PANDANUS SOLUTIONS

GREENCOAST ENVIRONMENTAL REHABILITATION - CRESCENT HEAD STOCKPILE REHABILITATION STRATEGY

CRESCENT HEAD REHABILITATION STRATEGY - APRIL 2018

Pandanus Solutions, [redacted]

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Project Title: Crescent Head Stockpile Rehabilitation Strategy

Prepared For: Greencoast Environmental Rehabilitation

Report History:

Draft 1: Prepared by Paul Smith, completed 11th April 2018

Final Report: Prepared by Paul Smith, completed 17th April 2018

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1. Introduction

Pandanus Solutions was engaged by Greencoast Environmental Rehabilitation (GER) to produce a Rehabilitation Strategy to rehabilitate an abandoned Ilmenite waste stockpile, located on Lot 2281 DP1153793, approximately one kilometre from the township of Crescent Head, NSW.

The stockpile is located on a former mining lease, that was mined in the late 1950's and continued to the late 1970's. Since mining ceased, the stockpile appears to have been left to revegetate naturally.

GER is seeking approval under the NSW Mining Act (1992) to gain approvals required to remove the Ilmenite stockpile down to natural ground level, and rehabilitate the stockpile footprint. The stockpile covers an area of approximately two hectares.

This Rehabilitation Strategy forms part of GER's approval documentation to obtain a mining permit and development approval from Kempsey Shire Council (Council) for the stockpile removal and revegetation of the site.

Due to the uncertain nature of the underlaying land surface and the uncertain timing of the stockpile removal, this Rehabilitation Strategy is designed to be flexible in some of its outcomes, should site conditions vary from those predicted in the site environmental surveys.

Pandanus Solutions has participated in the removal of numerous ilmenite stockpiles of a similar vintage to the Crescent Head stockpile for other clients and it is our experience that often, whilst removing the ilmenite, unforeseen issues can be encountered.

Past experience dictates that often there may be a large amount of solid waste within such stockpiles (such as pipes, timber or steel) or the underlaying ground surface has not been stripped of its original soil profile. On other sites we have found the underlaying soil to have been stockpiled or removed entirely. Finally, there is also a possibility of encountering buried timber from previous clearing activities.

Therefore, GER has commissioned Pandanus Solutions to develop a Rehabilitation Strategy to be provided to Council as part of the approval documentation and with the intention to amend or update the strategy once the project has commenced and ground conditions are clearer.

1.1. Rehabilitation and relevant legislation

In order to create effective rehabilitation solutions to degraded sites, each project must first determine its own measures or objectives, essentially speaking, what makes “good” rehabilitation.

The definitions of what makes “good” rehabilitation of land after mining activities is subjective and differs considerably with the perspective of the end land user or land custodian. Whilst many government agencies focus on the “Three S approach" of “Safe, Stable and Self-Sustaining”, others prefer to look more closely at specific outcomes.

For example, Bell L. C. in Mulligan (1996) states that the objectives of rehabilitation should be to:

> *Create a landscape which is stable against the forces of wind and rain in order to reduce both onsite and offsite environmental impact….with a secondary objective of:*
>
> *Return(ing) the mined land, where possible, to a condition that allows it to be used in a productive manner.*

Indeed, in many applications this narrow definition of rehabilitation is all that can be achieved at some sites, due to the mining constraints, and the nature of the resultant residual landscape post mining.

At a federal level, the Australian government publish a series of best practice guidelines for mining, including two guidelines for mining rehabilitation and mine closure.

The mine rehabilitation guideline (DFAT (2016)), advises rehabilitation should meet three key objectives, namely:

1. *The long term stability and sustainability of the landforms, soils and hydrology of the site*
2. *The partial or full repair of ecosystems capacity to provide habitats for biota and services for people, and*
3. *The prevention of pollution of the surrounding environment*

Similarly, at a local level, the NSW *Mining Act 1992* defines rehabilitation as:

> *The treatment or management of disturbed water or land for the purpose of establishing a safe and sustainable environment.*

In their fact sheet, “Exploration and mining rehabilitation” (see NSW (2016)), the NSW Department of Industry, Resources and Energy regulates rehabilitation conditions of mining and mining related activities. In this instance, the Crescent Head Ilmenite stockpile is no longer situated on an active mining lease and the mining company originally responsible for the stockpile has discharged its responsibilities for the site and is no longer operating in the area.

Therefore, the application of the *Mines Act 1992* and the State Planning Policy No. 55 - Remediation of land are not particularly relevant to the application to remove the stockpile, as it is no longer an operating mine. However, the principles and practices of the department with relation to their derelict mines program are relevant to this proposal to remediate a derelict site.

For the purposes of this rehabilitation strategy, the primary aims of the derelict mines program can be met by the rehabilitation of the stockpile footprint area, namely:

- Reducing or eliminating the risks to public health, safety and the environment
- Stabilise and prevent further degradation of the site, and
- Remove or contain contamination or sources of nuisance at their source and prevent them from spreading

Furthermore, the secondary aims of the derelict mines program can also be met as GER's rehabilitation strategy seeks to;

- Optimise beneficial reuse of a derelict mine site
- Encourage native plant and animal life
- Conserve items of significant heritage value and
- Improve visual amenity

So, by combining the federal best practice guideline objectives in DFAT (2016) and those of the NSW government in NSW (2016), GER will focus on not only making the site safe, stable and non-polluting, but will also aim to restore some form of ecosystem services to the site that will eventually, if allowed to continue to develop and grow, will provide a sustainable ecosystem similar to what may have occurred in the area prior to the original mining activity.

2. Existing site conditions

2.1. Rainfall

Crescent Head has a humid subtropical climate with warm, humid summers and mild winters. Continuous rainfall records from the Crescent Head Weather Station (Station Number 59047) are available from 1st September 1961 to present day. The average Crescent Head annual rainfall is 1,426 mm, with rainfall occurring in all months of the year. The wettest months are typically January to April as shown in Figure 1. A histogram of daily rainfall is shown in Figure 2.

Figure 1. Average Monthly Crescent Head Rainfall

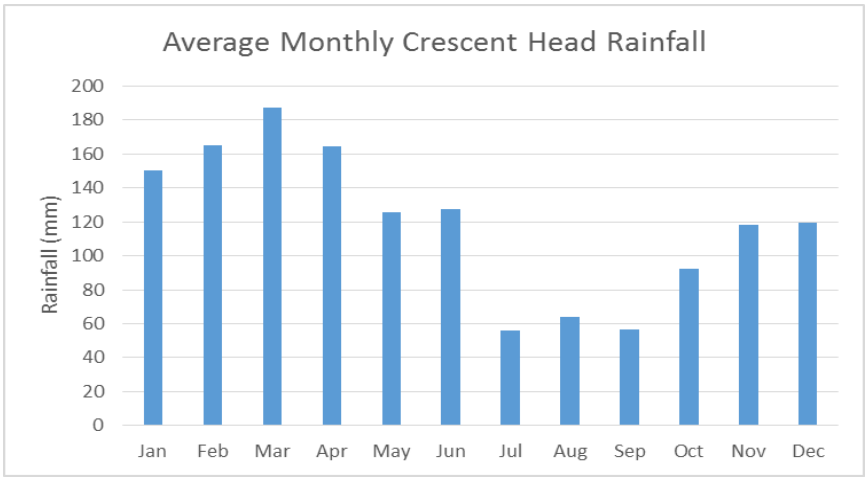
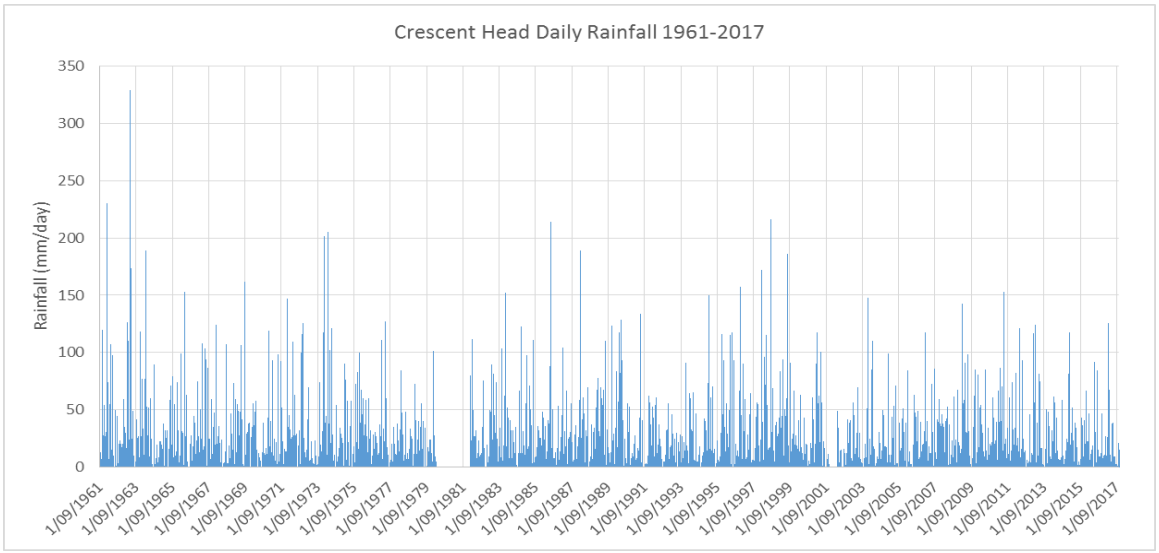


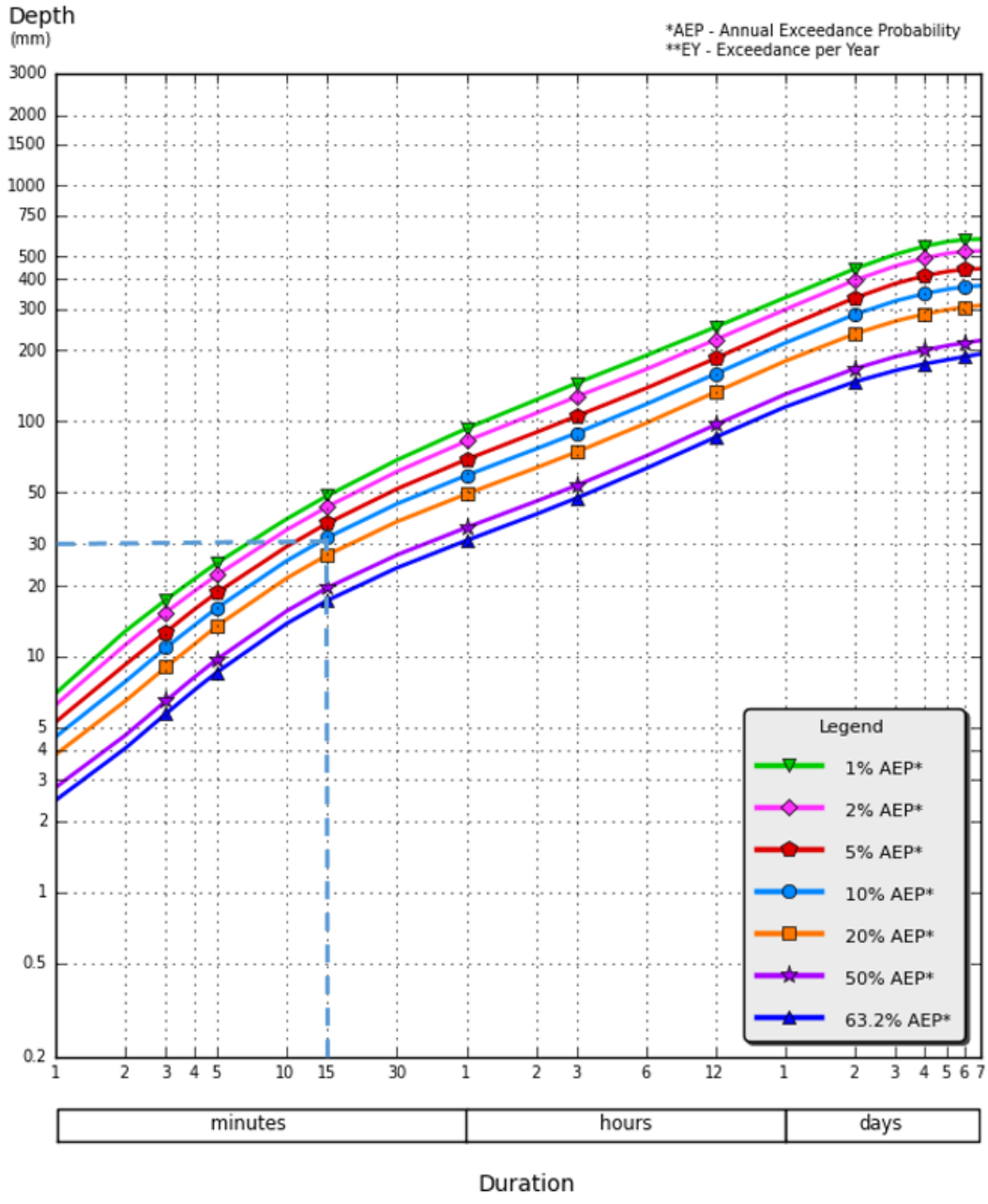
Figure 2. Crescent Head Daily Rainfall 1961-2017



The Bureau of Meteorology's 2016 Computerised Design IFD rainfall system (CDIRS) has been used to construct a full set of Intensity-Frequency-Duration (IFD) curves for Crescent Head, which have

been used to estimate the probability of rainfall events of different intensity and duration at the Project Site. In accordance with s 2.3.1 of Managing Urban Stormwater: Soils and Construction Manual (Landcom, 2004) the design storm event for the Project Site is taken as the 15 minute time of concentration for a 1:10 year Average Recurrence Interval (ARI), which is equivalent to a 10% Average Exceedance Probability (AEP).

Figure 3. Crescent Head Depth-Frequency-Duration curves created from the BoM Rainfall IFD Data System. A 15 minute time of concentration for 10% AEP equates to 30mm depth, as shown.



2.2. Surface Water Runoff & Infiltration

The ilmenite stockpile and the underlying quartz sand at the Project Site are both Group-A Soils. Group-A Soils have very low runoff potential and water is expected to move through the soil profile relatively quickly (F.2, Managing Urban Stormwater: Soils and Construction Manual Landcom, 2004). High infiltration capacity at the Project Site are confirmed by the absence of drainage lines or areas of ponding, even in low lying areas of the ilmenite stockpile.

Infiltration capacity is highest when the sand is dry, and declines once it is saturated. Group-A Soils have both very high initial infiltration capacities, typically around 60mm/hour, and long-term infiltration capacities, typically ranging between 180 - 275mm/day.

For a 15 minute time of concentration and 10% AEP storm a depth of 30mm depth is predicted at the Project Site (Figure 3). This indicates that for the design storm event no runoff is expected at the Project Site, as the estimated initial infiltration capacity (60mm) is double the expected water depth (30mm).

For longer duration rain events the data in Figure 2 shows only nine days since 1961 where daily rainfall has exceeded the estimated minimum long-term infiltration capacity of 180mm, and only one day in excess of the estimated maximum long-term capacity 275mm. This indicates that the Project Site will not shed runoff except during extreme long duration rain events.

Once the stockpile has been removed to natural ground level the resulting gently undulating profile will be consistent with surrounding natural topography (Plate One). Surface water is likely to infiltrate into the sand after rain, with little or no ponding or runoff. Erosion is unlikely to occur in the short term, due to the relatively flat natural topography and lack of runoff, and once the stockpile footprint has been revegetated raindrop impact on the soil will be minimal.

2.3. Existing soils

As indicated above, the project area is defined as a Group-A soil, or at best, a sandy loam. The Environmental Site Survey (Pandanus Solutions (2018a)) indicated that the current stockpile surface is completely devoid of a soil layer. The current growth of vegetation (mostly invasive weeds) on the pile, is through a build up of organic matter from the weeds themselves and no true soil horizons exist.

What may be present under the stockpile area once it has been removed will also guide the rehabilitation approach regarding soils. Should the underlaying surface be devoid of remnant topsoil, a soil substrate or plant growth medium will need to be created or added to the area to facilitate rehabilitation.

Conversely, if there is a remnant soil available, this will need to be augmented to restore its fertility and indeed its suitability as a growing medium.

2.4. Pre-mining vegetation

Pre-disturbance vegetation descriptions for the stockpile area are non-existent, due to the stockpile area and indeed the entire lot being previously disturbed by sand mining operations in the mid 1980's (see site history in the site environmental assessment, Pandanus Solutions (2018a)).

2.5. Existing vegetation

The vegetation survey of the ilmenite stockpile and surrounds took place in early 2018 (Pandanus Solutions (2018a)).

From the survey results it was clear that no particular ecotype / vegetation community has yet been established on the stockpile itself. Whilst the surrounding vegetation has developed into a coastal wetland / Wet Schlerophyl forest community (albeit a not very diverse one). the stockpile itself is poorly vegetated and shows little diversity, structure or habitat value.

Some of the stockpile has evidence of previous tree plantings (such as random *B. integrifolia* plantings throughout the main body of the pile and the row of single age *E. tereticornis* planted along the roadside), however the majority of the pile shows only natural regeneration, predominately from the weed species; *Lantana camara* and *Chrysanthemoides monilifera rotundata* (Bitou).

The stockpile is currently an unsustainable vegetation type. It is heavily impacted by weed species, native species are present but in exceptionally low numbers and there is almost a complete lack of viable organic material or topsoil of any kind over the majority of the pile.

3. Objectives

Considering the factors above, Pandanus Solutions proposes to GER that the objectives of the Rehabilitation Strategy for the rehabilitation of the stockpile area at Crescent Head are as follows:

1. Removal of the Ilmenite stockpile in its entirety to natural ground level
2. Removal of any rubbish from the cleared area
3. Removal of weed species from the stockpile area
4. Make the site stable and erosion resilient
5. Rehabilitation of the stockpile area shall be with native vegetation, similar to that which is likely to have occurred pre-mining, and
6. Key habitat trees surrounding the pile should be maintained

To meet these objectives a series of further actions and decisions need to be considered. Namely, the target vegetation type must be identified, a methodology for making the site stable needs to be selected and the key disrupting process of weed regrowth needs to be addressed. These are detailed below.

3.1. Determining the target vegetation

Determining the target vegetation for the stockpile rehabilitation involved a series of assumptions and has been based on observations of similar natural habitats nearby, as well as over 20 years experience Pandanus Solutions has had with rehabilitating coastal environments after sand mining. These assumptions have shaped the proposed seed mix and techniques that will be used to maximise the chances of rehabilitation success.

Unfortunately, a number of key pre-disturbance data inputs are not available to use to shape the rehabilitation strategy or end goals. Namely there are uncertainties with regards to the presence, absence or condition of any underlaying soils and what the actual target vegetation was in the area originally (due to extensive mining of the surrounding area).

Therefore, the following assumptions have been made to guide the rehabilitation strategy:

- It is assumed that there will be no viable soil present under the stockpile and rehabilitation efforts must therefore focus on soil creation and promoting the growth of pioneer species.
- The distance of the final land surface to groundwater will vary across the 2 hectare site, with the eastern and southern most points being more influenced by seasonal water table depths, with the western and northern section being more dependent on rainfall (see Plate One for predicted groundwater levels)
- The surrounding area is already heavily impacted by weeds and weed control and control of potential weed propagules in any cleared vegetation will be a priority, and

- The site is small in nature (only 2 Ha) and surrounded by advanced regrowth and remnant vegetation which will assist with recolonisation of the site by vegetative encroachment (eg. runners of *Pteridium esculentum* (Bracken)) and seed blow (eg. *Melaleuca quinquinerva* or *Eucalyptus tereticornis*). Note this edge effect will also create an issue with weed species encroachment

Bearing all of these issues in mind, GER are proposing the most appropriate target forest types that will be used to guide the rehabilitation process are:

1. Swamp Sclerophyll Forest - Dominant tree species including *Eucalyptus tereticornis*, *Eucalyptus siderphloia*, *Eucalyptus robusta*, *Melaleuca quinquinerva* and *Casuarina glauca*, and
2. Coastal Woodland - dominant tree species including *Eucalyptus racesmosa*, *Banksia intergrifolia* and *Cupaniopsis anacardiodes*

There forest types are common on the east coast of NSW and QLD and Pandanus Solutions noted good examples of these forest types just north of the Crescent Head township and in undisturbed parts of Lime burners Creek NP.

3.3. Site stability

One of the primary end goals of all rehabilitation after mining activities is for the site to remain stable under expected climatic conditions (wind and rain). Due to the sandy nature of the expected substrate it is not anticipated that once the stockpile material is removed, there will be any appreciable slopes or surfaces that may erode.

The site post stockpile removal will be mostly flat and undulating and it is unlikely that any contouring will need to be undertaken to reduce potential for runoff.

3.4. Weed control

The existing significant weed presence both on the site and within the surrounding vegetation will create an ongoing weed issue for the site. This is expected to be exacerbated due to the apparent absence of any significant efforts to control weeds on the adjacent properties.

Early establishment of rehabilitation on the site also has the potential for weed incursion and germination and efforts to control these weeds will need to be a priority. Indeed, the success of native vegetation growth will depend on early weed control and it will be extremely difficult to control weeds once they are established amongst the young vegetation without greatly reducing rehabilitation success.

Successful rehabilitation will almost certainly have to occur alongside the presence of some weeds and will rely on the following ecological successional processes of the establishing vegetation to further suppress and stifle weed dominance:

1. Shading out of weed species by a rapidly establishing canopy of native species is a essential to suppress their dominance of the site. For this effort, it is preferable to over sow the area with larger canopy species (trees), sacrificing understory vigor in the process,
2. Establishing a growth promoting “topsoil” medium that suits the growth of native species and doesn’t over encourage weed species (ie. a correct N:P:K ratio),
3. Establishing a cover crop / native grassland community to protect germinating native tree species during their first few months of growth and fill the niche often occupied by weeds,
4. Encouraging the colonisation of the site by native ground covers such as *Pteridium esculentum* and *Acacia sophorae, and*
5. If necessary, selective herbicide application or heat treatment to control any weed outbreaks in the first few months of site revegetation growth

4. Site preparation

4.1. Retention of key vegetation

Remnant vegetation on the site is restricted to the edges of the pile and present along most of its boundary. Thicker remnant vegetation areas are present to the north and south of the pile itself. The small amount of native vegetation present on the pile itself is of little ecological value, due to it being comprised almost completely of exotic weed species.

The key habitat trees listed in Pandanus Solutions (2018a) will be retained to provide habitat for returning fauna once the project is completed and all care will be taken to retain as many of these as possible during the removal of the pile material.

Remnant vegetation found to the south west of the pile and along the roadside will also be retained, to provide a continuous corridor of Koala habitat trees and a pathway for arboreal fauna.

As mentioned above, due to the small nature of the site, retained remnant vegetation will be a source of vegetative regrowth for the area once the Ilmenite material is removed and the natural ground surface exposed and provide protection from the elements whilst the rehabilitation is establishing.

4.2. Clearing

The stockpile vegetation consists mostly of weed species, with a few established native trees. Little value can be gained from retention of the cleared weed species and all cleared weeds will be stockpiled and mulched or removed. Either treatment will ensure that weed propagules (seeds and roots) are not spread to the rehabilitation area or allowed to regerminate.

Any native vegetation cleared from the site (the author notes only a few small native trees) will be stockpiled and retained for return to the rehabilitation as fauna habitat on the establishing rehabilitation.

4.3. Management of weeds

Management of existing weeds on the stockpile such as *Lantana camara* and *Chrysanthemoides monilifera rotundata* (Bitou) is essential for the success of any rehabilitation attempted on the site. As detailed in section 3.4 above, a number of strategies will be employed to manage weeds on the site during rehabilitation process, however weed control will be a life of project task. To control and contain the weed risk whilst operating on site, the following strategies will be employed by GER and its contractors:

- Use of only clean equipment whilst on site - All equipment to be used on site will be washed (and disinfected if coming from a weedy area) prior to arrival on site.
- Mechanical removal of weeds from the entire stockpile and sterilisation of the removed parts will occur as part of the first site works. This will be achieved by mechanical removal (excavator or equivalent) and then mulching or removal,

- Spot herbicide control of any weed regrowth / sprouting will occur during during site works with regular inspections of weed outbreaks throughout the project life,
- Rehabilitation materials used on site (seed, stabilisers etc) will be certified weed free,
- Rehabilitation activities will be undertaken using strategies to avoid weed establishment and
- Maintenance treatment of any weed outbreaks will occur post rehabilitation establishment

4.4. Growth media management

As stated above, a key component of the future rehabilitation of the site will be the creation on a suitable growing media or the restoration of a possible underlaying topsoil layer. At this point in time, it is expected to have a remnant sandy soil present under the stockpile and therefore the rehabilitation of the site will utilise one or a combination of the following growth media management strategies to maximise the chances of rehabilitation success:

- Existing topsoil rejuvenation - If present, any existing topsoil will be tested for its viability and this will guide the application of fertilisers / ameliorates and/or hydromulch
- Hydromulch and Hydrocompost and creation of a topsoil layer - Using hydromulch or indeed the thicker hydro compost, whilst not ideal, would serve to create a suitable growing medium should no residual topsoil layer be uncovered
- Application of fertiliser and surface stabiliser - With or without a residual topsoil, the site will require the selective application of fertilisers and additives to address any soil in-balances and anything that may hamper plant growth

5.Site Rehabilitation

It is anticipated that Site Rehabilitation will not occur until the complete removal of the Ilmenite stockpile. Due to the size of the site, slope of the ilmenite and confined nature of the area, there is little opportunity or value in progressively rehabilitating the site, whilst ilmenite is being removed. Site rehabilitation will involve a number of processes and these our outline below.

5.1. Rubbish removal

There are a number of indications that the area of the stockpile has been used for the dumping of rubbish material both during the original mining campaign and post mining. Aside from the two abandoned vehicles, building and garden waste dumped at the entrance to the site, there is also rubbish from the sand mining era (solid waste, HDPE and timber) present either on the surface of the pile, or seen protruding from the edges of the stockpile.

Pandanus Solutions has found at other old ilmenite piles were used as a dumping ground for mining waste. Given the Ilmenite was originally a low margin by product of the mineral sands mining process it was often discarded at the end of first stage of processing in favour of the more lucrative Zircon and Rutile product streams.

All rubbish recent and historic encountered on stockpile during remediation works will be stored separately and taken from site to the appropriate recycling facility prior to final rehabilitation of the stockpile.

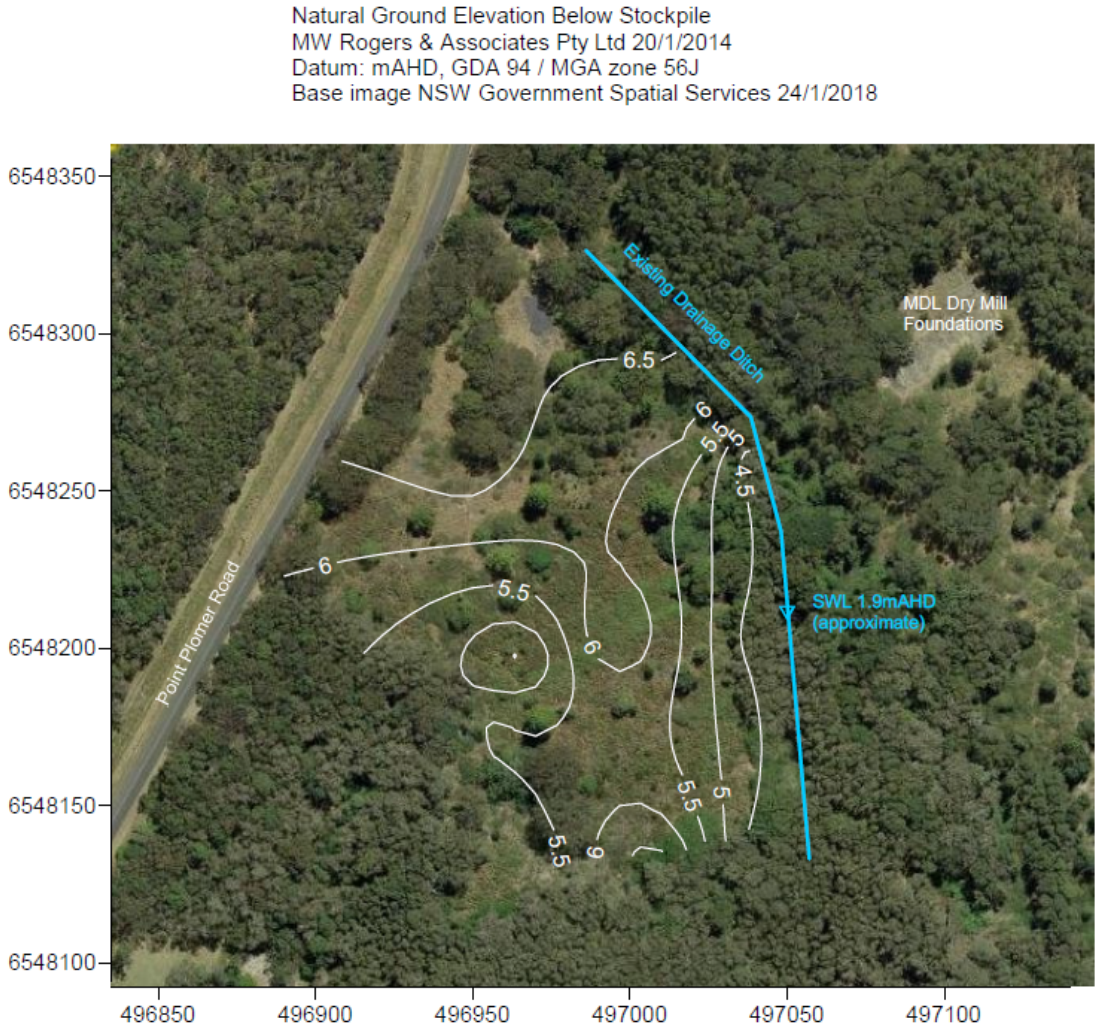
5.2. Surface contouring and preparation

As stated previously, the condition of the underlaying topsoil will determine to some extent what earthworks and surface preparation may be required.

From the hand auger surveys, it is unlikely that surface contouring and preparation will be required. If its is required, all slopes within the removed stockpile area >5% will be contoured and reduced. It is acknowledged that this may not be feasible on the eastern edge of the pile (see Plate One), where the natural ground level drains to the south east and therefore in this instance, slope lengths will be minimised to reduce erosion by installing small contour banks in the final land surface.

Final preparation of the soil surface will involve the entire site to be raked, increasing the surface permeability of the site and reducing compaction.

Plate One: Predicted Natural Ground Topography



5.3. Potential topsoil placement

If there is indeed buried topsoil material encountered on site once the pile has been removed, this material will be reclaimed and re-spread over the exposed surface prior to rehabilitation.

5.4. Surface stabilisation and soil amelioration

Due to the potential lack of a viable topsoil for the stockpile area, and as a method of introducing seed and soil treatments, it is assumed that GER will utilise hydromulch or hydrocompost treatments over the exposed surface.

Application of this material will be via a specialised hydraulic spray truck and this will apply a layer of;

- Stabilising soil binder,
- Organic material comprising a mixture of sugar cane, recycled paper and potentially wood fibre,
- Seed mix of cover crop and native seeds, and
- Specialised fertiliser mix, tailored to suit the sandy soils

Pandanus Solutions has found that for small sites and linear disturbances (such as roads, pipelines and cuttings), Hydromulching and / or hydrocomposting has become the preferred and cost effective method of site rehabilitation. This technique is gaining popularity across a range of industries and provides the following advantages:

- Provides for rapid, one application erosion and sediment control,
- Provides a tailored layer of organic material to each site with resulting water application,
- Can evenly introduce seed, soil binders, soil treatments (clay breakers) and fertilisers to a site without driving on it (spray cannons can reach up to 50m and material can be delivered by hose)
- Lasts for typically 6 to 12 months+ depending on the treatments used, and
- Has been proven to improve the chances of germination and growth of seeded species and those present in the topsoil well above that achieved by seeding alone

Seeding and seed mix

Seeding of the site will be undertaken mostly using hydromulch application, but will also require some seed to be delivered to the remediated stockpile area using alternative techniques. As with all rehabilitation activities, there is a variety of plants required in the seed mix which have differing growth habits / germination triggers and therefore seeding requirements. The seed mix for the site has been prepared (Table One) and this outlines the key species GER feels are needed to achieve the target vegetation types. Pandanus Solutions recommends a focus on canopy and pioneer species, as these will be critical to provide rapid establishment and address the weed issue and lack of good soil.

Seeding will be done using the following methods:

- Spread as part of hydromulching activities, through the hydromulch machine and applied along with organic material, binders and fertilisers, and

- Spread by hand, either using a seed spreading machine (packed in packing material to ensure even coverage, or using seed clay “balls”. Seed “balls” are essentially coating more delicate or resource intensive seeds in a clay coating by hand. These are then air dried and thrown into existing vegetation (in this case, establishing cover crop and native grasses). The clay balls protect the seed from insects and animals, and only break down once significant rainfalls are received.

Seed will be sourced where possible from a local supplier, or not for profit bush care group.

Table One: Proposed seed mix		
Tree and Shrub species	Common Name	Notes
Banksia integrifolia	Coast Banksia	May be spread by hand due to potential damage of seed by hydro seeding machine
Cupaniopsis anacardiodes	Tuckeroo	May be spread by hand due to potential damage of seed by hydro seeding machine
Eucalyptus racemosa	Scribbly Gum	
Eucalyptus robusta	Swamp Mahogany	
Eucalyptus tereticornis	Forest Red Gum	
Eucalyptus siderophloia	Ironbark	
Melaleuca quinquenervia	Broad Leaved Paperbark	
Mid and Ground Cover		Notes
Acacia sohorae	Coastal Wattle	
Pteridium esculentum	Common Bracken	Not present in seed mix, may be transplanted by rhizomes if not present at 12 months post establishment
Grasses		Notes
Imperata cylindrica	Blady Grass	Not present in seed mix, may be transplanted by rhizomes if not present at 12 months post establishment
Themeda triandra	Kangaroo Grass	Commercial Native Grass mix
Austrostipa spp.	Spear grass	Commercial Native Grass mix
Poa labillardieri	Tussock grass	Commercial Native Grass mix
Rytidosperma spp.	Wallaby grass	Commercial Native Grass mix
Microlaena stipoides	Weeping grass	Commercial Native Grass mix
Chloris truncata	Windmill grass	Commercial Native Grass mix
Introduced Species		Notes
Echinochloa esculenta	Japanese Millet	Sterile cover crop only, may not be required

5.5. Maintenance and establishment monitoring

At this point in time it is difficult to gauge what maintenance may be required for the site post rehabilitation. Selection of maintenance measures will be dependant on a range of environmental factors and will also be dependant on the expectations of the land custodian (crown lands).

For this reason, GER will continue to monitor the site post rehabilitation activities are complete and any significant issues that may hamper the rehabilitation outcomes are noted, these will then trigger a maintenance activity.

Expected maintenance activities that could be utilised on site include the following:

- Weed Control - As suggested above, it is expected that some weed re-establishment will occur on site forgoing rehabilitation treatments. Should this weed establishment be determined to be prohibiting rehabilitation success, herbicide or heat treatment can be employed to control weed outbreaks
- Supplemental watering - A water tanker will be utilised should expected climatic conditions result in drought conditions
- Maintenance fertiliser - often when undertaking rehabilitation, initial plant establishment can use up large amounts of nutrients and then the decomposition of the initial cover species can effectively result in Nitrogen deficiency of the remaining plants. This can be effectively treated with the application of a maintenance fertiliser at the 6-12 month phase of rehabilitation
- Supplemental seeding or planting - Studies form all round the world in rehabilitated landscapes have shown that plant establishment from seed is the preferred method for establishing a resilient plant community and certainly a plant community that is expected to establish on a bare site. Tube stock plantings require a very narrow window of conditions to be successful and for this reason were not selected for the rehabilitation program. Should however, some of the plants fail to become established after seeding, some planting of additional tube stock may be undertaken to improve diversity and cover.

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