Site Rehabilitation and Environmental Management Plan (SREMP)

Augusta Boat Harbour

Department of Transport

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1. INTRODUCTION

1.1 PURPOSE

The purpose of the Site Rehabilitation and Environmental Management Plan (SREMP) is to describe procedures that will be implemented on behalf of the Department of Transport (DoT) to meet the rehabilitation and environmental objectives associated with construction and management of the proposed Augusta Boat Harbour project, situated south of the Augusta town site on the east side of Leeuwin Road (Figure 1).

The document has been prepared in accordance with the guidelines published by the Environmental Protection Authority (EPA 2006) and with the proposed Environment Protection and Biodiversity Conservation (EPBC) Approval 2008/4506, and addresses the rehabilitation commitments provided in the Environmental Referral Document for the proposal (Oceanica 2008), and comments provided by the Department of Environment and Conservation (DEC 2011, see Appendix 1) and Department of Environment Water Heritage and Arts[1] (DEWHA 2008). The project proposal was submitted to the then Department of Environment Water Heritage and Arts under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and on 6 November 2009, the proposal was determined a Controlled Action – Listed Threatened species and communities (Sections 18 and 18a), therefore requiring assessment under the EPBC Act.

1.2 SCOPE

The SREMP has the following scope:

- Clearly establishes the objectives of the SREMP;
- Proposes an end-use plan for the Augusta Boat Harbour project area, describing landforms, vegetation communities, and protected areas;
- Addresses provenance issues such as seed and propagule collection;
- Identifies a benchmark analogue site (the baseline used in determining realistic performance criteria for rehabilitation efforts);
- Provides a description of the development process and how it will be integrated with rehabilitation, reinforcing effective management of rehabilitation resources;
- Provides prescriptions for restoration of landforms and associated vegetation, important and dominant flora species, and conservation significant flora;
- Provides prescriptions for the management of disturbances that may affect the spread of exotic flora; and
- Outlines a program for monitoring rehabilitation success using appropriate indicators.

The extent of this SREMP includes areas directly impacted by development and construction works, adjacent areas of existing *Kennedia lateritia* (Declared Rare Flora) including requirements for the ongoing maintenance of the northern DRF population, neighbouring degraded locations where it is proposed to undertake remedial rehabilitation and extend the existing *Kennedia lateritia* population, and an existing access track from Leeuwin Road that will be closed and rehabilitated (Figure 2).

[1] DEWHA is now known as the Department of Sustainability, Water, Environment, Population and Communities (DSEWPC)

1.3 CONTENTS

The SREMP contains the following information.

Environmental setting (Section 2)

Information on the existing environment for the Augusta Boat Harbour site is presented in this section to provide context to the rehabilitation program, its objectives and the constraints. The information is grouped as follows:

- Development plan;
- Location;
- Land use and tenure;
- Biological environment;
- Previous biological surveys;
- Key landscape attributes;
- Vegetation;
- Flora; and
- Flora of conservation significance.

Management objectives and key constraints (Section 3)

Part 1 of this section presents the environmental and rehabilitation objectives that the SREMP is committed to pursuing. Part 2 outlines the final land use concept plan. Part 3 of this section describes the significance of limitations to successful rehabilitation (i.e. constraints) and how these limitations will be minimised.

Implementation strategy (Section 4)

This section is the working end of the SREMP and includes prescriptions, responsibilities and implementation timeframes (schedules) for:

- Rehabilitation planning;
- Rehabilitation schedule;
- Clearing;
- Topsoil and subsoil management;
- Mulching of cleared vegetation debris;
- Contour scarification of prepared rehabilitation surfaces;
- Direct seeding;
- Planting;
- Perimeter fencing; and
- Maintenance.

The list of parameters addressed in this section is derived from the Environmental Referral Document (Oceanica 2008), EPA Guidance No 6 (2006), and incorporates site specific strategies developed by Onshore Environmental using on-site resources.

Monitoring and reporting (Section 5)

The SREMP includes monitoring schedules for obtaining the information necessary to assess performance and progress towards the desired end points.

Figure 1 Location and footprint of the Augusta Boat Harbour project area.

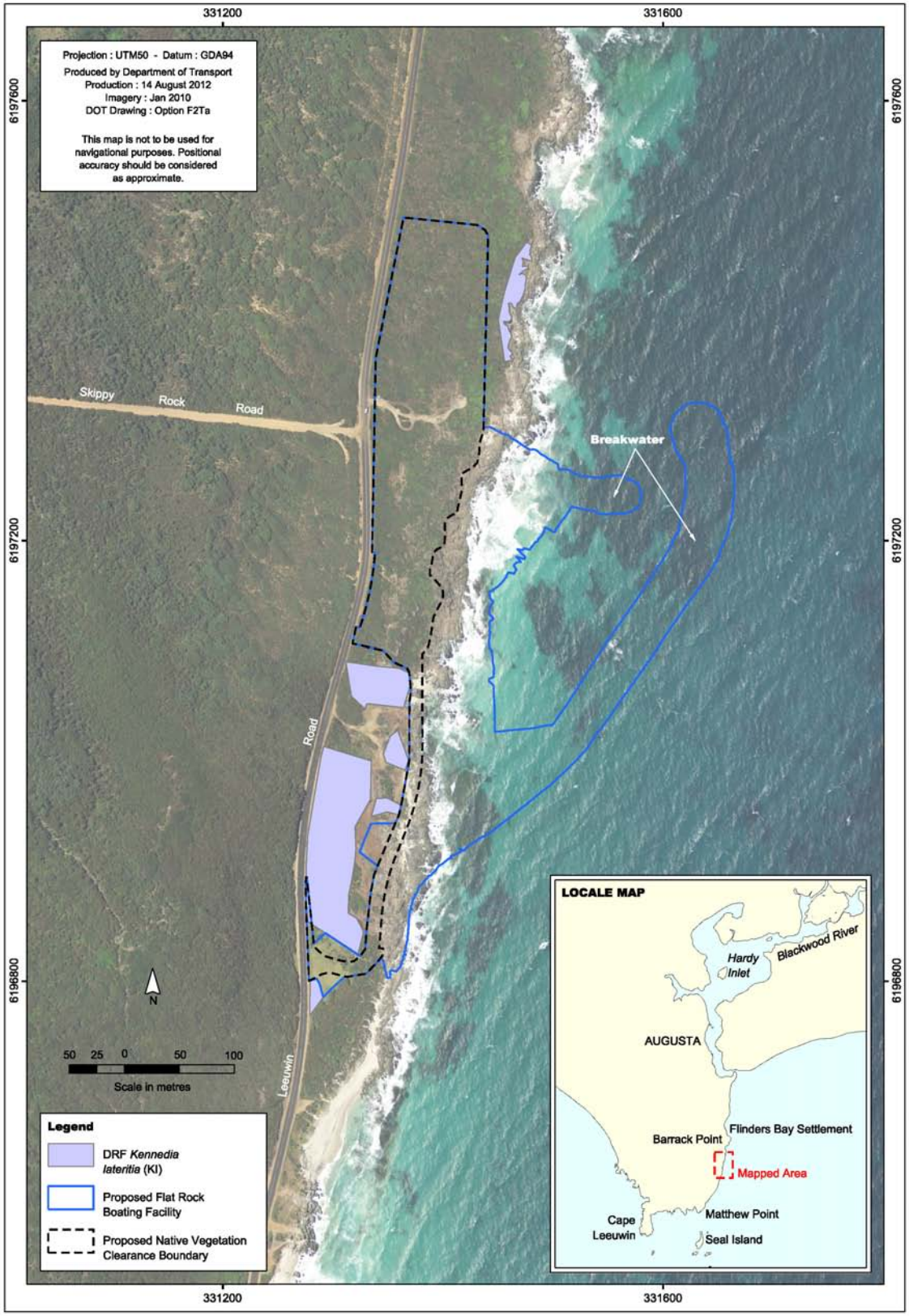
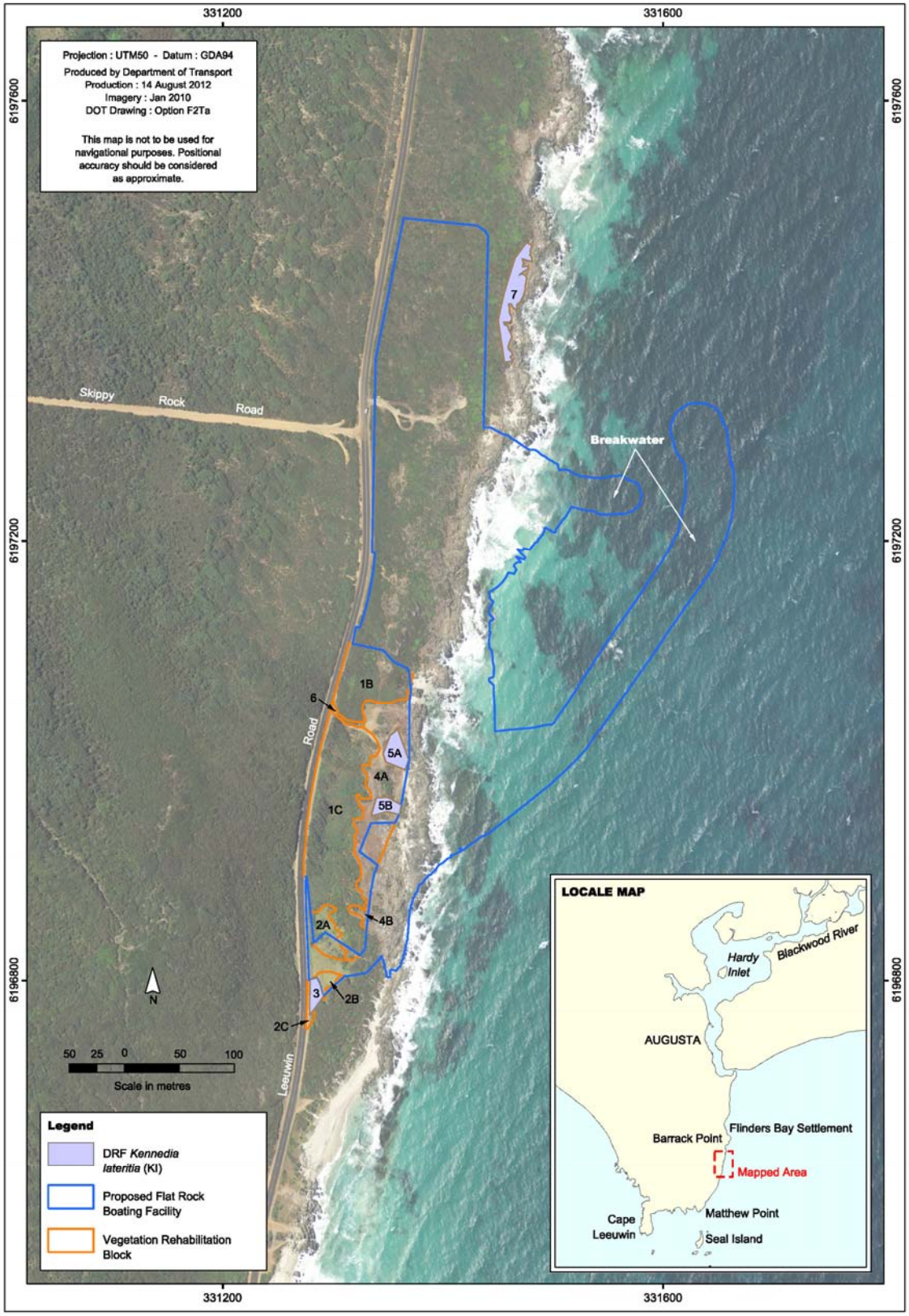


Figure 2 Development plan for the Augusta Boat Harbour Project area, including proposed rehabilitation blocks.



2. ENVIRONMENTAL SETTING

2.1 DEVELOPMENT PLAN

The proposed Augusta Boat Harbour is a community-driven project, arising from the need for safe navigation and mooring in the Southern Ocean off the Augusta coast. The project has a long history of both technical and environmental investigations, and strong community consultation and support. Flat Rock is the community's preferred site for the development of a boating facility, and also has many significant environmental positives.

The concept plan for the boat harbour was redesigned in April 2011 as a result of the state environmental impact assessment process and negotiations regarding native vegetation clearing. Alterations were made to the quarry boundary and native vegetation clearing boundary in the northern area of the site at the request of the Department of Environment and Conservation (DEC). The new concept plan (concept design F2R) for the boat harbour has further buffered the direct impact area from the endangered *Kennedia lateritia*, which was identified at the northern end of the site, adjacent to the proposed quarry area, as well as the southern area of the project site (refer to Figures 1 and 2) during the baseline flora and vegetation survey (Onshore Environmental Consultants (OEC) 2007; OEC 2008). The F2R concept design provides a greater buffer between the proposed quarry site and the northern population of the DRF *Kennedia lateritia*, as requested by the DEC.

In addition to reducing and redesigning the clearing footprint to conserve populations of *Kennedia lateritia,* the revised plan also identified areas where remedial rehabilitation could be undertaken to improve the *in situ* vegetation condition and incorporating revegetation of the endangered species. Overall, the development will result in a well-managed area of terrestrial vegetation, with proactive management of *Kennedia lateritia*.

2.2 LOCATION

The proposed Augusta Boat Harbour Project area is located within the Shire of Augusta Margaret River, midway between the Augusta town site and Cape Leeuwin Lighthouse on the eastern side of Leeuwin Road. The proposed Project area is opposite the Skippy Rock Road turnoff and adjacent the Leeuwin Naturaliste National Park.

2.3 LAND USE AND TENURE

The proposed Project area is located on the newly proclaimed Augusta Boat Harbour Reserve 51096 (January 2012), and occurs on the lower side of the Leeuwin-Naturaliste National Park. The project will necessitate the clearing of approximately 3.72 ha of native vegetation.

2.4 BIOLOGICAL ENVIRONMENT

The project area is part of the Boranup vegetation system, situated in the Warren Botanical District of the South West Botanical Province (as described by Beard 1981). The Boranup system extends from Cape Naturaliste in the north to Irwin Inlet in the south, and covers the Leeuwin-Naturaliste Ridge and coastal dunes of the Scott River Plain.

The Leeuwin-Naturaliste Ridge is a north-south trending horst of Precambrian granite and granulite forming hills rising to 200 m. Most of the outcrop is obscured by laterite and sand on the eastern side, and by dune sand and calcarenite on the western, seaward side. The seaward

slopes are exposed to prevailing storm winds and sea spray. Vegetation is an intricate mosaic controlled by the factors of soil and exposure (Beard 1981). The coast has a rugged retrograding shoreline with small sandy bays between promontories of granite and limestone. Soils are calcareous sands on the seaward slope and acidic grey earths on the inland side.

2.5 PREVIOUS BIOLOGICAL SURVEYS

Beard (1981) found *Agonis flexuosa* to be the dominant plant species in a range of structural vegetation types that range from scrub to low forest on recent sands of the southwestern coasts. Vegetation structure was influenced by fire, soil quality, and exposure to wind, with the understory containing a range of large and small shrubs, reeds and herbaceous perennials.

Bridgewater and Zammit (1979) described vegetation of the exposed western slopes of the ridge as *Pimelea ferruginea* heath, improving locally to form thicket. With decreasing exposure, peppermint *(Agonis flexuosa)* became the dominant species in a range of structural types including low forest, low woodland, and open low woodland.

Tille and Lantzke (1990) have mapped soils and landforms of the Busselton Margaret River Augusta region. The entire Flat Rock survey area forms part of the 'Gracetown Exposed Slopes' land system, described as having moderate slopes that are exposed to prevailing winds directly off the ocean, with deep and shallow yellow-brown siliceous sands over limestone (Spearwood Sands). The Gracetown Ridge is the dominant feature of the Leeuwin-Naturaliste coast, forming a discontinuous strip, 1-4 km wide, running from Cape Naturaliste to Cape Leeuwin, and covering an area of 168 km^2. Acacia, teatree and peppermint scrub covers the exposed slopes (forming the survey area) and ridge crest, while peppermint and jarrah/marri woodland grows on the sheltered eastern slopes, with areas of karri forest occurring on the footslopes (outside of the survey area).

Onshore Environmental Consultants (OEC) completed a two season Level 2 flora and vegetation survey of the Flat Rock survey area in February 2007 and October 2008 (Onshore Environmental Consultants 2007 and 2008); results from the survey are summarized in Sections 2.6 – 2.9 below.

2.6 KEY LANDSCAPE FEATURES

Vegetation at the Flat Rock site is strongly associated with five distinct landforms:

1. Primary Sand Dune;
2. Humic Granitic/ Sandy Swale;
3. Granitic Coastal Hill Slope;
4. Granitic/ Sandy Foreshore; and
5. Humic Granitic Platforms.

In addition, there is bare sand (beach sand) and bare rock (exposed granite) landform features represented that are devoid of vegetation.

2.7 VEGETATION

The five broad vegetation complexes outlined below were recorded from the survey area.

1. *Primary Sand Dune*
   Olearia axillaris, Spyridium globulosum, Agonis flexuosa Open Low Scrub over *Scaevola crassifolia, Leucopogon parviflorus, Pimelea ferruginea, Acanthocarpos preissii* Dense Low Heath over *Lepidosperma gladiatum* Very Open Tall Sedges over *Poa poiformis* Very Open Low Grass

Plate 1 Vegetation type 1, 'Primary Sand Dune'.

2. *Humic Granitic / Sandy Swale*
   Agonis flexuosa Open Scrub over *Rhagodia baccata, Pteridium esculentum* Dwarf Scrub over *Muehlenbeckia adpressa, ^Kennedia macrophylla* Open Climbers (Dwarf Scrub C) over *Lepidosperma gladiatum* Open Tall Sedges

Plates 2 & 3 Vegetation type 2, 'Humic Granitic / Sandy Swale'.

3. *Granitic Coastal Hill Slope*

Agonis flexuosa, Spyridium globulosum, Hakea oleifolia Low Scrub over *Scaevola crassifolia, Hakea oleifolia, Chorilaena quercifolia, Leucopogon parviflorus, +Bossiaea disticha, Pimelea ferruginea, Dodonaea ceratocarpa* Heath over *Lepidosperma gladiatum* Very Open Tall Sedges over *Desmocladus flexuosus, Lepidosperma squamatum* Very Open Low Sedges

Plates 4 & 5 Vegetation type 3, 'Granitic Coastal Hill Slope'.

4. Granitic / Sandy Foreshore

Olearia axillaris, Rhagodia baccata, Leucopogon parviflorus, Pimelea ferruginea, Dodonaea ceratocarpa, Leucophyta brownii Dwarf Scrub over *Poa poiformis, *Romulea rosea* var. *rosea, Sporobolus virginicus* Very Open Low Grass over *Ficinia nodosa* Very Open Low Sedges

Plate 6 Vegetation type 4, 'Granitic / Sandy Foreshore'.

5. *Humic Granitic Platforms (disturbed)*
Scaevola crassifolia, Rhagodia baccata, Olearia axillaris Open Dwarf Scrub C over **Trachyandra divaricata, Phyllanthus calycinus, Carpobrotus virescens, Hibbertia cunninghamii* Dwarf Scrub D over *Stypandra glauca, *Polypogon* sp., **Romulea rosea* var. *rosea, *Lagurus ovatus* Open Low Grass over **Anagallis arvensis, *Hypochaeris glabra, *Lotus subbiflorus* Open Herbs

Plate 7 Vegetation type 5, 'Humic Granitic Platforms'.

2.8 FLORA

A total of 138 plant taxa (including varieties and subspecies) from 49 families and 115 genera were recorded from the proposed Augusta Boat Harbour study area, 15-16 February 2007 and 7 October 2008. Species representation was greatest among the Poaceae, Fabaceae, Asteraceae, Cyperaceae, Ericaceae and Orchidaceae.

2.9 FLORA OF CONSERVATION SIGNIFICANCE

Two flora species of conservation significance were recorded from the proposed Augusta Boat Harbour study area:

- *Kennedia lateritia* is listed as 'Endangered' under the EPBC Act (Federal), and as Declared Rare Flora (DRF) under the Wildlife Conservation Act (State); and
- *Bossiaea disticha* is listed as Priority 3 flora by the Department of Environment and Conservation (DEC).

Kennedia lateritia was recorded at an average density approximating 4-6 plants 10 m^{-2} (4,000-6,000 ha^{-1} equivalent). It is a climbing perennial with large trifoliate leaves that have round glossy green leaflets up to 7 cm long (Wrigley & Fagg 2006). When there are adequate support shrubs or trees available, *K. lateritia* can attain heights of up to 5 m (Paczkowska and Chapman 2000). At Flat Rock it was observed as a self-supporting low shrub (0.5-1.5 m) or climber up to 3 m in height. Most individuals were observed as self-supporting shrubs, however tall shrubs and low trees of the native peppermint (*Agonis flexuosa*) were sometimes used for support. Bracken (*Pteridium esculentum*) shrubs were also used when *K. lateritia* occurred in treeless stands.

At the Flat Rock survey area, *Kennedia lateritia* preferred the moist rich soils of the 'Humic Granite / Sandy Swale' landform that occurred at the base of granitic hill slopes. The swales develop where steep granitic hills to the west terminate at some distance from the coast, allowing for development of nutrient rich and moist soils in a subdued terrain. This landscape is prevalent in the southern half of the study area, and corresponds with the presence of *K. lateritia*. In the north of the survey area, steep granitic hills occur closer to the coast and jut out into the Southern Ocean, thereby restricting the development of the swale communities. One small population of *K. lateritia* occurs at the north-east sector of the project area, fringing the coastline. The development footprint (F2R) has been altered to mitigate the requirement to clear any plants from the northern population, and a buffer established to minimise the risk of potential impact. There will be no requirement to rehabilitate the northern DRF population, but management and maintenance of the population will be required.

Due to the location and prevalence of *Kennedia lateritia* in brown to black soil of the 'Humic Granite/ Sandy Swales', adequate moisture and nutrients are likely to be significant environmental factors determining its geographical and ecological distribution in the region. These soils are likely to be kept moist by underground water seepage from the granite hills that abut it from the west.

It is proposed that soil sampling and analysis is undertaken at the northern *Kennedia lateritia* population site prior to the commencement of quarrying and construction works, to determine the moisture content of the soil and the primary nutrients present. This information will be utilized during the ongoing management and maintenance of the northern population of *Kennedia lateritia* during and following quarrying works and the construction of the car park to ensure its ongoing survival. Further detail in relation to the proposed methods for the ongoing management and maintenance of water supply is discussed in the 'Augusta Boat Harbour Construction Environmental Management Plan'.

One Priority 3 flora (P3), *Bossiaea disticha,* was formally recorded from three sites in the northern half of the survey area, and mapped across a wide area in the northwest portion of the survey area. The P3 taxon occurred as a moderately common component amongst heath of the Granitic Coastal Hill Slope vegetation community; it was not observed from any other community type. In these communities, *B. disticha* occurred as a low to medium sized shrub up to 1 m in height and was often wind pruned, sometimes becoming prostrate in extremely exposed situations. It appeared to prefer the brown loam soils derived from the granite rock substrate. Within formal assessment plots plants were recorded at an average density approximating 3-5 plants 10 m^{-2} (3,000-5,000 ha^{-1} equivalent)

3. MANAGEMENT OBJECTIVES AND KEY CONSTRAINTS

3.1 ENVIRONMENTAL & REHABILITATION OBJECTIVES

The principal environmental objective for the Augusta Boat Harbour project is to maintain and, where possible, enhance the social, environmental and economic values and services of the proposal area and surrounds.

Associated with the principal environmental objective, are the following rehabilitation objectives that are committed to by the DoT:

- Propose a conceptual land-use plan for the Flat Rock Project Area;
- Minimise disturbance impacts where ever practicable;
- Integrate infrastructure development and rehabilitation schedules to maximise environmental outcomes;
- Provide a description of the development process and how it will be integrated with rehabilitation, reinforcing effective management of rehabilitation resources;
- Maximise the use of rehabilitation resources available on site;
- Address provenance issues such as seed and cutting / root propagule collection;
- Provide prescriptions for restoration of landforms and associated vegetation;
- Ensure that populations of any significant flora and vegetation communities are not compromised by the project;
- Adopt controlled approaches towards the management of existing threatening processes such as weed control, fire and feral animals;
- Assess a reference (analogue) site in tandem with developing rehabilitation to provide an accurate comparison on the success or otherwise; and
- Outline a program for monitoring landform reconstruction and revegetation, environmental impacts and compliance with the SREMP.

3.2 POST-CONSTRUCTION LANDSCAPE CONCEPT PLAN

The conceptual post-construction landscape plan for the Augusta Boat Harbour project is outlined in Figure 2. There will be six different rehabilitation strategies and two maintenance strategies implemented within defined blocks at the site:

1. Blocks supporting an established native vegetation cover where no additional rehabilitation is required and proposed management will focus on weed control (Blocks 1b and 1c; see Figure 2);
2. Blocks at the southern end of the Project site supporting a dense ground cover of introduced grasses and where the existing native vegetation is completely degraded. In these areas a complete rehabilitation program shall be implemented in combination with ongoing intensive management (Blocks 2a, 2b and 2c; see Figure 2);
3. Sub-areas within Blocks 2a, 2b and 2c that support *Kennedia lateritia;* the rehabilitation strategy will require consideration for maintaining the *Kennedia lateritia* plants present (Block 3; see Figure 2);
4. Blocks along the eastern fringe of the Project site supporting skeletal sandy soils on granite, a ground cover dominated by a variety of environmental weeds, and an existing native vegetation that is degraded to completely degraded; there will be a requirement to implement a complete rehabilitation program within these blocks in combination with ongoing intensive management (Blocks 4a and 4b; see Figure 2);

5. Sub-areas within Block 4a that support *Kennedia lateritia;* the rehabilitation strategy will require consideration for maintaining the *Kennedia lateritia* plants present (Blocks 5a and 5b; see Figure 2);
6. A small block supporting a deeply eroded access track that will require a complete rehabilitation program to be implemented including management of surface run-off water from Leeuwin Road and ongoing intensive management (Block 6; see Figure 2); and
7. A block of *Kennedia lateritia* population at the northern end of the project site which will require maintenance and management to ensure that environmental conditions at this site are sustained (Block 7).

3.3 CONSTRAINTS TO SUCCESSFUL REHABILITATION OUTCOMES

A summary of the scale of rehabilitation constraints is provided below (Table 1), as per the EPA Guidance on Rehabilitation (EPA 2006). The criteria used in the table are discussed further in the following sections, with various controls and management measures described for reducing the impact of these potential rehabilitation constraints, as far as practicable.

Table 1 EPA scale of rehabilitation constraints (from EPA 2006).

Criteria	1	2	3	4	5	Score
1. Land clearing scale	a few m^2	a few ha	many ha	a few km^2	many km^2	**2**
2. Drought/rainfall unpredictability	very low risk, or not relevant	low risk, but of some relevance	moderate risk – some problems are expected	substantial problems are expected	major problems are expected	**2**
3. Temperature harshness and unpredictability						**2**
4. Disease and pests						**3**
5. Weeds						**4**
6. Seed germination/ availability						**2**
7. Soil/ landform stability						**3**
8. Soil structure and chemistry	unaltered	minor/ temporary impacts	some long-term impacts expected	substantial impacts expected	unlikely to support original vegetation	**2**
9. Hydrology						**3**
10. Landform structure						**4**
11. Connectivity for seed dispersal, etc	continuous	some cleared land	good linkages	poor linkages	fully isolated	**3**
12. Ecosystem resilience	highly resilient	resilient	fairly resilient	susceptible	highly susceptible	**3**
					AVERAGE SCORE	**2.75**

3.3.1 Scale of land clearing

The Augusta Boat Harbour proposal will result in the clearing of approximately 3.72 ha of native vegetation. The proposed clearing has been positioned to negate any direct impact on the DRF *Kennedia lateritia,* and minimise overall clearing and rehabilitation requirements.

3.3.2 Climatic unpredictability

The proposal area is subject to relatively mild and predictable weather patterns and reasonably-predictable changes in temperature or rainfall are not expected to be a significant constraint to rehabilitation during the establishment years. Seeding and planting is typically undertaken in mid-autumn to maximise the germination and establishment period prior to the first summer season when revegetation will be at its most vulnerable. Strong onshore winds are evidenced by the stunted habit of existing vegetation on elevated points at the site; these winds are likely to be a constraint to revegetation, and may influence plant life forms in the medium to long term.

3.3.3 Diseases and pests

The Flat Rock site does not show visual evidence of being significantly impacted by disease or pests, and surrounding vegetation generally remains in good health.

Glevan Consulting (2011) conducted an assessment for the presence of the disease caused by *Phytophthora cinnamomi* within remnant vegetation of the Augusta Boat Harbour Project area in September 2011 (Appendix 2). The threat of *P.cinnamomi* was considered to be low, as site conditions were thought to be unfavourable for the pathogen. The site vegetation was observed to be uninterpretable due to a lack of indicator species. Site conditions were observed to be unfavourable for *P. cinnamomi* due to soil type and a lack of susceptible plants. Moreover, none of the species observed on site, including *Kennedia lateritia*, are contained in the Western Australian Natives Susceptible to *Phytophthora cinnamomi* list (E. Groves *et al.*). It was recommended that a 'clean on entry point' be established at the junction of Leeuwin Road and the proposed site access road, along with the implementation of measures to ensure there is no run-off runoff into areas supporting *Kennedia lateritia*.

Grazing by rabbits and snails has been observed in areas of reduced vegetation condition. Grazing of establishing native plants is a well-documented hazard. Rabbits will be controlled using a site specific program of baiting, fumigation and release of RHDV (Rabbit Hemorrhagic Disease Virus) over a two year period commencing in August 2012.

3.3.4 Weeds

The proposed Augusta Boat Harbour Project area includes previously disturbed sites that support established populations of environmental weed species. Flat Rock is also sited adjacent to a major local road (Leeuwin Road) that increases the likelihood of new species being introduced or spreading.

A total of 25 environmental weeds were recorded during the baseline flora and vegetation survey (Onshore Environmental Consultants 2007). None are listed as Declared Weeds under the *Agriculture and Related Resources Protection Act, 1976* (ARRP Act). The majority of weeds were recorded at locations that have been subject to historical ground disturbance including road verges, the southern end of the 'Humic Granitic / Sandy Swale' vegetation association, and the granite platform along the eastern fringe of the Project area supporting skeletal sandy soils with high exposure to prevailing winds. Few weeds were recorded from 'intact' vegetation types.

Kikuyu Grass *(*Pennisetum clandestinum)* formed a dense cover at the southern limit of the 'Humic Granitic / Sandy Swale' vegetation community, adjacent to Leeuwin Road. The majority of the slip lane and entry road into the Project area will be constructed through this

completely degraded unit. The dense mat formed by the Kikuyu Grass *(*Pennisetum clandestinum)* will require management prior to undertaking rehabilitation within this block. There must also be consideration of scattered plants of *Kennedia lateritia* that occur within the unit.

The granite platform vegetation association that occurs along the eastern fringe of the Project area supports a number of weed species including **Cynodon dactylon, *Romulea rosea* var. *australis, *Trachyandra divaricata, *Lagurus ovatus, *Anagallis arvensis, *Hypochaeris glabra, *Lotus subbiflorus, *Melilotus indicus* and **Sporobolus africanus*. The existing weed loading will require management prior to undertaking any remedial rehabilitation and/or maintenance works within the block. There must also be consideration of *Kennedia lateritia* plants that occur within localised areas.

3.3.5 Native seed availability

The availability of seed for native species is not a constraint to rehabilitation efforts. A native seed collection program commenced at the site in December 2010 (Appendix 3), and was expanded to include adjacent Shire Reserves; the program continues in May 2011.

As of 23rd March 2011 a total weight of 19.36 kg of clean native seed including 47 species had been collected for future rehabilitation activities (Appendix 4). A further 2.85 kg of native seed will be collected from eight additional plant taxa in coming months to complete the seed collection program (Appendix 5). There will be a specific requirement to collect seed from plants of the DRF *Kennedia lateritia* and Priority 3 flora *Bossiaea disticha* present at the site. This will be conducted under issue of specific licences from the DEC. The seed from both taxa will be incorporated into a combination of direct sowing and planting of nursery propagated seedlings onto prepared rehabilitation surfaces.

When preparing and estimating the seed application rate for individual species incorporated into the seed mix, factors such as sample purity, seed quality, final germination and seed size must be carefully considered. This testing was completed for seed lots collected for use at the site and has been utilised in developing final seeding rates.

3.3.6 Topsoil and subsoil management

Topsoil is arguably the most important rehabilitation resource in the Project area, and along with the subsoil component, will be recovered and utilised to reconstruct the upper soil profile in degraded and completely degraded rehabilitation blocks; labelled as 2a-2c, 3, 4a-4b, 5a-5b, and 6 (Figure 2).

Topsoil and subsoil will be recovered from surfaces of the proposed quarry situated north of the rehabilitation blocks. The existing surface of the quarry supports an intact native vegetation cover with only minor occurrence of non-aggressive weed species. The depth of topsoil (and subsoil) available from surfaces of the quarry is variable in response to outcropping of granulite; however, estimated volumes provided by the DoT confirm there will be a surplus of material recovered given current on-site rehabilitation requirements. The DoT estimates that a minimum of 20,000 m^2 of the quarry surface supports topsoil and subsoil stratum at 0.3 m depth, equating to 6,000 m^3 of available material. With topsoil being stripped at 50 mm depth and subsoil at 250 mm depth, a conservative estimate of available topsoil and subsoil volumes is 1,000 m^3 and 5,000 m^3 respectively. An upper estimate for topsoil and subsoil volumes required for rehabilitation within the Project area is 368 m^3 and 1,586 m^3 respectively (Table 2).

Table 2 Rehabilitation blocks defined at the Augusta Boat Harbour – area (ha), topsoil and subsoil (m^3) requirements.

Rehabilitation Block	Area (ha)	Topsoil Required (m^3)	Subsoil Required (m^3)
1b	0.324	0	0
1c	0.901	0	0
2a	0.097	48.36	241.81
2b	0.027	13.37	66.87
2c	0.016	7.90	39.52
3	0.023	11.71	0
4a	0.462	230.82	1,154.11
4b	0.019	9.54	47.71
5a	0.049	24.58	0
5b	0.030	15.10	0
6	0.015	7.35	36.79
7	0.115	0	0
		368.76	**1,586.81**

For all areas where clearing occurs for development of infrastructure, topsoil will be stripped and utilised as a rehabilitation resource via direct return onto prepared rehabilitation surfaces such as existing access tracks and degraded areas where native species richness is reduced. The stripping method implemented will be determined by the earthworks contractor in liaison with the Rehabilitation Advisor. This will most likely be grading over the northern sector of the quarry area (where topsoil depth increases) into windrows, and then utilising a loader to bucket into dump trucks.

Development of the quarry will commence in October 2011 and require up to eight months to complete removal of rock to floor level across the entire site. The October 2011 start date will allow for direct return of topsoil and subsoil material required for the 2012 rehabilitation program. There will be a requirement to stockpile surplus topsoil and subsoil material required for the 2014 rehabilitation program. It is proposed that development of the quarry occur in stages to facilitate staged clearing of vegetation and topsoil and subsoil handling. A staged development would reduce the surface area 'open' at any one time and increase the ability to manage indirect impacts on the environment such as dust. For storage of topsoil on site, topsoil stockpile height will be minimized (1.5 m maximum height).

3.3.7 Soil and landform stability

The existing slope of landforms within rehabilitation areas is gently to very gently inclined, with the exception being Block 6 (Figure 2) which supports a steeply eroded access track off Leeuwin Road. A diversion drain will be required to redirect surface run-off originating from Leeuwin Road away from Block 6 to minimise the potential for future erosion at this site.

The alignment of Leeuwin Road along the western boundary of the Project area represents a potential water catchment area with associated risk for sheet water flows onto disturbed surfaces once construction commences. The Augusta Boat Harbour Construction Environmental Management Plan has considered the management of surface water across the entire site, with particular attention on maintaining surface stability during the early stages of rehabilitation. Minimising surface water run-off from any catchment areas occurring at the existing site, or created during the construction process, will be an important strategy particularly where these

catchments occur at elevated points in the landscape. Consideration must also be provided to maintaining the *in situ* soil moisture status for areas supporting *Kennedia lateritia,* particularly the main populations occurring in the Humic Granitic/ Sandy Swale and Granitic/ Sandy Foreshore complexes.

Techniques that will be incorporated into the rehabilitation program to minimise wind and water erosion during the early stages of revegetation development will include:

- The development of a Construction Environmental Management Plan and detailed design will ensure the rehabilitation areas will not be affected by surface water from the development during and after construction;
- Spreading a thin layer of cleared vegetation debris and brushing from cleared areas of the quarry over re-contoured topsoil;
- Shallow contour scarification of re-contoured rehabilitation surfaces; and
- Establishment of temporary shade cloth fencing at strategic points within the rehabilitation to minimise the impact from prevailing south-easterly winds during summer months (particularly the effect of strong winds, salt spray and sand blasting on young seedlings).

4. IMPLEMENTATION STRATEGY

4.1 REHABILITATION PLANNING

The rehabilitation program will commence in advance of any clearing or earthworks activities occurring at the proposed Augusta Boat Harbour Project area. Tasks during this period will include:

- Collecting native seed required for direct sowing and propagation of native seedlings for utilisation in rehabilitation blocks at the site (commenced in December 2010);
- Treatment of introduced (weed) species within rehabilitation blocks at the site aimed at reducing the weed loading ahead of ground preparation activities, and preventing longer term invasion of developing rehabilitation from surrounding areas (Table 3) – this will commence immediately on acceptance of the SREMP by DEC;
- Commencing nursery propagation of seedlings from a combination of seed, cuttings and root divisions (aimed at being ready for a mid-June 2012 planting on site); and
- Field demarcation of *Kennedia lateritia* plants in the field by construction of non-permanent perimeter fencing using white sighter wire.

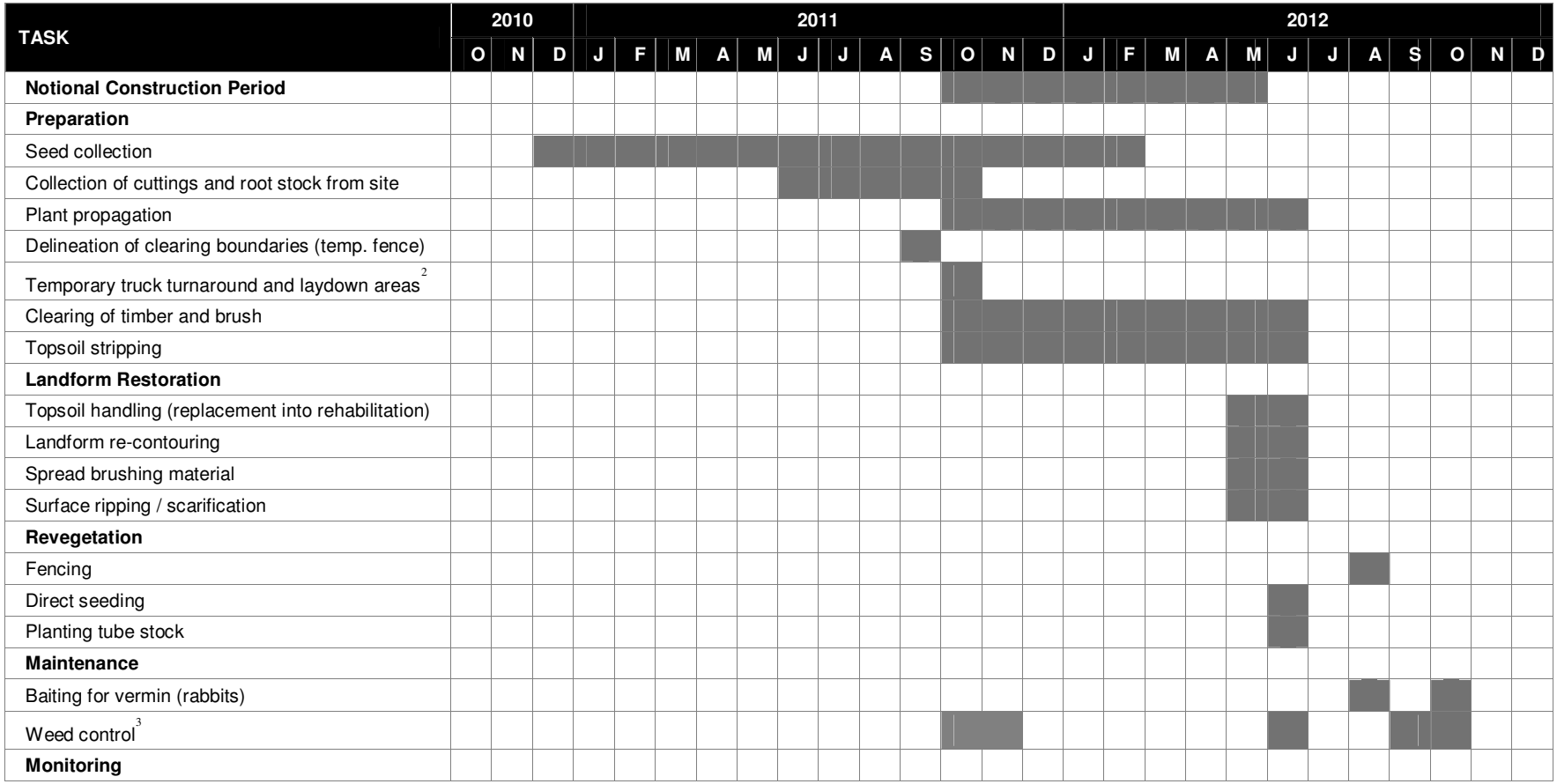
Table 3 Appropriate control measures for problematic weed species occurring within the project area.

Common Name	Scientific Name	Recommended Control
Arum lily	**Zantedeschia aethiopica*	Blanket wipe with a mixture of Glean (20g ha^{-1}), Gramoxene W (2L ha^{-1}), and wetting agent (250ml $100L^{-1}$) in late winter (for best results treat plants when flowering begins, but before seed production).
Bearded oats Blowfly grass Shivery grass Hare's tail grass Water couch Parramatta grass Buffalo grass Kikuyu grass	**Avena barbata* **Briza maxima* **Briza minor* **Lagurus ovatus* **Paspalum dilatatum* **Sporobolus africanus* **Stenotaphrum secundatum* **Pennisetum clandestinum*	Use Fusilade 212 or Verdict 520 at 2 L ha^{-1} for blanket and spot spraying during winter or spring. Fusilade and Verdict are suitable for spraying over native vegetation, and should be used in combination to prevent plants becoming resistant.
Dune onion weed	*Trachyandra divaricata*	Manually remove isolated patches by hand before flowering. Wick application using 5 g of metsulfuron or 500 mL of glyphosate plus 2.5 mL wetting agent per litre of water. Apply before flowering in late winter and spring.
Pimpernel South African orchid Flat weed Birdsfoot trefoil Sweet melilot Pennyroyal Ribwort plantain Rough sowthistle Common sowthistle Cluster clover	*Anagallis arvensis* *Disa bracteata* *Hypochaeris glabra* *Lotus subbiflorus* *Melilotus indicus* *Mentha pulegium* *Plantago lanceolata* *Sonchus asper* *Sonchus oleraceus* *Trifolium glomeratum*	Mix 500 mL glyphosate (360 g L^{-1}) WITHOUT wetting agent with 100 L of water. Fill backpack from tank and spray infested areas early in the growing season (early winter). May require re-treatment in early spring. Has minimal impact on native species. However, should not be used on *Kennedia lateritia*.
Onion grass	*Romulea rosea* var. *australis*	Blanket wipe using 1-2 L ha^{-1} of glyphosate (450 g L^{-1}) in combination with 10-20 g ha^{-1} chlorsulfuron or metsulfuron in winter prior to flowering.
Spear thistle	*Cirsium vulgare*	Manual removal for small areas. Wick application using 1 part glyphosate (450 g L^{-1}) to 2 parts water for larger infestations in early winter prior to flowering.

4.2 REHABILITATION SCHEDULE

Development of the proposed Augusta Boat Harbour Project is planned to commence in October 2011 and expected to be completed in early 2014. Table 4 represents the preferred annual chronology for specific rehabilitation activities that are outlined in more detail below.

Table 4 Schedule of rehabilitation activities at the Augusta Boat Harbour project.



[2] The temporary truck turnaround area situated at the site entry point nearby to Leeuwin Road and the contractor laydown will both be rehabilitated in June/July 2014.

[3] Weed control will be ongoing as required.

TASK	2010			2011												2012											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Vegetation																											

4.3 CLEARING

4.3.1 Preparation of Rehabilitation Blocks

The established ground cover of **Pennisetum clandestinum* (Kikuyu Grass) present within Rehabilitation Blocks 2a – 2c will be cleared and removed from site, the remaining surface soils lightly scarified, and follow-up herbicide control of re-establishing grass undertaken using a grass selective herbicide (Table 3). These preparation steps will occur ahead of replacing a topsoil / subsoil resource to 0.3 m depth[4] and undertaking direct sowing and planting of nursery raised seedlings. It is proposed that similar clearing occurs ahead of construction for the site access road at the same location.

For selected areas within Rehabilitation Blocks 2b and 4a supporting the temporary truck turning and laydown areas, additional preparation tasks will be required prior of revegetation. For Rehabilitation Block 2b this will include removal of limestone road base and temporary limestone bunds[5], scarification of exposed upper profile (humus) to remove any surface compaction, replacement of humus layer with *in situ* stockpiled humus material, and replacement of a 0.3 m topsoil layer recovered from the quarry. Rehabilitation Block 4a is defined by granite rock close to the surface and as such will require removal of any imported limestone prior to rehabilitation as per methods described below for the larger area within this block.

Selective removal of Kikuyu will occur around existing scattered plants of *Kennedia lateritia* within Rehabilitation Block 3, with remaining grass to be eradicated using a grass selective herbicide (Table 3). There will be careful replacement of imported topsoil to 0.3 m depth within this block.

Skeletal soils within Rehabilitation Blocks 4a and 4b that support weeds such as **Cynodon dactylon* (Couch Grass) will be scalped and the weed load immediately removed from site. A treatment program will be instigated at the site using herbicides listed in Table 3, in preparation for topsoil and subsoil placement.

Clearing of weeds will occur by hand within Rehabilitation Blocks 5a and 5b, in combination with a selective herbicide program that accounts for the presence of *Kennedia lateritia*.

Vegetation occurring at Blocks 1b, 1c and 7 will have targeted weed control undertaken as required. There will be no additional preparation work required as no remedial earthworks will be completed within these blocks.

4.3.2 Infrastructure Areas

The proposal includes clearing approximately 3.72 ha of native vegetation for the construction of critical infrastructure associated with the project, with the quarry at the northern end of the Project accounting for a large proportion of this area. All practicable measures have been implemented to reduce the clearing foot print.

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[4] Topsoil will be used for entire 0.3 m layer where recovered volumes allow, otherwise recovered sub-soil will used below a minimum topsoil depth of 50 mm.

[5] Any recovered limestone material reused on site should be 'weed-free' particularly from contamination by Kikuyu.

Prior to any clearing activities commencing at site, disturbance boundaries will be surveyed and clearly delineated by white sighter wire fencing to ensure that clearing of native vegetation does not exceed those areas approved. After initial clearing activities the white sighter wire may be upgraded to include ringlock fencing fixed under the sighter wire for further site definition and protection. The sighter wire fence may be replaced during construction with a chainwire fence with hessian screening if localised dust management measures need to be implemented. After construction the temporary fences will be removed and replaced with the specified perimeter fencing.

Pre-clearance checks will be undertaken by the Site Supervisor to ensure that necessary surface preparation has occurred at rehabilitation areas to allow for direct return of topsoil and subsoil (where possible), stockpile areas for topsoil, subsoil and vegetation debris and brushing resources have been prepared where direct return of this resource is not possible, and machinery operators have been familiarised with the objectives of the clearing program in respect to required rehabilitation outcomes.

The clearing protocol will involve two broad steps outlined below:

1. The above ground vegetation mass from the quarry site will be cleared and direct returned to prepared rehabilitation surfaces as brushing in higher wind areas to minimise erosion; and
2. Surplus vegetation debris cleared and not required for rehabilitation activities will be removed from site.

4.4 TOPSOIL MANAGEMENT

Topsoil will be stripped in stages during development of the quarry in line with clearing of the native vegetation cover.

Native topsoil within the footprint of the quarry will be recovered to a depth of 50 mm to preserve the *in situ* native seed resource and nutrient content, noting this may not be possible in areas where outcropping granulite occurs. The DoT has calculated that approximately 20,000 m^2 of the quarry site supports an upper soil stratum to 0.3 m depth, providing a conservative recoverable topsoil resource of 1,000 m^3. It is estimated that approximately 368m^3 of topsoil will be required to complete remedial earthworks in the rehabilitation blocks (Table 2), however, 100% of this resource will be recovered where possible[6].

Staged development of the quarry may provide the opportunity to direct return topsoil onto prepared rehabilitation surfaces, particularly during the final clearing stage. However, stockpiling of this important resource will commence during the initial stages to ensure required volumes are available. Topsoil will be stockpiled to a maximum height of 1 m at the northern end of the quarry site (the final stage) surrounded by intact vegetation to minimise potential for weed infestation. Stockpile locations and volumes will be recorded and mapped, and stockpiles in the field will be signposted to allow easy differentiation of stripping dates.

Topsoil will be replaced at a minimum depth of 50 mm onto prepared subsoil medium, however, a deeper profile may be reconstructed using topsoil where surplus volumes are realised (in preference to using subsoil).

[6] Topsoil will be used in preference to subsoil wherever possible.

4.5 SUBSOIL MANAGEMENT

The subsoil resource will be recovered to a maximum depth of 0.3 m below natural surface following topsoil stripping to ensure the minimum volume of topsoil and subsoil available for rehabilitation activities is realised (see Table 2). Subsoil will be direct returned to prepared rehabilitation surfaces where ever possible, or stockpiled to less than 2 m in height at the northern end of the quarry site (within the final clearing stage). Stockpile locations and volumes will be recorded and mapped, and stockpiles in the field will be signposted to allow easy differentiation of stripping dates.

It is proposed that subsoil be replaced within Rehabilitation Blocks 2a-2c, 4a-4b and 6 to a maximum depth of 0.25 m, where adequate topsoil volumes are not available to achieve this profile depth. Relaced subsoil will be re-contoured to blend with the surrounding vegetation / landform units in readiness for application of topsoil and then mulched vegetation.

4.6 VEGETATION DEBRIS / BRUSHING

Native vegetation removed during clearing of the quarry site will be spread onto prepared surfaces within Rehabilitation Blocks 2a-2c, 4a, 4b and 6 to 10 mm depth using a Posi Track to minimise compaction, prior to surface scarification.

For Rehabilitation Blocks 3, 5a and 5b vegetation debris and brushing will be spread to 50 mm depth aimed at suppressing weed establishment in the ground cover. The material will be spread by machine across open areas within these blocks; however application by hand will be required in localised areas supporting *Kennedia lateritia* plants.

4.7 CONTOUR SCARIFICATION

There will be shallow contour scarification of rehabilitation surfaces within Rehabilitation Blocks 2a-2c, 4a, 4b and 6 to reduce the potential for surface erosion and promote a seed bed for establishing plants. Contour scarification will be completed with the front forks of a Posi Track to a maximum depth of 0.2 m prior to direct seeding and planting of nursery raised seedlings.

4.8 DIRECT SEEDING

Direct seeding will be used to provide a fast establishing vegetation cover within Rehabilitation blocks 2-6, while enhancing native species richness. Native seed has been collected by an experienced contractor familiar with the Augusta region (Appendices 3 and 4). The rehabilitation species composition reflects vegetation in the pre-disturbance environment. Sowing rates for individual species will be finalised when seed quality data has been completed for each seed collection. Hand sowing will be completed in during early winter at a rate of approximating 5-7 kg ha^{-1}.

4.9 PLANTING

A number of species occurring within the project area survive fire and other disturbance by resprouting. Some of these resprouters also regenerate readily from seed, while for others this is rare (recalcitrant species). For species that only set small quantities of viable seed, seedlings will be propagated from this resource in the nursery and then planted into prepared rehabilitation areas (Appendix 3). For species where seed collection or germination of seed is

not possible, plants will be produced by vegetative propagation using cuttings or rootstock material. Commercial nurseries will be contracted to supply required plant stock.

Native seed and cuttings for tubestock understorey species will be collected during the year prior to planting to ensure a sufficient period for propagation. For certain target species such as *Lepidosperma gladiatum,* this may involve disturbing areas of vegetation within the proposed clearing footprint at site in order to promote regrowth (daughter rhizomes) essential for plant propagation in the nursery.

Seedlings for understorey species will be planted evenly across Rehabilitation Blocks 2-6 at a rate approximating 12,000 plants ha^{-1}. With a variety of other understorey species also developing from a combination of topsoil, mulch and direct sown native seed, the re-established vegetation is expected to have a suitably randomised distribution.

There will be emphasis on propagation of *Kennedia lateritia* plants for utilisation in rehabilitation of degraded areas of the 'Humic Granite/ Sandy Swales' vegetation association (Rehabilitation Blocks 1-3), where it currently occurs as a dominant species. However, plantings of the DRF will occur throughout all rehabilitation blocks at the site in an attempt to increase the size of the current population and consolidate the area of the population. Justification is provided by the fact that *K. lateritia* plants were recorded from four of the five vegetation associations within the project area (absent from the "Primary Sand Dune" complex), suggesting the ability to survive in some capacity outside the humic granitic swales.

Fauna (Elscot 2010) and flora (OEC 2007; OEC 2008) surveys identified a number of taller Peppermint (*Agonis flexuosa*) trees occurring in two clumps in the south western sector of the Flat Rock site. During a survey undertaken by OEC and DoT on 22 July 2011, it was identified that to facilitate the construction of an access road at the southern end of the project site, a total of twelve Peppermint trees ranging in height from 3.8 m to 4.6 m are required to be cleared. The twelve Peppermint trees occur on the northern tip of the southernmost population of taller Peppermint trees, and cover an area of approximately 292.4 m^2 (0.029 ha). There were no Western Ringtail Possums sighted during the fauna survey, nor were any dreys or scats encountered (Elscot 2010*)*. However, to avoid any direct impacts to the Western Ringtail Possum, clearing of this vegetation shall be carried out in accordance with the Western Australian Department of Environment and Conservation's Guideline *Procedures to Minimise Risk to Western Ringtail Possums During Vegetation Clearing and Building Demolition* (DEC 2010). To mitigate any longer term impact, Peppermint trees will be specifically established around the perimeter of the existing southern population of taller trees as part of the rehabilitation program to consolidate the existing stand. As such, it is considered unlikely that the clearing of the twelve Peppermint trees within the access route will have any significant impact upon the Western Ringtail Possum.

4.10 PERIMETER FENCING

In consultation with the Department of Environmental and Conservation (DEC) a suitable alignment for a perimeter fence will be determined and a fence constructed around the perimeter, or portions of the perimeter, following completion of construction. The alignment shall be chosen to minimise impacts to native vegetation. The type of fence or barrier may

vary depending on the interface requirements of the rehabilitation areas to infrastructure but shall generally be 1 m high[7].

The same style of fencing will be erected to separate infrastructure areas from existing native vegetation in areas at high risk of uncontrolled pedestrian traffic, e.g. coastal side of car parks. Fencing will also be appropriate to act as a dust screen to further minimise the risk of the impacts of dust emissions. Furthermore, dust control during construction and quarrying work will also focus on limiting the amount of dust generation through the use of plant and equipment such as water carts as practicable.

4.11 MAINTENANCE

4.11.1 Vermin control

Introduced fauna have the potential to significantly impact on revegetation development within the relatively small rehabilitation area, by increasing and concentrating grazing pressure. Control options should be considered carefully in liaison with surrounding land managers, primarily DEC in this case, prior to being implemented. Potential management options for the Augusta Boat Harbour site are:

- Construction of perimeter fencing around rehabilitation areas;
- Annual baiting for rabbits in and around rehabilitation areas;
- Baiting for snails; and
- Fox and feral cat control.

4.11.2 Fire Management

Fire management at the site will be a primary concern, with surrounding vegetation considered a high fire risk during the summer and autumn months. Appropriate fire management strategies will be important in protecting developing revegetation and should be considered in terms of management (controlled burns) as well as a threat (bushfire).

The DoT will liaise with DEC to ensure that fuel loads within the adjacent National Park areas remain at acceptable levels during the early stages of rehabilitation development, and that any controlled burns undertaken account for the location and age of the rehabilitation at the Augusta Boat Harbour.

4.11.3 Dieback and pest management

Management of dieback and pests at the Project area will aim to ensure that the severity of both parameters does not increase during construction, and that appropriate controls and monitoring actions are implemented to ensure that the area remains protected.

Management of dieback during construction operations will be facilitated by:

- Adopting a formal approach to managing the dieback threat; and

[7] The land upon which the boat harbour (including rehabilitated areas) is located will be included in a new harbour reserve vested with the Minster for management by the Department of Transport. As with all Transport facilities all infrastructure included with the boat harbour reserve will be the responsibility of the Department of Transport for enduring management.

- Ensuring that the *in situ* status does not increase as a result of project development.

These management goals will be achieved on site by adopting the following strategies:

Identification and assessment

The dieback status across the Project area was assessed by Glevan Consulting in September 2011 (Appendix 2), with the entire Project area mapped as uninterpretable. For management purposes, 'The Precautionary Principle' will be adopted requiring that uninterpretable areas be considered uninfected and actions be taken to prevent the spread of dieback into these areas.

Hygiene – vehicles and machinery

All contractors will follow strict hygiene protocols when entering the Project area from a 'Clean on Entry Point' located at the junction of Leeuwin Road and the site access road. The Clean on Entry Point will be the sole entry point onto the site and represent the point at which all personnel will take personal responsibility to ensure the vehicles and machinery they are operating have been appropriately cleaned to ensure no dieback, weeds or other foreign diseases / pests are unknowingly introduced. The Clean on Entry Point will be clearly signposted in red and a copy of the relevant Work Instruction outlining vehicle and machinery hygiene responsibilities and procedures (see Appendix 6) will be maintained at the same point.

All vehicles and machinery must be clean prior to entering site. The process will require either a washdown or brushdown procedure which is outlined in Work Instruction 1 (Appendix 6). The washdown / brushdown bay will be located at an appropriate Shire facility in Augusta; cleaning of vehicles and machinery should not be completed at the Clean on Entry Point or on site under any circumstance.

Once vehicles and machinery have been appropriately cleaned and are on site, no additional cleaning is required. However, in the instance that the vehicles or machinery leave site and move off either formed bitumen roads or approved road ways constructed using limestone base, then additional washdown / brushdown will be required prior to re-entering site.

The above procedures will be clearly outlined to all personnel prior to entering site as part of a formal site induction.

Hygiene – seedlings

Plant stock used for on-site rehabilitation works will be certified dieback-free prior to being delivered to site.

Quarantine areas

Access into areas of native vegetation that are not to be cleared or disturbed will be strictly controlled by a combination of non-permanent fencing and locked gates. There will be clear signposting informing of restricted access at these points. These areas will be clearly demarcated on a site map and included into the formal site induction process. Entry into these areas will be restricted to environmental and/or rehabilitation activities, such as weed control and monitoring; appropriate hygiene measures will apply prior to entry (as described below).

Drainage

Surface run-off from roads, stockpiles and other soil disturbances/trafficked areas should be contained within the disturbed areas as far as is practicable. Management strategies will include staged clearing of vegetation, retention of vegetation as perimeter buffers, retention of vegetated strips within the clearing zone, and perimeter bunding of topsoil and subsoil stockpiles.

During initial construction of the site access road within Vegetation type 2 'Humic Granitic/ Sandy Swale' (Onshore Environmental 2008), surface drainage within disturbed areas of this low lying area will be managed by constructing temporary limestone bunds immediately after installation of the fences and prior to any kikuyu stripping commencing. The bunds will aim to localise surface drainage within disturbed areas and prevent any associated impacts on the neighbouring vegetation type supporting *Kennedia lateritia*.

Contingency Actions

In the event that management actions are deemed insufficient to meet management objectives, the following actions shall be employed following consultation with relevant stakeholders:

- Halt vehicle access into the Project area for a specified period;
- Review hygiene procedures and their implementation;
- Review the SREMP; and
- Utilise additional measures, as determined appropriate by the Site Supervisor in liaison with DEC.

4.11.4 Weed Control

It is anticipated that physical removal and chemical treatment of weeds prior to Project development will significantly reduce weed loading at the site. It is anticipated that the physical removal of weeds prior to development will serve to decrease the amount of time required for weed control pre-rehabilitation. This will subsequently ensure that rehabilitation can occur in an optimum timeframe and with higher quality resources such as direct return topsoil.

Other strategies that will reduce longer term weed establishment include reconstruction of upper soil profiles (burying existing weed seed loading), application of cleared vegetation debris and brushing, and the implementation of an ongoing weed management program. Recommended control strategies for weed species occurring within the Project area are listed in Table 3 and will be updated and applied on the basis of results recorded during annual rehabilitation assessments, and ongoing professional advice from stakeholder groups and contractors.

5. MONITORING

5.1 MONITORING

An annual monitoring program designed to assess rehabilitation development success and the requirement for additional management strategies will be undertaken for three years following completion of rehabilitation, and at a three year interval from then onwards. Monitoring will continue until it has been proven that revegetation is self-sustaining and can be integrated with the surrounding undisturbed vegetation, as determined by an appropriately qualified botanist appointed by the DoT. Monitoring will be the responsibility of an appropriately qualified botanist appointed by the DoT, and will be conducted in accordance with the procedures outlined below. DoT will accept final responsibility for the rehabilitation works until such time as the completion criteria (Table 5) have been met.

In addition to the rehabilitation areas, a reference (analogue) site will be selected for annual monitoring. The analogue site will be selected on the basis of having similar soil-landform-vegetation associations to corresponding rehabilitation areas to allow for appropriate comparison of parameters. It is recommended that the analogue site be situated north of the proposed Augusta Boat Harbour (along the same section of the ridge), in close proximity to Granny's Pool.

Monitoring will use a series of plant biodiversity parameters such as species richness and diversity, plant density and percentage cover as indicators of ecosystem development and stability, which is endorsed by the EPA (EPA 2006). Qualitative assessment of the developing rehabilitation will be undertaken on a regular basis during the first growing season following establishment, and up to 15 months of age. Seed germination, plant establishment and survival, species diversity and weed establishment will be key parameters monitored during this period. Quantitative monitoring of rehabilitation will commence in the second spring (September/October) following rehabilitation (15 months), and continue on an annual basis until the third assessment at which time the monitoring interval will be extended to a triennial basis (once every three years)[8].

Rehabilitation blocks (as per Figure 2) will be sampled with adequate replication to ensure the data is representative of the vegetation present. This will be demonstrated via graphing of 'species-area curves' for the understory vegetation.

The monitoring procedure will involve assessment of permanent belt transects of twenty contiguous one metre square quadrats. A GPS location of the commencement point and orientation of each transect will be recorded and photo monitoring point established. The twenty 1 m^2 quadrats along each transect line will be assessed individually. For each species within a quadrat the number present, percentage ground cover, and maximum plant height will be recorded. Summarised data will provide mean density values (no. plants m^{-2}), mean percentage ground cover, and mean maximum plant height.

An importance value index (IVI), (Mueller-Dombois & Ellenberg 1974) which considers frequency, density, and cover will be calculated for each species recorded along a transect line. For all species recorded along each transect line the total IVI value is 300; the larger an individual IVI, the greater the dominance of that species. Species diversity will be measured by

[8] On the provision that stakeholders are satisfied with rehabilitation development to this stage; annual rehabilitation monitoring will continue otherwise.

the Shannon-Wiener diversity Index, with higher values representing a greater level of diversity. The spread of individuals between the species recorded is defined by the 'Evenness' value (J). Evenness ranges between 0 and 1, with the maximum value indicating the same number of individuals being recorded for all species (Zar 1996, Magurran 1988). Lower J values reflect the dominance of one or a few species within the revegetation.

A monitoring report outlining annual results will be submitted annually to the DoT by 31 March following annual assessments. The report will be provided to documented stakeholders and will be otherwise publicly available on request. This annual report will also be made available to the DEC upon request. A copy of the annual monitoring report will also be provided to DSEWPC by 31 March each year.

5.2 COMPLETION CRITERIA

To enable the assessment of rehabilitation progress towards objectives outlined in Section 3.1, a number of completion criteria have been developed (Table 5). For each completion criterion, performance indicators have been identified to enable progress to be measured and assessed (Table 5). The targets are both qualitative (audit of design implementation during early stages to ensure maximum likelihood of a positive outcome), and quantitative (direct measure of performance outcomes).

The completion criteria listed in Table 5 will be assessed during the following five stages of the project:

- Planning;
- Pre-clearing;
- Pre-rehabilitation;
- Establishment (0 – 15 months); and
- Development (15 months onwards).

5.3 REVIEW OF MANAGEMENT PLAN

It is proposed that this Site Rehabilitation and Environmental Management Plan and rehabilitation works be reviewed by DoT after an initial three year period, and again after a subsequent two years, following the completion of construction works. All data and information relating to rehabilitation and maintenance works will be collected and reviewed to ensure that all completion criteria have been met and that rehabilitation and management strategies and practices continue to be appropriate.

The DEC are invited by the DoT to have an active and ongoing role in the rehabilitation management of the site, and relevant DEC personnel are invited and encouraged to visit the site to view rehabilitation works while underway.

Table 5 Completion Criteria for rehabilitation within the Flat Rock project area

ASPECT		COMPLETION CRITERION	PERFORMANCE INDICATOR
		1. PLANNING	
Access	1.	Stakeholders have been consulted with proposed boat harbour access plans	Emails, letters, minutes of meetings
Fire	2.	Fire management strategies are incorporated into the SREMP aimed at protecting developing rehabilitation	SREMP approved, Fire is excluded from developing rehabilitation for a minimum period of ten years following rehabilitation.
Land use	3.	Area meets land use purpose as defined by land owner / manager	Shire of Augusta Margret River formally approves & adopts the end land use for the project area
Flora Vegetation and Fauna	4.	Baseline flora & vegetation and fauna surveys have been completed	Management strategies for flora, vegetation and fauna of conservation significance are developed, as evidenced by correspondence.
		2. PRE-CLEARING	
Hydrology Landform and soils	5.	Prior to commencement of clearing, surface drainage plan developed for areas earmarked for clearing	Surface drainage plan sighted by Project Manager
Clearing	6.	Disturbance boundaries delineated with white sighter wire	Site inspection, photographs
Clearing	7.	Machinery operators informed of clearing measures	Meeting minutes, correspondence
Vegetation and flora	8.	Search for DRF (and other conservation significant flora) completed prior to clearing	Flora & vegetation survey report, photographs of flagged DRF
Vegetation and flora	9.	Seed and plant material required for propagation removed and appropriately stored	Site inspection, photographs, invoices/receipts from seed merchants & nurseries
Vegetation and flora	10.	Infrastructure and stockpile areas approved for clearing surveyed and pegged	Site inspection, photographs, survey/site plans, approval documents
		3. PRE-REHABILITATION	
Landform and soils	11.	Native vegetation topsoil stripped in two layers: 0 – 50 mm and 50 – 150 mm, with clear signage delineating the two resources to prevent later confusion	Site inspection, photographs
Landform and soils	12.	Native vegetation topsoil stripped during dry conditions wherever practicable	Site inspection, photographs
Landform and soils	13.	Upper topsoil stripped with a grader (or similar) and stockpiled into pre-determined locations	Site inspection, photographs
Landform and soils	14.	Native vegetation topsoil stockpiled over cleared native vegetation areas to a maximum height of 1 m	Site inspection, photographs, site plan
Landform and soils	15.	Landform design is integrated with existing landscape	Survey plan for proposal area (showing contours before and after development)
Vegetation and flora	16.	Clear and stockpile understorey vegetation	Site inspection, photographs

ASPECT		COMPLETION CRITERION	PERFORMANCE INDICATOR
Landform and soils	17.	Topsoil spread over 100% of the rehabilitated areas	Site plan, schedule, site inspection, photographs
Landform and soils	18.	Aim to direct return 100% of the upper (top 50 mm) topsoil resource over disturbed rehabilitation areas	Site plan, schedule, site inspection, photographs
Landform and soils	19.	Post-disturbance surfaces re-contoured with a Posi Track following survey	Survey report (including pre- and post-disturbance contours), site inspection, photographs
Landform and soils	20.	Re-contoured surface deep ripped / scarified with appropriate machine (Posi Track)	Site inspection, photographs
Landform and soils	21.	'Lower topsoil' material replaced at 150 mm depth	Monitoring (survey) results, site inspection, photographs
Landform and soils	22.	'Upper topsoil' material replaced at 50 mm	Monitoring (survey) results, site inspection, photographs
Landform and soils Hydrology	23.	No uncontrolled surface runoff or soil erosion that is unstable and degrading, and/or compromises end land use objectives	Site inspection, photographs, monitoring results
Vegetation and flora	24.	Fencing strategically erected to minimise impact of prevailing south-easterly winds on seedling development	Invoice/ receipt from fencing contractor, site plan, site inspection, photographs
		4. ESTABLISHMENT	
Vegetation and flora	25.	Prepared rehabilitation areas direct seeded with a native species mix	Seed list outlining volume of seed utilised for each species, area direct-seeded, site inspection, photographs
Vegetation and flora	26.	Nursery propagated seedlings (from a mixture of seed, cuttings, root divisions, and tissue culture) replanted throughout the rehabilitation area at a density >1,000 seedlings ha^{-1}	Species list showing seedling numbers for each species, area of rehabilitation, site inspection, photographs, monitoring results
Vegetation and flora	27.	At 15 months total number of *Kennedia lateritia* plants at the site to be 150% of the number recorded prior to development	Site inspection, photographs, monitoring results
Vegetation and flora	28.	At 15 months species richness to be at least 80% of that recorded at the analogue site, with not more than 10 percent of the annual assessment plots failing to record this level of diversity	Monitoring results confirm species richness at least 80% of that recorded at the analogue site, with not more than 10 percent of the annual assessment plots failing to record this level of diversity
Landform and soils	29.	Surfaces stable with no evidence of surface erosion that is likely to limit establishment of a native vegetation cover	Monitoring results (erosion and vegetation) confirming that erosion is not limiting plant establishment in the rehabilitation
Vegetation and flora	30.	No areas greater than 0.01 ha without understorey	Monitoring results, site inspection to confirm there are no areas greater than 0.01 ha without understorey
		5. DEVELOPMENT	
Vegetation and flora	31.	Longer term species richness to be at least 80% of that recorded at the analogue site, with not more than 10 percent of the annual assessment plots failing to record this level of diversity	Monitoring results confirm species richness at least 80% of that recorded at the analogue site, with not more than 10 percent of the annual assessment plots failing to record this level of diversity

ASPECT	COMPLETION CRITERION	PERFORMANCE INDICATOR
Vegetation and flora	32. For Peppermint trees (*Agonis flexuosa*) planted to consolidate the existing southernmost clump of taller trees at the project site, a minimum number of 15 trees have survived 5 years following commencement of rehabilitation.	Annual monitoring results confirm survival of at least 15 Peppermint trees *(Agonis flexuosa)* at 5 years.
Vegetation and flora	33. No Declared Plants (weeds) as defined by DAFWA (2007) present within rehabilitation areas.	Monitoring results, site inspection confirm no Declared Plants present in the rehabilitation
Access	34. The agreed access plan has been implemented	Access plan, site inspection, correspondence from regulatory authorities
Land use	35. The site meets the agreed end land use	Site inspection, photographs, correspondence from regulatory agencies
Landform and soils	36. The rehabilitation surface is stable and vegetated, with no uncontrolled run-off	Monitoring results, site inspection, photographs

6. REFERENCES

Atkins, K.J. (2009) **Declared Rare and Priority Flora List for Western Australia** (updated 3 May 2002). Department of Conservation and Land Management, Perth, Western Australia.

Beard, J.S. (1990) **Plant Life of Western Australia**. Kangaroo Press Pty Ltd, Kenthurst, NSW, Australia.

Beard, J.S. (1981) **Vegetation Survey of Western Australia – Swan, 1:1000 000 Vegetation Series**. UWA Press, Perth, WA, Australia.

Blackall, W.E. and Grieve, B.J. (1975) **How to Know Western Australian Wildflowers.** University of Western Australia Press, Nedlands, Perth, Australia.

Bridgewater, P.B. and Zammit, C.A. (1979) Phytosociology of southwest Australian limestone heaths. **Phytocoenologia 6**: 327-343.

Churchill, D.M. (1968) The distribution of and prehistory of *Eucalyptus diversicolor F. Muell., E. marginata* Donn ex Sm., and *E. calophylla* R.Br. in relation to rainfall. **Aust. J. Bot. 16**.

Churchward, H.M. and McArthur, W.M. (1980) Landforms and soils of the Darling System. In: **Atlas of Natural Resources, Darling System, Western Australia**. Department of Conservation and Environment, Western Australia.

Conservation Commission of Western Australia (2003) **Forest Management Plan for the Southwest Forest Region**. Conservation Commission of Western Australia, Perth.

Department of Environment and Conservation (2010) Procedures to Minimise Risk to Western Ringtail Possums During Vegetation Clearing and Building Demolition. Department of Environment and Conservation, Western Australia.

Department of National Development (1955) Vegetation regions. **Atlas of Australian Resources**.

Elscot, S. 2010, Proposed Flat Rock Boating Facility, Augusta: Additional fauna investigation. Prepared for DEWHA EPBC Act Ref: 2008/4502, Prepared for Oceanica Consulting Pty Ltd by Green Iguana, Dunsborough, Western Australia, May 2010.

Environmental Protection Authority (EPA) 2006, **Guidance No. 6 Rehabilitation of Terrestrial Ecosystems.** Government of Western Australia, June 2006.

Gardner, C.A. (1942) The vegetation of Western Australia. **J. Roy. Soc. W. Aust. 28**, 11-37.

Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994) **A Floristic Survey of the Southern Swan Coastal Plain**. Unpublished Report for the Australian Heritage Commission. Prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).

Green, J.W. (1985) **Census of the Vascular Plants of Western Australia**. (2nd edition) Western Australian Herbarium, Department of Agriculture, Western Australia.

Green, J.W. (1987) **Census of the Vascular Plants of Western Australia. Supplement No. 7.** Western Australian Herbarium, Department of Agriculture, Western Australia.

Groves, E., Hardy, G. and McComb, J. (unknown publication date) *Western Australian Natives Susceptible to Phytophthora cinnamomi*. Murdoch University.

Glevan Consulting (2011) Augusta Boat Harbour *Phytophthora cinnamomi* occurrence assessment. Report to Department of Transport.

Havel, J.J. (2000) Ecology of forests of south western Australia in relation to climate and landforms. **PhD Thesis**, Murdoch University, Western Australia.

Havel, J.J. and Mattiske Consulting (2002) **Review of management options for poorly reserved vegetation complexes**. Prepared for the Conservation Commission of Western Australia, Perth.

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980) Vegetation of the Darling System. In: **Atlas of Natural Resources, Darling System, Western Australia**. Department of Conservation and Environment, Western Australia.

Hill, A.L., Semeniuk, C.A., Semeniuk, V., and Del Marco, A. (1996) **Wetlands of the Swan Coastal Plain, Volume 2b: Wetland Mapping, Classification and Evaluation, Wetland Atlas**. Department of Environmental Protection and the Water Authority of Western Australia, Perth.

Oceanica (2008) Flat Rock Boating Facility, Environmental Referral Document (Revised), Prepared for Shire of Augusta Margaret River by Oceanica Consulting Pty Ltd. **Report No. 458.003/1**.

OEC 2007, Flora & Vegetation Survey - Proposed Flat Rocks Boating Facility, Prepared for Oceanica Consulting Pty Ltd by Onshore Environmental Consultants, Dunsborough, Western Australia, May 2007.

OEC 2008, Flora & Vegetation Survey - Proposed Flat Rocks Boating Facility Addendum Report, Prepared by Onshore Environmental Consultants, Dunsborough, Western Australia, August 2008.

Magurran, A.E. 1988. *Ecological Diversity and its Measurement*. University Press, Cambridge, Great Britain.

Mattiske, E.M. and Havel, J.J. (1998). **Vegetation Complexes of the Southwest Forest Region of Western Australia**. Prepared as part of the Regional Forest Agreement, Western Australia. Department of Conservation and Land Management & Environment Australia.

McArthur, W.M. and Clifton, A.L. (1975) Forestry and agriculture in relation to soils in the Pemberton area of Western Australia. **Soils and Land Use Series No. 54**. CSIRO Australian Division of Soils.

Mueller-Dombois, D. and Ellenberg, H. 1974, *Aims and Methods of Vegetation Ecology,* John Wiley and Sons, New York.

Onshore Environmental (2008) Flora and Vegetation Survey - Proposed Flat Rocks Boating Facility, Spring 2008. Report to Oceanica Consulting.

Paczkowska, G. and Chapman, A. R. (2000) **The Western Australian Flora, A Descriptive Catalogue**. Wildflower Society of Western Australia, Western Australian Herbarium CALM, Botanic Gardens and Park Authority, Perth, Western Australia.

Smith, F.G. (1972) **Vegetation Survey of Western Australia, 1:250 000 Series, Pemberton & Irwin Inlet**. Department of Agriculture, Perth.

Tille, P.J. (1996) Wellington-Blackwood Land Resources Survey: **Land Resources Series No 14**. ISSN 1033-1670. Natural Resources Assessment Group, Agriculture Western Australia.

Tille, P.J. and Lantzke, N.C. (1990) Busselton Margaret River Augusta land capability study, **Land Resource Series No. 5**. ISSN 1033-1670. Department of Agriculture Western Australia.

Wildlife Conservation Act (1950-1980) **Wildlife Conservation Act and Regulations**. Western Australian Government Publication.

Wrigley and Faggs (2006) **Australian Native Plants - Cultivation, use in landscaping and propagation.**

Zar, J.H. 1996, *Biostatistical Analysis,* 3rd ed., Prentice-Hall, New Jersey.

APPENDICES

Appendix 1 Revisions Table from DEC Comments in Preliminary Assessment Report (3990/1) Revised February 2011.

DEC Comments/Requirements – PAR 3990/1 (Revised February 2011)	Proponent Comments and SREMP (Version 7) Updates
In section 1.3 the site map, does not show the significant northern population of *Kennedia lateritia,* and hence does not show any buffering of this occurrence. Similarly, references in the document about the impacts on the *Kennedia* (3.3.1) do not include the impacts on this important population at the northern end of the application.	Text revised, refer to Figure 1 in Section 1.3. Text revised, refer to Section 2.1. The concept design was revised to design F2R to increase the buffer between the harbour (particularly the quarry) footprint and the northern *Kennedia lateritia* population, as requested by the DEC on 8 April 2011 at the on-site meeting involving representatives from DEC, DoT, OEC and Oceanica. These changes ensure that there is no direct impact on the northern DRF population resulting from the harbour and quarry development. The northern DRF population has been included as Block 7 in the SREMP and will form part of the annual monitoring program.
Section 3.2 states that rehabilitation will be reliant on topsoil sourced from areas such as the quarry. This is assumed to be a granite location, which is confirmed in section 4.1 which states the topsoil will come from the 'Granitic Coastal Hill Slope'. There are concerns with the practicality of sourcing topsoil from a granitic area. Section 3.3.6 refers to the topsoil management strategy. The reliance of this strategy on the availability of such topsoil is thus problematic.	Text revised, refer to Section 3.3.6.
In section 4.1, Table 2 talks about chemical use in weed control and proposes trials on *Kennedia lateritia* prior to spraying; these trials have the potential to cause plant death, which may result in the taking of DRF. A permit to take DRF is required in accordance with Section 23F of the Wildlife Conservation Act 1950.	Text revised, refer to Section 4.1 and Table 3. There is no requirement to conduct herbicide spraying trials on or around *Kennedia lateritia* populations, and as such a permit to take DRF is not required for this purpose. Chemical use around the *Kennedia lateritia* will be restricted to grass selective herbicides that will not impact the DRF (refer to Table 3).

DEC Comments/Requirements – PAR 3990/1 (Revised February 2011)	Proponent Comments and SREMP (Version 7) Updates
In Section 4.2, Table 3, The schedule of rehabilitation activities; should be expanded to incorporate the ongoing monitoring talked about in Table 4. Also, the term of site responsibility in terms of rehabilitation success is unclear, it appears the Shire is to take responsibility after 2 years (1 year of which includes site construction). This seems inappropriate as one agency needs to be responsible for all site works and associated monitoring until completion criteria are met	Refer to Section 4.2, Table 4. Refer to Section 5.1 – DoT will have ultimate responsibility for rehabilitation monitoring until selection criteria are met.
Section 4.3 references the removal, stockpiling and replacement of habitat logs. There are no habitat logs within coastal heath vegetation, the Agonis sp. being in a shrub habit. There are no other potential log- producing 'trees' which occur at the site (section 4.5 refers to the salvage of 'larger trees and tall shrubs' with 'distinct hollows' for fauna habitat).	Reference to habitat logs has been removed from the SREMP.
The wind rowing of vegetation within the footprint area may be difficult at this site, if it is intended to retain this vegetation for rehabilitation purposes. The current entry roads will be too narrow for wind rows, and its likely adjacent vegetation will be disturbed, and the main development site will be cut into the hill side, thus not leaving any area for stockpiling.	Noted. Reference to wind rowing has been removed from SREMP.
The plan Indicates that "excessive quantities of cleared vegetation will be burnt". Burning debris onsite is not a management option that is supported as the cleared site is very small, surrounded by remnant vegetation. At the base of a hill and directly upslope is the Leeuwin-Naturaliste National Park, this is a high fire risk situation of which any ember movement on an easterly, south-easterly and north easterly wind could ignite the adjoining National Park. Other management options such as removal from site should be explored. . It is thus uncertain that the clearing protocol identified in section 4.3 can be implemented.	Excess cleared vegetation not required for mulch or brushing, will be removed from site appropriately. Sections 4.3.2updated appropriately.

DEC Comments/Requirements – PAR 3990/1 (Revised February 2011)	Proponent Comments and SREMP (Version 7) Updates
Section 4.3 mentions that Western Ringtail Possums on the site will be managed by the relevant DEC clearing protocols. These protocols apply to tall trees that can be nudged by machines so that possums can be spotted by spotters and their movement tracked. These procedures cannot be implemented in coastal heath, mallee peppermint vegetation. Therefore these clearing protocols are inappropriate and the proponent should propose alternative methods.	Tall peppermints do exist on site in the south west corner. However, during the fauna survey no evidence of Western Ringtail Possum activity was observed. Section 4.3.2 has been updated.
Section 4.3 talks of direct return of topsoil from the clearing area to the rehabilitation site, and section 3.3.6 talks of topsoil storage and stockpiles. It is unclear what the actual process will be and if it's the later, how the topsoil be stored within such a small project area.	Topsoil recovery and use is an integral part of the rehabilitation of this project site, and the ability to strip as close to a 50 mm layer wherever possible within the clearing footprint is required. To maximise the rehabilitation outcome and success, it is important to prepare rehabilitation surfaces in readiness for topsoil (and subsoil where appropriate) spreading prior to undertaking clearing and stripping activities. This will allow for direct return of topsoil (and subsoil where required). Refer to Sections 3.3.6 and 4.3 which have been updated
Section 4.4 mentions double stripping topsoil. This is a practice where soil profiles occur. At this site soils over granite are expected to be skeletal, with limited profile development, and therefore the concept of double stripping does not appear to be applicable to this site. It is unknown if this method will be feasible given the habitat and development footprint to grade the topsoil into windrows.	It is important to remove as close as possibly the upper 50 mm of topsoil from the clearing footprint, as deeper cuts will dilute the *in situ* native seed resource and nutrient content. The potential to remove a lower layer will be dependent on the soil profile, which is likely to be variable across the site. Refer to Section 4.4 which has been updated

DEC Comments/Requirements – PAR 3990/1 (Revised February 2011)	Proponent Comments and SREMP (Version 7) Updates
Some of the area that is to be retained for rehabilitation is very heavily infested with perennial grass, the rehab plan indicates Buffalo grass. This weed species at the level of infestation present cannot be removed from only two lots of weed control in the one year (May and September) as currently proposed in Table 2. A minimum of two years ongoing pre- rehabilitation weed control should occur to obtain removal from the site.	The level of infestation within the area discussed is extreme and would benefit from having the dense grass matting physically removed and disposed of off-site, prior to commencement of rehabilitation activities. There would be scope to direct return topsoil from the cleared area following the removal of the "thatch", with follow-up spraying using grass selective herbicides to be undertaken over following years. The pre-rehabilitation weed control period can be considerably reduced by undertaking physical removal of weeds in the specified area, which would further decrease the amount of time topsoil would be required to be stockpiled for, resulting in increased quality of this resource. Refer to Section 4.11.4 and Table 3.
Contour ripping, section 4.7, is a concept from gravel pit or mine site rehabilitation, and is therefore not applicable to a granite landscape where the soil depth is not adequate. As stated in the Plan, contour ripping is usually applied where slopes are compacted and need to be broken up to enable root and water penetration or where slope erosion is a problem and some water catchment and redistribution is required. It is unclear what areas would require such treatment if clearing is restricted to the development footprint. If this treatment is intended for the areas amongst the *Kennedia lateritia* that are identified for re-establishment, it is unclear why contour ripping and other processes would be applied to natural landscapes within the habitat area of the DRF. Any ground ripping with large machinery as proposed is not possible in the small rehabilitation area that supports a large number of plants of the DRF species.	Shallow contour 'scarification' is still proposed to reduce the potential for surface erosion and promote a seed bed for plant establishment. Refer to Section 4.7 which has been updated.

DEC Comments/Requirements – PAR 3990/1 (Revised February 2011)	Proponent Comments and SREMP (Version 7) Updates
The monitoring section (5.1) refers to tree establishment and measuring stem diameter at breast height by species. This method is inappropriate at this site as it is coastal heath mallee peppermint vegetation, and is a practice usually undertaken in woodland or forest communities. As there will be no tree establishment at this site, the DBH monitoring approach is not applicable for the over storey. The monitoring section is confusing, as the text of the plan provides no measureable completion criteria and no completion date (section 5.1). An analogue site for referencing the monitoring success is also mentioned, however in Table 4, that measures success criteria (completion criteria 30 & 33) there is no reference to any of that being linked to the analogue site.	A large proportion of the rehabilitation area is occurring lower in the landscape and supports a tree canopy of *Agonis flexuosa* (Peppermint) in areas where vegetation is not degraded or completely degraded. A number of other tree species may also have occurred in this association when in its original state. Seed has been collected for these species and will be incorporated into the rehabilitation plan. During the on-site meeting it was again confirmed that trees of breast height are present on site; however, monitoring using the method of measuring stem diameter at breast height (DBH) has been removed from Section 5.1 on request by DEC. Refer to Section 5.1 and 5.3 for proposed completion timeframes for monitoring. Refer to Table 5 for completion criteria.
In section 5. 2. Figure 4, The completion criteria. Criteria 30 & 33 have a target species richness of 80%. This figure may be inappropriate as it is based on the pre-disturbance assessment plots. It is not clear where these plots are located, and may be in the rehab site (i.e.: prior to rehab disturbance) or in the clearing footprint, or they could be at the analogue site.	The 80% figure is based on the original baseline flora and vegetation survey undertaken by OEC (OEC 2007; OEC 2008). Reference has now been made in the completion criteria table that comparison with developing rehabilitation will be made to an appropriate analogue site located along the ridge north of the Project area, adjacent to Granny's Pool. Refer to Section 5.2, Table 5.
The impacts of dust and hydrology to the DRF have been previously identified as matters of concern and will need to be addressed in the management plan. Similarly, the concept of an adequate buffer needs to be considered in the plan for the maintenance of the species and its supporting physical and ecological processes.	Refer to Sections 3.3.7 and 4.10. Hydrological impacts are to be addressed in the Stormwater Drainage Management Plan (DoT). Dust control during construction will focus on limiting dust generation, as well as managing the potential impacts. Refer to Section 2.1. The concept design for the harbour footprint was updated in April 2011 at the request of the DEC during the on-site meeting on 8 April 2011 to increase the buffer area between the footprint and the northern population of DRF *Kennedia lateritia*.

DEC Comments/Requirements – PAR 3990/1 (Revised February 2011)	Proponent Comments and SREMP (Version 7) Updates
The plan also needs a completion date (a minimum of 5 years post works completion), detailed completion criteria that if not met requires ongoing work by the proponents until met and a review of referencing.	Refer to Sections 5.1 and 5.3.
In conclusion, the Site Rehabilitation and Environmental Management Plan does not appear to apply to the specifics of this particular site, and it cannot be established that the site will be appropriately managed to address the environmental impacts identified. The implementation of this plan may have the potential to negatively impact on the DRF habitat within the rehabilitation areas.	The SREMP (Version 7) has been updated to ensure all DEC comments made in the Preliminary Assessment Report 3990/1 (Revised February 2011) have been addressed. The rehabilitation, maintenance and management practices outlined within the SREMP will serve to ensure that the DRF *Kennedia lateritia* populations will not be negatively impacted as a result of this project.

Appendix 2 Augusta Boat Harbour Phytophthora cinnamomi occurrence assessment (Glevan Consulting 2011)

Appendix 3 Plant taxa that will be targeted for seed collection and nursery plant propagation at the Augusta Boat Harbour project.

Family	Species	Source
AIZOACEAE	*Carpobrotus virescens*	Seed
ANTHERICACEAE	*Thysanotus patersonii*	Topsoil
APIACEAE	*Xanthosia candida*	Seed, Topsoil
ASPARAGACEAE	*Acanthocarpus preissii*	Seed
ASTERACEAE	*Leucophyta brownii*	Seed, Topsoil
	Olearia axillaris	Seed
	Ozothamnus cordatus	Topsoil
CAMPANULACEAE	*Lobelia anceps*	Seed
CHENOPODIACEAE	*Rhagodia baccata*	Seed, Seedling
	Threlkeldia diffusa	Seed, Topsoil
CYPERACEAE	*Baumea juncea*	Seed, Seedling
	Ficinia nodosa	Seed, Seedling
	Lepidosperma gladiatum	Seedling (root division)
	Lepidosperma squamatum	Seedling (root division)
	Tetraria capillaris	Topsoil
DASYPOGONACEAE	*Acanthocarpus preissii*	Seed
	Lomandra pauciflora	Topsoil
DENNSTAEDTIACEAE	*Pteridium esculentum*	Topsoil
DILLENIACEAE	*Hibbertia cunninghamii*	Topsoil
ERICACEAE	*Acrotriche cordata*	Seed
	Astroloma ciliatum	Topsoil
	Astroloma drummondii	Topsoil
	Leucopogon capitellatus	Topsoil
	Leucopogon parviflorus	Seed, Topsoil
	Sphenotoma capitatum	Seed, Topsoil
EUPHORBIACEAE	*Phyllanthus calycinus*	Seed, Seedling
GOODENIACEAE	*Scaevola crassifolia*	Seed, Seedling
	Scaevola nitida	Seed, Seedling
HAEMODORACEAE	*Conostylis aculeata*	Seed, Seedling
IRIDACEAE	*Patersonia occidentalis*	Seed, Seedling
	Patersonia umbrosa var *xanthina*	Seed, Seedling
JUNCACEAE	*Juncus kraussii* ssp. *australiensis*	Seed, Seedling
LAURACEAE	*Cassytha racemosa*	Topsoil
LOGANIACEAE	*Logania vaginalis*	Seed
MIMOSACEAE	*Acacia alata*	Seed
	Acacia littorea	Seed
	Acacia pulchella var. *pulchella*	Seed
	Acacia saligna	Seed
MYRTACEAE	*Agonis flexuosa*	Seed, Seedling
	Melaleuca incana ssp. *incana*	Seed, Seedling
PAPILIONACEAE	*#Bossiaea disticha*	Seed, Seedling
	Chorizema diversifolium	Seed
	Eutaxia obovata	Seed, Seedling
	Hardenbergia comptoniana	Seed

Family	Species	Source
	Hovea elliptica	Seed
	Kennedia carinata	Seed
	^Kennedia macrophylla	Seed, Seedling
	Kennedia coccinea	Seed
	Kennedia prostrata	Seed
	Templetonia retusa	Seed
	Viminea juncea	Seed, Seedling
PHORMIACEAE	*Dianella brevicaulis*	Seedling
	Stypandra glauca	Seed
PITTOSPORACEAE	*Sollya heterophylla*	Seed, Seedling
POACEAE	*Sporobolus virginicus*	Seed
POLYGALACEAE	*Comesperma confertum*	Seed
POLYGONACEAE	*Muehlenbeckia adpressa*	Seed
PRIMULACEAE	*Samolus repens*	Seed, Seedling
PROTEACEAE	*Banksia grandis*	Seed, Seedling
	Banksia littoralis	Seed, Seedling
	Hakea oleifolia	Seed, Seedling
RANUNCULACEAE	*Clematis pubescens*	Seed
RESTIONACEAE	*Desmocladus flexuosus*	Topsoil
	Hypolaena pubescens	Topsoil
RHAMNACEAE	*Cryptandra arbutiflora* var. *tubulosa*	Seed, Seedling
	Spyridium globulosum	Seed, Seedling
RUBIACEAE	*Opercularia hispidula*	Topsoil
RUTACEAE	*Boronia alata*	Seed
	Chorilaena quercifolia	Seed, Seedling
	Philotheca spicata	Seed
SANTALACEAE	*Exocarpos sparteus*	Seed, Topsoil
	Leptomeria squarrosa	Topsoil
SAPINDACEAE	*Dodonaea ceratocarpa*	Seed, Seedling
SOLANACEAE	*Anthocercis littorea*	Seed
STYLIDIACEAE	*Stylidium adnatum* var. *adnatum*	Seed, Topsoil
THYMELAEACEAE	*Pimelea ferruginea*	Seed, Seedling
	Pimelea rosea ssp. *rosea*	Seed, Seedling
XANTHORRHOEACEAE	*Xanthorrhoea preissii*	Seed, Seedling

Appendix 4 Native seed reconciliation to March 2011 - Augusta Boat Harbour Project.

Species	Location	Qty (gms)	Seeds per gram	Seed State	Comment
Acacia alata	Res39156	49		Pure Seed	
Acacia littorea	Res25141	382		Pure Seed	
Acacia pulchella var *pulchella*	Res25141	68		Pure Seed	Very small seed and semi prostrate
Acanthocarpus preissii	Res25141	1275	24.4	Pure Seed	5g = 122 seeds
Acrotriche cordata	Res25141	337	100	Pure Seed	
Agonis flexuosa	Res25141	1100		With Chaff	
Anthocercis littorea	Res25141	10		Pure Seed	
Baumea juncea	Res25141	11		Pure Seed	
Boronia alata	Res25141	70		Pure Seed	
Carpobrotus virescens	Res25141	289		Pure Seed	
Carpobrotus virescens	Res25141	900		In dry Pods	
Chorilaena quercifolia	Res25141	0.5		Pure Seed	
Chorizema diversifolium	Res39156	0.4		Pure Seed	
Clematis pubescens	Res25141	361		Pure Seed	
Comesperma confertum	Res25141	0.1		Pure Seed	
Dodonaea ceratocarpa	Res25141	18		Pure Seed	
Eutaxia obovata	Res25141	1986		Pure Seed	
Exocarpus sparteus	Res25141	48		Pure Seed	
Ficinia nodosa	Res25141	115		Pure Seed	
Hardenbergia comptoniana	Res25141	1141	51.4	Pure Seed	5g = 125 seeds
Hovea elliptica	Res20761	32		Pure Seed	shire oval reserve
Hovea elliptica	Res39156	15		Pure Seed	
Kennedia carinata	Res25141	1.3		Pure Seed	
Kennedia coccinea	Res39156	12		Pure Seed	
Kennedia prostrata	Res25141	2.00		Pure Seed	
Leucophyta brownii	Res25141	2000		With Chaff	

Species	Location	Qty (gms)	Seeds per gram	Seed State	Comment
Leucopogon parviflorus	Res25141	914	82	Pure Seed	2g =164 seeds
Lobelia anceps	Res25141	10		Pure Seed	
Logania vaginalis	Res20761	26		Pure Seed	
Patersonia occidentalis	Res25141	65		Pure Seed	
Patersonia umbrosa var *xanthina*	Res25141	18		Pure Seed	
Philotheca spicata	Res25141	0.1	21 seeds total	Pure Seed	
Phyllanthus calycinus	Res25141	21		Pure Seed	
Pimelia ferruginea	Res25141	209		Pure Seed	
Rhagodia baccata	Res25141	1500		Pure Seed	
Scaevola crassifolia	Res25141	66		Pure Seed	
Sollya heterophylla	Res25141	88		Pure Seed	
Sphenotoma capitatum	Res25141	1.6		Pure Seed	
Sporobolus virginicus	Res25141	6.7		Pure Seed	
Spyridium globosum	Res25141	802		Pure Seed	
Stylidium adnatum var *adnatum*	Res25141	0.05	~200 seeds total	Pure Seed	
Templetonia retusa	Res25141	0.7	32 seeds	Pure Seed	
Threlkeldia diffusa	Res25141	219	195	Pure Seed	
Viminaria juncea	Res20761	1997		Pure Seed	
Viminaria juncea	Res25141	92		Pure Seed	
Xanthorrhoea preissii	Res 27432	3100		Pure Seed	
Xanthosia candida	Res25141	0.7			
		19360.15			

Appendix 5 Native seed outstanding to March 2011 - Augusta Boat Harbour Project.

Species	Location	Qty (gms)	Comment
Banksia grandis	Res25141	50	
Hakea oleifolia	Res25141	150	
Melaleuca incana subsp. *incana*	Res9658/25141	250	
Juncus kraussii subsp. *austaliensis*	Res25141	50	
Olearia axillaris	Res25141	250	
Agonis flexuosa	Res25141	1100	
Kennedia lateritia	Res25141	500	500gm in storage with AMR Shire from deceased estate collection. Can source additional seed in late 2011 with pemit.
Bossiaea disticha	Res25141	500	Can source seed in 2011 with permit from DEC
		2850	

Appendix 6 Work Instruction 1 – Dieback and Weed Control: Vehicle and Machinery Hygiene.