition Authority, Addenda Report 1 – October 2016

URS (2000) Draft Environmental Impact Statement, Dalrymple Bay Coal Terminal Expansion Stages 6 and 7; prepared for Ports Corporation Queensland

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GHD Advisory

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DBCT REHABILITATION PROJECT

Basis of Estimate

0	8-Mar-19	Issued for Use	RC	HD
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Attachment A - AACE Class of Estimate (Extract)

Attachment B – Capx Summary By Facility

Attachment C - Capex Summary by Major Commodity

Attachment D - Capex Details

Glossary of Terms and Acronyms

$/A$/AUD	Australian Dollars
CAPEX	Capital Expenditure Cost Estimate
COA	Code of Accounts
DBCT	Dalrymple Bay Coal Terminal
DBCT Holdings P/L	A Government of Queensland holding company (terminal asset owner)
DBCTM	DBCT Management (terminal asset manager)
DBCT P/L	Dalrymple Bay Coal Terminal P/L (terminal operator and maintenance contractor)
EPC	Engineering, Procurement and Construction (form of contract where the head contractor is responsible for engineering, procurement and construction of the works)
EPCM	Engineering, Procurement and Construction Management (form of contract where the head contractor is responsible for engineering, procurement and management only of other construction contractors)
GET	Ground engaging tools
GHD	GHD Pty Ltd (Rehabilitation Project consultant)
IFC	Issued for Construction
LS	Lump Sum (price)
M	Million
MTO	Material Take-Off
MRC	Mackay Regional Council
PEP	Project Execution Plan
PMS	Project Master Schedule
PPE	Personal Protective Equipment
QCA	Queensland Competition Authority
R&R	Rest and Recreation leave
RDO	Rostered Day Off
TIC	Terminal Infrastructure Charge
UP	Unit Price
VENM	Virgin Excavated Natural Material
WBS	Work Breakdown Structure

1 INTRODUCTION

1.1 PURPOSE

This document sets out the results of the capital cost estimates and the methodologies used to arrive at the given values for the DBCT Rehabilitation Project.

1.2 PROJECT OVERVIEW

DBCTM has commissioned GHD to prepare a Rehabilitation Plan and associated capital cost estimate for the Rehabilitation Project to decommission, demolish, dispose, remediate and rehabilitate the DBCT site at the end of its operations. DBCT is situated on the coastline approximately 35km by road, south of Mackay, Queensland. DBCT holds product coal from various Bowen Basin miners and loads out to ships for export. Current nameplate capacity is 85Mtpa.

1.3 AXIOM SCOPE

The scope of works included in this estimate covers only the disposal, remediation and rehabilitation elements of Domains 1 to 8 (see Section 2.1) including:

- Disposal – loading, transport off-site and disposal fees
- Recycling – revenue from sale of goods
- Remediation – onsite treatment of soils to either neutralise or decontaminate to allow re-use onsite or to meet disposal regulatory requirements
- Rehabilitation – landform reconstruction, soil conditioning and planting of flora
- Monitoring and maintenance for 10 years post rehabilitation
- Associated project studies, management and common indirects

Specifically excluded is the scope of Domain 9 Tug Harbour, and all decommissioning and demolition works to deconstruct the DBCT infrastructure. These are separately addressed by GHD.

1.4 ESTIMATE PURPOSE

The purpose of this estimate is to provide a prudent basis for DBCTM to calculate the remediation allowance component of its Annual Revenue Requirement (ARR) as part of its upcoming 2019 Draft Access Undertaking.

1.5 ESTIMATE CLASSIFICATION

As agreed with DBCTM, the capital cost estimate has been developed in accordance with a Class 4 AACE International Recommended Practice No. 47R-11 - Cost Estimate Classification System – As Applied in The Mining and Mineral Processing Industries (refer extract provided in Attachment A).

The estimate, inclusive of contingency, is intended to reflect the most likely cost expenditure outcome within an accuracy range of - 20% to + 35%.

1.6 CURRENCY AND BASE DATE

All estimates are presented in Australian dollars as of 4th quarter calendar year 2018 market terms.

The following exchange rates where applicable at the time of estimating. Rates are provided to indicate the relativities between world economies and may not necessarily have been used in the direct build- up of the estimates.

AUD 1.00 buys:

- USD 0.72
- EUR 0.63
- CNY 4.90

1.7 ESTIMATE CONDUCT

This estimate has been performed as a desk top study using scope information provided by DBCTM, GHD, Google maps and that available in the public domain.

No project specific pricing enquiry has been issued nor budgetary quotes received in relation to the DBCT Rehabilitation Project. Pricing has been based on a combination of advertised charges (e.g. council waste fees), reference to Axiom's extensive library of project data and other construction cost references as noted herein. Where possible, productivities and pricing rates used in this estimate have been benchmarked against multiple sources that are relevant to the project scope and location.

Axiom project data is its intellectual property and its specific details are not for disclosure due to standing Confidentiality Agreements.

2 SCOPE OF WORKS

2.1 SCOPE INCLUSIONS

The scope of works covered by this estimate is summarised below by the reporting domains and estimate WBS.

Domain 1 – Rail Loop, Receival and Conveyors (Area 1100)

Facility 1110 – Rail Loop

- Rail line trackwork 1, 2 & 3 (3.2km of balloon loop)
- Rail line overhead catenary and support towers
- Aurizon substation
- Assoc. support structures and services

Facility 1120 – Rail Receival Stations

- Receival pits and stations RRP1, RRP2, RRP3
- Pit conveyors C1, C2, BF11
- Assoc. support structures and services

Facility 1130 – Materials Handing

- Conveyors S1, S2, S11
- Towers T1, T2, T21
- Assoc. support structures and services

Facility 1190 – Rail & Receival Domain Rehabilitation (88 Ha)

- Land forming earthworks
- Soil conditioning
- Seeding and tube stock

Domain 2 – Stockyards (Area 1200)

Facility 1210 – Stockyard Infrastructure

- Surface roads & drainage
- Stockpile pads rows 1, 2, 3, 4, 5, 6, 7 & 8 bulk earthworks and bedding coal
- Bund walls 1, 2, 3, 4, 4A, 5, 5A, 6

Facility 1220 – Yard Machines

- Stacker/reclaimer machines SR2, SR3A, SR4A, SR5, SR6
- Stacker machines ST1, ST2, ST3, ST4
- Reclaimer machines RL1, RL2, RL3
- Assoc. support structures and services

Facility 1230 – Materials Handling

- Inloading Conveyors S3, S4, S13, S5, S6, S7, S8
- Outloading conveyors R1, R2, R3, R4, R5, R6, R7, R8
- Towers T3, T3A, T4, T4A, T5, T5A, T6, T6A, T8, T7, T9, T10, T11, T12, T20, T23, T23A, T25, T25A, T27, T29, T31
- Assoc. support structures and services

Facility 1290 – Stockyard Domain Rehabilitation (101 Ha)

- Land forming earthworks
- Soil conditioning
- Seeding

Domain 3 – Sea Wall & Transfer Stations (Area 1300)

Facility 1310 – Sea Wall Structure

- Bulk earthworks
- Hand bars

Facility 1320 – Materials Handling

- Outloading conveyors L1, L2, L3, L4, L6A, L11, L11A, L13, L15A,
- Towers T13, T14, T15, T16, T17, T18, T19
- Surge bins SB1, SB2, SB3
- Belt feeders, BF5, BF6, BF7, BF8, BF15, BF17
- Sample stations 1, 2, 3
- Assoc. support structures and services

Facility 1390 – Sea Wall Domain Rehabilitation (9 Ha)

- Land forming earthworks
- Soil conditioning
- Seeding & tube stock

Domain 4 – Offshore (Area 1400)

Facility 1410 – Jetty & Berthing Wharf

- Marine structures including:
  - Berth 1, 2, 3 & 4 mooring points & jewellery
  - Railings & ladders
  - Decks
  - Piling
- Wharf ship loader machines SL1, SL2 & SL3 and integral conveyors L9, L10, L19
- Wharf materials handling systems including:
  - Conveyors L5, L6, L7, L8, L15, L17
  - Main wharf transfer tower
  - Towers L7, L8, L17
- Assoc. support structures and services

Facility 1490 – Offshore Domain Rehabilitation

- Nil requirement

Domain 5 – Water Management (Area 1500)

Facility 1510 – Water Dams

- Industrial dam
- Rail Loop dam,
- Rail Receival dam,
- Spindlers dam
- Associated surface roads & drainage

Facility 1520 – Water Systems

- Process water pump house, pumps and piping
- Potable water treatment plant, tanks, pumps and piping
- Fire water pump house, tanks pumps and piping

Facility 1590 – Water Management Domain Rehabilitation (50 Ha)

- Land forming earthworks
- Soil conditioning
- Seeding

Domain 6 – Quarry Dam (Area 1600)

Facility 1610 – Quarry Dam

- Quarry dam bulk earthworks,
- Water pumping and pipelines
- Associated surface roads & drainage

Facility 1690 – Quarry Dam Domain Rehabilitation (8 Ha)

- Land forming earthworks
- Soil conditioning
- Seeding

Domain 7 – Offices & Workshops (Area 1700)

Facility 1710 – Buildings & Infrastructure

- Paved roads and carparks
- Site fencing
- Carpark cover structures
- Buildings - including the DBCT Corporate office, Operations Centre, Stores Warehouse, Q2 Coal building, L&D Training building, DBCT Administration building, Archives building, Learning Centre, CP Office, Old NQBP Tower, Fire Pump House, Sample Prep Building and the main and west gate security huts
- Assoc. support services

Facility 1720 – General Utilities

- Sewage mains connection to the MRC waste water plant
- Diesel fuel storage and distribution

Facility 1790 – Offices & Workshops Domain Rehabilitation (31 ha)

- Land forming earthworks
- Soil conditioning
- Seeding

Domain 8 – Utilities (Area 1800)

Facility 1810 – Mains Power Supply

- Ergon 33/11kV Substation
- 11kV overhead transmission line feeding main DBCT Substation
- Main DBCT substation
- In-plant substations SS1, SS1A, SS2, SS2A, SS2B, SS3, SS3A, SS3B, SS3C, SS4, SS4A, SS5, SS5A, SS6, SS6A, SS9
- Substation power feeds

Facility 1820 – Water Supply

- Potable water connection mains to the MRC water treatment plant
- Raw water connection mains to SunWater

Facility 1890 – Utilities Domain Rehabilitation (10 ha)

- Land forming earthworks
- Soil conditioning
- Seeding

Domain 9 – Tug Harbour (Area 1900)

Facility 1910 – Tug Harbour Infrastructure

- By GHD

Facility 1990 – Tug Harbour Rehabilitation

- By Others

2.2 SCOPE EXCLUSIONS

Specifically excluded from the estimated scope of works is:

- All demolition and rehabilitation works outside the DBCT lease fence line unless noted otherwise,
- Removal of all product coal
- Any alteration to Hay Point Road other than back filling of the three receival conveyor/road tunnel underpasses.
- Rail trackwork removal upstream of the rail balloon loop
- Mains power supply removal upstream of the isolation breakers feeding the Ergon and Aurizon Substations.

3 PROJECT DELIVERY ASSUMPTIONS

It is assumed that DBCTM will manage the Rehabilitation Project and directly engage major Australian based consultants and contractors to assist and carry out the project scope of works as further described below.

This approach is considered to be the lowest cost method wherein DBCTM assembles its own Rehabilitation Management team of professionals with the required skills of project planning and delivery. As the functions of project engineering and procurement of plant equipment associated with new project builds are not involved, it is expected that an EPC/EPCM type consultant is not required. Should an external project management consultant (PMC) be engaged, then a further cost of 5% to 8% of the project management value could be expected.

3.1 PRE-REHABILITATION

Once a terminal closure date has been determined [1] , it is assumed Rehabilitation Project costs would begin with the appointment of the DBCTM Rehabilitation Management team and DBCT P/L costs associated with facilitating terminal shut down and handover of the site prior to physical rehabilitation activities commencing.

Early activities for the DBCTM Rehabilitation Management team would comprise all project planning, permitting and engagement of the rehabilitation contractors including:

- Update as necessary the Rehabilitation Plan as it exists at time of terminal closure notification, for current legislation, basis of design and terminal scope of works
- Formulate the Rehabilitation Project execution plan including project timeline and contracting plan
- Establish detail plans for the management of site water required to support the demolition/rehabilitation effort in terms of storm water control and construction water supply. This may include utilisation of existing dams, sequencing and timing for progressive dam decommissioning and the provision of any required temporary dams to support on-going site works.
- Establish detail plans for the management of the utility services (power, sewage, communications, fuel dispensing, etc.) required to support the demolition/rehabilitation effort including utilisation of the existing installations, timing of utility decommissioning and the provision of any required temporary services to support on-going site works.
- Source all necessary statutory body permits
- Perform waste stream studies of the demolished materials and identify and finalise disposal sites, associated criteria and controlling bodies
- Identify recyclable material markets and associated criteria
- Perform traffic management studies associated with the off-site disposal and earthwork haulage and identify any required public road upgrades, maintenance regimes, signalling and the like

[1] DBCTM assumes terminal operations will cease in September 2051, and that DBCT Holdings will notify DBCTM 5 years prior

- Establish site layout plans for the location of Rehabilitation Project contractor laydowns, demolished material stockpiles, site access/haul roads and other supporting temporary facilities
- Establish the legal framework and conditions of contract for the engagement of Rehabilitation Project contractors and service providers
- Bid and award of demolition and rehabilitation contracts
- Site establishment of demolition and rehabilitation contractor laydowns, stockpile pads, roads and supporting utility services
- Coordination with DBCT P/L with the wind-up of site operational activities

DBCT P/L rehabilitation support activities are expected to include:

- Return of yard machines and ship loaders to their parking bays
- Return of all fixed equipment to their standby or off-line status
- Return of all holding tanks of fuels, reagents, chemicals and the like
- Removal of all inventory stores
- Removal all DBCT P/L owned mobile equipment, loose equipment (including bench tools, office equipment, stores equipment, etc) and administrative records from the site
- Handover to the DBCTM Rehabilitation Management team of all terminal site engineering data such as geotechnical and survey records, as built drawings, operating manuals and maintenance records.

It is noted that the following DBCT P/L activities are excluded from this estimate as considered part of operational costs:

- Removal of all product coal from the stockyards, conveyors and storage bins
- Product coal load out activities
- Disposal fees or sale revenues associated with DBCT P/L owned assets
- Redundancy and termination of DBCT P/L staff
- Administration and storage of company records
- Wind up costs of DBCT P/L

3.2 REHABILITATION

For the purposes of this estimate, it is assumed that the Rehabilitation Project works will be awarded as major contract packages such as:

- Offshore demolition (Domain 4 scope)
- Onshore demolition (all other Domain scope)
- Metal recycling and disposal
- Landfill and disposal
- Site rehabilitation

Breakdown into further multiple packages will impact assumed management fees levels and consequently increase the capital expenditure cost estimate.

3.2.1 Demolition and Disposal Scope of Works

It is assumed the works will be carried out in the following major steps:

Decommissioning – (estimated by GHD) initial works to isolate all services and make safe the works ready for demolition including:

- Disconnection and isolation of the power supply both at the upstream source (substation switchboard) and local distribution board
- Disconnection and isolation of major utility services (raw water, potable water, sewage, communications)
- Disconnection and isolation of reticulated services including drainage of all liquids, flushing and capturing waste where required
- Degassing refrigerants (e.g. AC units)
- Release of suspended energy (gravity) and tensions (e.g. conveyors, rail catenary lines, etc)
- Release of pressure from pneumatic systems including flushing and capturing waste where required
- Drainage and capture of oils/hydrocarbons form mechanical and electrical equipment
- Removal of any hazardous waste such as asbestos, radioactive or PCB's and any stabilisation of residual materials where required
- Washdown of all coal handling plant to be free of excessive coal dust/spills
- Drainage of all reservoirs and major water tanks (other than that required for rehabilitation activities)
- Temporary works to provide a mechanical barrier to protect the downstream demolition works

Decommissioning works are assumed to be progressive to suit the demolition scheduling of each Domain. Isolation and shutdown of the Ergon 33kV substation and raw water dams would occur towards the end of the closure works to maximise the use of the existing facilities and the management of construction water and environmental releases.

Demolition – (estimated by GHD) the removal of the plant equipment, structures and service lines using a combination of heavy machinery and destructive methods.

On-Site Processing – (estimated by GHD) secondary treatment to:

- Cut materials to transportable lengths
- Separation of rebar from reinforced concrete
- Crushing of concrete to minus 100mm (-100mm) particle size for re-use as clean fill

Bulk Earthworks – (included in this estimate) refer Section 3.2.2 below.

It is assumed all demolished materials will be initially stockpiled on site according to their waste stream classification as set out in Table 3.1 below.

Code	Description	Meaning	Site Treatment	Disposal Method
C1	Light Contaminated Soils	Soils that can be treated on-site for re-use	Re-process stockpiled soils to wash/treat	Re-use on site for landforming
C2	Medium Contaminated Soils	Contamination level acceptable to local landfill	Reload stockpiled soils to off-site transport	Local landfill
C3	Heavy Contaminated Soils	Contamination not acceptable to local landfill	Reload stockpiled soils to off-site transport	Remote landfill
G1	Clean Soils	Clean soil suitable for landforming fill in site rehabilitation	Nil	Re-use on site for landforming
G2	Concrete	Clean concrete suitable for landforming fill in site rehabilitation	Strip rebar & secondary breaking to <600mm, crush concrete to -100mm	Separate rebar steel to R1 stockpile, crushed concrete re-used for land forming
G3	General Waste	Mixed materials of no commercial value	Compact stockpiled waste & load to off-site transport	Local landfill
H1	Asbestos	Materials containing asbestos	Demolish direct to special containment	Local landfill
H2	Putrescible, Noxious, Offensive	Materials of an offensive nature	Demolish direct to special containment	Local landfill
H3	Liquid Hydrocarbons	Oils and fuels	Demolish direct to special containment	Specialist receiver
R1	Recyclable Ferrous Metals	Steel materials	Cut to <6m long & load to off-site transport	Recycle/On-sell
R2	Recyclable Non-Ferrous metals	Other metal materials	Cut to <6m long & load to off-site transport	Recycle/On-sell
R3	Recyclable Copper cabling	Copper wiring	Load to off-site transport	Recycle/On-sell
R4	Recoverable Machinery	Gear boxes & electric motors	Place into offsite store with weather protection	Recycle/On-sell
R5	HDPE/Rubbers	Conveyor belts and HDPE piping	Cut to <6m long & load to off-site transport	Local landfill
R6	Other High Value Equipment	Other equipment for potential on-selling	Place into offsite store with weather protection	Recycle/On-sell

Table 3.1 Waste Streams

Disposal – (included in this estimate) removal of materials off site including:

- Packaging of machinery/electrical goods for on-selling
- Loading of goods and materials to road transport
- Off-site road transport
- Disposal dump fees
- Revenue from sale of goods

It is assumed that for disposal of materials to landfill, a project specific landfill site will be funded by the Rehabilitation Project and be established within a 30 km radius of the DBCT site to a capacity to meet the project's needs. Further it is assumed that the site will be owned and operated by the Mackay Regional Council (MRC) with disposal conditions and a fee structure similar to the existing

Hogans Pocket Waste Facility which has been established to receive current commercial waste demands of the Mackay Region. In consideration that the project waste facility would operate over a much shorter timeframe and the closed market conditions, a 20% premium has been added to the current MRC fee structure.

Other disposal assumption are as follows:

- For liquid hydrocarbons, it is assumed they are transported to Gladstone for discharge at the Caltex refinery at nil fee other than the transport cost.
- For heavy contaminated soils (not accepted by the MRC) it is assumed they will be transported to a commercial facility near Roma, Qld.
- For saleable (recycled) goods, it is assumed that market conditions will be severely depressed due to the influx of recyclable materials caused by not only the closure of the DBCT coal terminal but also the Hay Point coal terminal, supporting rail infrastructure and Bowen Basin coal mines. As such, it is anticipated that recyclable goods will be sold from site at nil revenue i.e. recyclers will collect the goods from site on a free issue basis. On a worst-case scenario where all recyclable goods are transported to landfill then an additional cost of $13M would be expected. At current recyclable market rates, then an approximate cost saving of $21M is anticipated.

3.2.2 Rehabilitation Scope of Works

Rehabilitation works included in this estimate comprise:

Bulk Earthworks – mass cut and fill operations to:

- Remove bedding coal and contaminated soils
- Remove excess earth above the final rehabilitation landform levels
- Treat acidic soils
- Place clean fill to build up ground levels to the final rehabilitated landform contours using a combination of recovered site excavated materials, crushed concrete and imported fill
- Final profiling

Where a shortfall exists between the quantity of excavated clean soils and crushed concrete from the demolition exercise to the amount of required fill, it is assumed virgin excavated natural material (VENM) will be sourced from sites within a 20km radius of the site.

Soil treatment - amelioration of the placed soils with lime/gypsum and the application of fertilisers to create a growth medium

Growth media – treat and place growth media to 100mm thick

Planting – combination of grass and tree seeding and planting of tube stock

4 CAPITAL COST ESTIMATE

4.1 ESTIMATE SUMMARY

A summary of the capital costs for disposal and rehabilitation by Domain is provided in Table 4.1.

Domain	Area/Facility	Total A$M
1	Rail Loop, Receival & Conveyors	203.3
2	Stockyards	423.8
3	Sea Wall & Transfer Stations	22.1
4	Offshore	3.1
5	Water Management	58.4
6	Quarry Dam	12.1
7	Offices & Workshops	45.5
8	Utilities	32.5
9	Tug Harbour (by GHD)	-
	Total Capex*	**800.8**

***Inclusive of indirects & contingency**

Table 4.1 – Cost Summary By Domain

Further capital cost summaries and full details are provided in:

- Attachment B - Capex Summary By Facility
- Attachment C - Capex Summary by Major Trade/Commodity
- Attachment D - Capex Details

4.2 ESTIMATE SCOPE

The capital cost estimate covers all expenditures to manage, deconstruct and rehabilitate the DBCT site including:

- Project management
- Rehabilitation Project studies and planning
- DBCT P/L Rehabilitation Project support activities
- Procurement of materials (e.g. bulk imported fill)
- Decommissioning of all machines and services (estimated by GHD)
- Demolition of all machines, structures and services (estimated by GHD)
- Removal of bedding coal
- Disposal of all recovered goods and materials
- Remediation of any contaminated soils, water bodies and the like

- Rehabilitation of the site to the required land forms as set out in the DBCT Rehabilitation Plan
- Temporary construction facilities (e.g. contractor laydowns, stockpile pads for demolished goods, access/haul roads, Construction Management offices and workshops, etc.)
- Construction support services (e.g. security, emergency response, traffic management, waste management, drug and alcohol screening, survey, etc)
- Operation and maintenance of construction facilities (e.g. construction power, construction water, fuel dispensing, etc)
- Common construction equipment (e.g. Construction Management light vehicles, warehouse equipment, etc)
- Monitoring and maintenance for a period of 10 years post initial site rehabilitation
- QLeave levy (currently 0.475%)
- Contingency

Excluded from the capital cost estimate are:

- Impact of the introduction of a waste fee levy proposed by the Queensland State Government and currently targeted to become effective 1 Jul 19
- Operational costs to clear the product stockpiles and load out of last coal
- All DBCT Holdings P/L costs to wind up site operations and prepare the site for rehabilitation
- Redundancy and termination costs of DBCTM and its subcontractors
- Redundancy and termination costs of DBCT P/L and its subcontractors
- Sale or lease termination costs of land tenure
- Dissolvement costs of all DBCT operational companies
- Project permitting fees
- Statutory and third party audit costs
- Native title & cultural heritage costs
- Project financing & legal costs
- Goods and Services Tax (GST)

4.3 WORK BREAKDOWN STRUCTURE AND CODE OF ACCOUNTS

The capital cost estimates have been structured by:

- **Area/Facility** – cost centres generally arranged by domain and process related function or by indirect function.
- **Trade/Commodity** - common activity groups arranged by trade discipline

4.3.1 Facility Codes

Direct Scope (as described in Section 2.1)

- **1000 DBCT Infrastructure**
    - Area 1100 – Domain 1 Rail Loop, Receival and Conveyors
    - Area 1200 – Domain 2 Stockyards
    - Area 1300 - Domain 3 Sea Wall & Transfer Stations
    - Area 1400 - Domain 4 Offshore

- Area 1500 - Domain 5 Water Management
- Area 1600 - Domain 6 Quarry Dam
- Area 1700 - Domain 7 Offices & Workshops
- Area 1800 - Domain 8 Utilities
- Area 1900 - Domain 9 Tug Harbour

Project Indirects

- 6000 Field Indirects
  - Area 6100 - Temporary Facilities
  - Area 6200 - Construction Support Services
  - Area 6300 - O&M of Temporary Facilities
  - Area 6400 - Construction Plant
  - Area 6600 – Site Maintenance
  - Area 6700 – Site Monitoring
- 8000 Owners Costs
  - Area 8100 - Owners Project Management Team
  - Area 8200 – Project Studies
  - Area 8300 – Qleave
  - Area 8400 – Operational Costs
- 9000 Provisions
  - Area 9900 - Contingency

4.3.2 Major Commodity Codes

- A Plant Decommissioning (estimated by GHD)
- B Demolition (estimated by GHD)
- C On Site Processing (estimated by GHD)
- D Disposal/Recycling
- W Project Indirects
- Y Owners Costs
- Z Project Provisions

4.4 ESTIMATE COMPILATION

The capital cost estimates have been compiled in *Microsoft Excel* using a purpose-built estimating template that captures the following elements

- Cost code as per the WBS coding system
- Activity description
- Quantity in physical units as per the Commodity standard units of measure
- Unit of measure
- Direct field workhours required to install/construct/deconstruct the item
- Costs broken down by the following category as applicable:
  - Bulk Materials
  - Installation Labour (cost to the employer of the direct field labour)

- Contractor Distributables (all other installation costs including contractor's mob/demob, site establishment, travel, sustenance and subsistence, construction equipment, unproductive direct labour, maintenance and support labour, staff and supervision, tools and consumables, off-site support, overheads and profit).
- Construction Equipment (where over and above the equipment provided for in Contractor's Distributables
- Subcontractor Costs
- Total cost

4.5 ESTIMATE METHODOLOGY

In order to meet the estimate criteria, the capital costs have been developed by a 1st principles approach whereby the direct (permanent) scope has been identified at a semi-detailed activity level in a manner that can be measured in physical terms and unit pricing applied. Project indirects have then been applied as a percentage of the direct costs based on industry norms.

4.5.1 Quantification:

The direct scope has been itemised and quantified by GHD to standardised units of measure as established for each Commodity.

Quantities are intended to reflect the neat line[2] design quantity of the DBCT asset exclusive of waste, bulking and the like. Such provisions have been included in the build-up of the unit cost rate or as a separate estimate activity. Quantities have been initially taken-off from the available engineered drawings and layouts with take-off allowances added in order to reflect the final as-built quantity.

Table 4.2 sets out the major project quantities by underlying engineering definition and expressed as a percentage of direct costs.

Code	Commodity	Qty	UoM	IFC	Detailed Design	Prelim Design	Concept/ Factored	Allowc
A	Plant Decommissioning [1]	9	LOT	0%	0%	0%	0%	0%
B	Demolition [1]	445,678	T	0%	0%	0%	0%	0%
C	On-Site Processing [1]	154,192	CM	0%	0%	0%	0%	0%
D	Disposal/Recycling	672,724	T	0%	0%	100%	0%	0%
R	Rehab & Remediation [2]	297	HA	0%	0%	100%	0%	0%
	Totals *			**0%**	**0%**	**100%**	**0%**	**0%**

* Percentage of total direct costs

[1] Costs excluded and estimated by GHD

[2] Includes bulk earthworks both removal and fill

Table 4.2 – Major Quantities by Design Quality

4.5.2 Pricing

The unit pricing applied to each work activity reflects the final demolished or rehabilitated cost of that item in 4th quarter 2018 market terms and conditions. The impact of price change over time is excluded from this report.

[2] By using neat line quantities, pricing rates applied can be benchmarked in a consistent manner.

Unit pricing has been broken down as much as possible into the following cost elements:

Supply

- Bulk material purchases
- Disposal fees
- Sale revenues
- Off-site haulage (freight)

Construction (Disposal and Rehabilitation)

- Direct labour
- Contractors distributables
- Subcontract

4.5.2.1 Supply Pricing

Table 4.3 sets out the direct supply costs by quality of pricing source.

Code	Commodity	Sply Cost* A$ 000	Award/ Comm Bid	Budget Quote	In-House Historical	Factored	Allowc
A	Plant Decommissioning	By GHD	0%	0%	0%	0%	0%
B	Demolition	By GHD	0%	0%	0%	0%	0%
C	On-Site Processing	By GHD	0%	0%	0%	0%	0%
D	Disposal/Recycling	213,037	0%	99%	1%	0%	0%
R	Rehab & Remediation	189,572	0%	0%	100%	0%	0%
	Totals	**402,609**	**0%**	**53%**	**47%**	**0%**	**0%**

* Direct costs only

Table 4.3 – Supply Pricing by Quality

Budget quotes for disposal costs relate to current list prices for the MRC Hogans Pocket Waste Facility[3] plus a 20% premium (refer Section 3.2.1). Individual rates by waste stream are set out in Table 4.5 below.

All other supply rates are based on a combination of recent project experience in the locality and rehabilitation rates as published by the NSW Department of Planning and Environment including:

- Import of VENM at $50/m^3 delivered
- Import of growth media at $65/m^3 delivered
- Lime and gypsum supply at $300/t and spread rate of 2.5t/Ha
- Fertiliser supply at $1280/t and spread rate of 250kg/Ha
- Seeding at $1050/Ha
- Tube stock at $4.00/ea

[3] Refer Mackay regional Council Schedule of Fees and Charges 2018-2019 at www.mackay.qld.gov.au

4.5.3 Construction Costs and Productivity

Construction costs have been developed by establishing productivities (direct field hours) for each task and applying a crew rate and a percentage for contractors distributables to represent the full cost as charged by the construction contractor.

Direct field hours are those expended by the manual workforce up to leading hand level, on site to construct the activity inclusive of paid breaks, job start meetings and onsite travel between the project gate and work place. Work hours have been calculated from an established baseline of productivities for each commodity accounting for site specific conditions (skills availability, weather, dust, location etc).

The labour crew rate reflects the bare cost of employment to the Contractor inclusive of payroll, burden and taxes. Labour rates have been developed for each labour craft group based on typical labour Enterprise Agreements for contractors operating in the project locality. Labour rates are based on a 55hr work week with an RDO every four weeks over 50 weeks per year. An average crew gang rate of $60.00/hr has then been developed using typical mixes of trade skills per major trade discipline.

All other constructor costs are captured in the Contractors Distributables cost component including such expenses as mobilisation and demobilisation, site establishment, travel and subsistence, small tools and consumables, PPE, construction equipment (including fuel, GET, maintenance etc), contractor's indirect support labour, staff & supervision, business overheads, profit and the like.

Contractor Distributables have generally been back calculated from benchmarked all-in installation rates and checked against established industry norms by major trade discipline. For disposal load out and bulk earthwork activities, the contractors construction equipment forms the most significant component of the distributable value.

Depending on the estimated activity, construction costs may be expressed as an all-in subcontract cost inclusive of material supplies and labour however this has been kept to a minimum.

Table 4.4 summarises the direct construction costs, workhours and installation rates by major commodity.

Code	Commodity	Constn Cost* A$ 000	Direct Hrs	Labour Crew Rate A$/hr	CD%	All-In Rate A$/Hr
A	Plant Decommissioning	By GHD				-
B	Demolition	By GHD				-
C	On-Site Processing	By GHD				-
D	Disposal/Recycling	6,013	19,038	60.00	426%	315.86
R	Rehab & Remediation	126,381	340,643	60.00	518%	371.01
	Totals	**132,395**	**359,682**	**60.00**	**513%**	**368.09**

* Direct costs only excluding specialist subcontract costs

Table 4.4 – Construction Costs, Workhours and Rates

4.5.4 All-In Disposal Rates

Table 4.5 below, sets out the developed all-in rates of disposal for each waste stream by stage of handling.

Code	Description	Disposal Method	Site Treatment/ Load Out $/t	Disposal Transport $/t	Disposal/(Sale) Fee $/t	Total $/t
C1	Light Contaminated Soils	Re-use on site for land forming	$27.00	$0.00	$0.00	$27.00
C2	Medium Contaminated Soils	Local landfill	$5.00	$11.00	$282.00	$298.00
C3	Heavy Contaminated Soils	Remote landfill	$5.00	$225.00	$383.00	$613.00
G1	Clean Soils	Re-use on site for land forming	N/A	$0.00	$0.00	$0.00
G2	Concrete	Separate rebar steel to R1 stockpile, crushed concrete re-used for land forming	By GHD	$0.00	$0.00	$0.00
G3	General Waste	Local landfill	$25.00	$11.00	$131.00	$167.00
H1	Asbestos	Local landfill	By GHDs	$11.00	$282.00	$293.00
H2	Putrescible, Noxious, Offensive	Local landfill	By GHDs	$11.00	$246.00	$257.00
H3	Liquid Hydrocarbons	Specialist receiver	By GHD	$135.00	$0.00	$135.00
R1	Recyclable Ferrous Metals	Recycle/On-sell	$30.00	$11.00	$0.00	$41.00
R2	Recyclable Non-Ferrous metals	Recycle/On-sell	$30.00	$11.00	$0.00	$41.00
R3	Recyclable Copper cabling	Recycle/On-sell	$30.00	$11.00	$0.00	$41.00
R4	Recoverable Machinery	Recycle/On-sell	$134.00	$11.00	$0.00	$145.00
R5	HDPE/Rubbers	Local landfill	$50.00	$11.00	$290.00	$351.00
R6	Other High Value Equipment	Recycle/On-sell	$134.00	$11.00	$0.00	$145.00

Table 4.5 – Disposal Rates

4.5.5 Indirect Costs

Common project indirects are activities that are provided on a site wide basis and cannot be directly attributed to a permanent asset. Such activities are generally managed by the project management organisation for the benefit of the overall project.

Project indirects have been separately itemised and priced as follows:

Temporary Works: - Establishment of temporary project facilities such as construction access and haul roads, contractor laydown areas, waste stream stockpile pads, Owners site offices and storage facilities, utility connections, security fencing, etc. Temporary works have been included in the estimate as 4% of the direct costs based on industry norms[4] and with consideration to the level of re-use of existing facilities.

Construction Support Services: - Services are likely to include site security, emergency response, drug and alcohol testing, janitorial, waste management, traffic management, power management, site water management, surveying, material testing and the like. Construction support services have been included in the estimate as 2% of the direct costs based on industry norms.

Operation and Maintenance (O&M) of Temporary Facilities – these are likely to include consumption or operational costs for construction power, construction water, fuel storage and dispensing etc. O&M costs have been included in the estimate as 2% of the direct costs based on industry norms. Note fuel consumption costs are included in the direct costs.

Construction Equipment: - Costs may include Owners management light vehicles, warehouse equipment and vehicles, generator hire, pump hire, common transport vehicles and other one-off equipment hire not typically part of the installation pricing. Construction equipment has been included in the estimate as 1% of the direct costs based on industry norms.

Monitoring and Maintenance: The Rehabilitation Plan calls for a 10 year monitoring and maintenance program once the site has been initially rehabilitated. It is assumed a two person team will be engaged on a full time basis for the duration to conduct regular monitoring and stakeholder reporting. The monitoring team will engage maintenance contractors on an as required basis to repair landforms, maintain required soil chemistry and reseed/replant where initial rehabilitation planting has been unsuccessful.

Annual monitoring costs are based on a staffing cost of $150,000/person plus office and support costs of $120,000/person. An initial set up cost of $100,000 plus $20,000/year maintenance for specialist equipment is also included.

Annual maintenance costs are based on $1200/Ha per year which represents 1.2% of the initial rehabilitation works.

Owners Project Management Costs: Includes the DBCTM staffing cost to specify the project scope, bid and award the required construction contracts, contractor management and administration, technical support and quality assurance. Owners Project Management costs has been included in the estimate as 10.0% of the direct costs plus a further 2.5% for Rehabilitation Project study works based on industry norms.

QLeave Levy: Is a levy to provide portable long leave benefits for the State of Queensland's building and construction industry and is governed under the Building and Construction Industry (Portable

[4] Industry norms are a set of project metrics established by Axiom based on its database of project costs, construction cost reference manuals and information shared between the construction industry

Long Service Leave) Act 1991. QLeave is funded by the Owner for whom the work is being done and is currently charged as 0.475% of the total project cost.

Operational Costs: A provisional allowance of $5M has been included to cover the costs incurred by DCTB P/L in facilitating works for the Rehabilitation Project as described in Section 3.1.

4.5.6 Escalation

Escalation of costs from 4th quarter 2018 to time of expenditure have been excluded from this estimate and separately addressed by GHD.

4.5.7 Contingency

Contingency has been included to cover the anticipated variances between the specific items allowed in the estimate and the final project actual cost based on the assumptions, qualifications and exclusions specified within the estimate. Contingency is not intended to cover fundamental changes to scope, project execution strategy nor unforeseen events that are typically covered by project insurances.

Contingency has been assessed at 18.7% of all base costs based on the underlying quality of current project definition and pricing sources. A further 1.3% has been added to address project discrete risks to cover for such events as schedule delays and unexpected site conditions.

5 DISCLAIMER

Axiom has prepared the cost estimate using information reasonably available and based on the assumptions and judgments as detailed in this Basis of Estimate document. The Cost Estimates have been prepared for the purpose of assisting DBCTM with understanding the order of magnitude cost requirements for the rehabilitation of the DBCT asset as detailed in the GHD study report and must not be used for any other purpose.

The Cost Estimates are preliminary only (-20% +35% accuracy). Actual prices, costs and other variables may be different to those used to prepare the cost estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. Axiom does not represent, warrant or guarantee that the works can or will be undertaken at a cost which is the same or less than the Cost Estimate.

Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

Attachment A

AACE Class of Estimate (Extract)

July 6, 2012

	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low(L), and high(H) ranges[a]
Class 5	0% to 2%	Conceptual planning	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Screening options	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Funding authorization	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Project control	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Fixed price bid check estimate	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Notes: [a] The state of technology, availability of applicable reference cost data and many other risks affect the range markedly. The +/- values represent typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

Table 1 – Cost Estimate Classification Matrix for Mining and Mineral Processing Industries

Attachment B

Capex Summary by Facility

WBS	Area/Facility	Total A$M
1000	**DBCT Facility**	
1100	***Rail Loop, Receival & Conveyors***	***135.8***
1110	Rail Loop	79.4
1120	Receival Stations	7.7
1130	Materials Handling	0.1
1190	Rail & Receival Domain Rehabilitation	48.6
1200	***Stockyards***	***283.1***
1210	Stockyard Infrastructure	108.4
1220	Yard Machines	0.5
1230	Materials Handling	0.9
1290	Stockyard Domain Rehabilitation	173.3
1300	***Sea Wall & Transfer Stations***	***14.8***
1310	Sea Wall Structure	6.3
1320	Outloading Materials Handling	6.9
1390	Seawall Domain Rehabilitation	1.6
1400	***Offshore***	***2.1***
1410	Jetty & Berthing Wharf	2.1
1490	Offshore Domain Rehabilitation	-
1500	***Water Management***	***39.0***
1510	Water Dams	3.5
1520	Water Systems	-
1590	Water Management Domain Rehabilitation	35.5
1600	***Quarry Dam***	***8.1***
1610	Quarry Dam	2.0
1690	Quarry Dam Domain Rehabilitation	6.1
1700	***Offices & Workshops***	***30.4***
1710	Buildings & Infrastructure	22.7
1720	General Utilities	0.5
1790	Office & Workshop Domain Rehabilitation	7.2
1800	***Utilities***	***21.7***
1810	Power	12.9
1820	Water	0.0
1890	Utilities Domain Rehabilitation	8.8
1900	***Tug Harbour***	***-***
1910	Tug Harbour Infrastructure	-
1990	Tug Harbour Domain Rehabilitation	-
	Subtotal Direct Costs	**535.0**
6100	Temporary Facilities	21.4
6200	Construction Support Services	10.7
6300	O&M Of Temporary Facilities	10.7
6400	Construction Plant	5.4
6500	Freight & Logistics	-
6600	Site Maintenance	3.6
6700	Site Monitoring	5.7
7100	External Project Management Team	-
8100	Owners Project Management Team	53.5
8200	Studies, Testwork & Permitting	13.4
8300	Qleave	3.1
8400	Operational Costs	5.0
	Subtotal Indirect Costs	**132.3**
9900	Contingency	133.5
	Total Capex*	**800.8**

*Inclusive of indirects & contingency

Attachment C

Capex Summary by Major Commodity

CBS	Major Commodity	UOM	Total Qty	Total Hrs	Total A$M
A	Plant Decommissioning	LOT	128	By Others	By Others
B	Demolition	T	445,678	By Others	By Others
C	On-Site Processing	CM	154,192	By Others	By Others
D	Disposal/Recycling [1]	T	672,724	19,038	219.1
RA/RB	Bulk Earthworks	CM	10,291,850	328,964	293.2
R	Rehabilitation	HA	297.1	11,679	22.8
W	Project Indirects	LOT	-	-	57.4
X	EPCM Costs	LOT	-	-	-
Y	Owners Costs	LOT	-	-	74.9
Z	Project Provisions	LOT	0	-	133.5
	Total Capex*			**359,682**	**800.8**

1 Disposal quantity includes 579,600m3 of earthwork disposal

*Inclusive of indirects & contingency

Further details of Disposal/Recycling, Bulk Earthworks and Rehabilitation are provided below.

Commodity Summary – Disposal/Recycling

CBS	Major Commodity	UOM	Total Qty	Total Hrs	Total A$M
DCB	Dispose of Medium Contaminated Soils	T	451,100	7,218	134.4
DCC	Dispose of Heavy Contaminated Soils (Hydrocarbons)	T	128,501	2,056	78.8
DCD	Dispose of General Waste (Landfill)	T	8,990	602	1.5
DHB	Dispose of Putrescible, Noxious, Offensive Materials	T	15	-	0.0
DHC	Dispose of Liquid Hydrocarbons	T	247	-	0.0
DRA	Dispose/Recycle Ferrous Metals	T	76,010	6,309	3.1
DRE	Dispose of HDPE & Rubbers	T	562	112	0.2
DR*	Dispose/Recycle Other Metals & Machinery	T	7,300	2,741	1.0
	Total Disposal/Recycling	**T**	**672,724**	**19,038**	**219.1**

Commodity Summary – Bulk Earthworks

CBS	Major Commodity	UOM	Total Qty	Total Hrs	Total A$M
RA	**Excavation**	**CM**	**3,732,050**	**88,177**	**34.8**
RAA	Cut to Stockpile - Non-contaminated	CM	3,189,500	73,359	29.1
RAB	Cut to Fill - Non-contaminated	CM	130,000	5,330	2.0
RAC	Cut to Stockpile - Contaminated	CM	412,550	9,489	3.8
RB	**Fill**	**CM**	**6,559,800**	**237,334**	**257.5**
RBE01	Borrow Stockpile to Fill	CM	3,176,507	114,926	42.8
RBE	Import to Fill	CM	3,383,293	122,408	214.7
	Other	**CM**	**2,970,710**	**3,453**	**0.9**
RBB	Ground Surface Treatment- Acid Neutralisation	SM	573,000	573	0.2
RBH	Final Profiling	SM	2,397,710	2,880	0.7
	Total Bulk Earthworks	**CM**	**10,291,850**	**328,964**	**293.2**

Commodity Summary – Rehabilitation

CBS	Major Commodity	UOM	Total Qty	Total Hrs	Total A$M
RLA01	Soil Pre-Treatment - Amelioration (Lime/Gypsum) 2.5	*HA	-	119	0.3
RLA02	Soil Pre-Treatment - Fertiliser 250kg/Ha	*HA	-	119	0.1
RLG	Growth Media	CM	-	5,927	20.8
RLS	Seeding	HA	287	1,434	0.6
RLP03	Planting - Tube Stock	HA	10	4,080	1.0
	Total Rehabilitation	**T**	**297**	**11,679**	**22.8**

Attachment D

Capex Details

Refer to the 'Capex Details' worksheet in Axiom's cost estimate, which is included in Attachment 2 (GHD's Rehabilitation Cost Estimate for DBCT).