Drayton Management System Standard

Bioremediation Management Plan

Author:	**Name**	**Daniel Sullivan - Senior Environmental Scientist, Hansen Bailey** **James Benson – Environmental Coordinator**		
	Signature		**Date**	
	Signature		**Date**	

Reviewer:	**Name**	**Peter Forbes / Chris Gardner**		
	Title	**Safety, Health, Environment Manager / Maintenance Manager**		
	Signature		**Date**	
	Signature		**Date**	

Authoriser:	**Name**	**Clarence Robertson**		
	Title	**General Manager**		
	Signature		**Date**	

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Revisions

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Document Information

1 PURPOSE

This plan outlines the process for the bioremediation of contaminated soils and the management of the bioremediation area at Drayton coal mine.

2 SCOPE

This Bioremediation Management Plan describes the management of contaminated soils from the point of contamination, through the bioremediation process, to the final disposal of soils. The scope includes the classification of contaminated material, treatment process for contaminated soils, roles and responsibilities, monitoring and reporting.

3 DEFINITIONS

DECCW	Department of Environment, Climate Change and Water (now Office of Environment and Heritage
DP&I	Department of Planning and Infrastructure
DRE	Division of Resources and Energy
EPA	Environmental Protection Authority

4 PROCEDURAL REQUIREMENT

4.1 Responsibilities

Maintenance Supervisor

The Maintenance Supervisor is responsible for:

- The day to day management and maintenance of the bioremediation area;
- Aeration of contaminated soils;
- Maintaining a register of material inputs and outputs of the bioremediation area; and
- Adding required ameliorants to bioremediation cells.

Environmental Officer

The Environmental Officer is responsible for:

- Soil sampling and classification in accordance with the *Waste Classification Guidelines* (DECCW, 2009);
- Supplying soil sample to a NATA accredited laboratory for analysis;
- Recording soil analysis results and filing these for a period of at least 5 years; and
- Inspecting the bioremediation area on a weekly basis.

Operators

The operators using the bioremediation area are responsible for:

- Reporting contaminated material outside the bioremediation cells;
- Reporting incidents of hydrocarbon contamination; and
- Notifying the Maintenance Supervisor prior to placing material into the bioremediation cells.

4.2 Audit/Review Schedule

This management plan is to be reviewed at least every three years or as otherwise directed by DP&I or officers of the EPA or DRE. The review process is to consider changes in environmental legislation and guidelines, and changes in technology and operational procedures.

4.3 Records Management

The Maintenance Supervisor will maintain a register of all material placed in and removed from the bioremediation cells. This register will also record any ameliorants that are added to cells and the dates that aeration has been conducted.

The Environmental Officer will maintain records of soil analyses. These records will be kept onsite for a period of at least 5 years and will be provided to EPA, DRE or DP&I upon request. Inspection documentation will be filed in the Drayton environmental filing system.

4.4 Legislative Review

The management and treatment of waste from waste generators for disposal is governed by the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations (Waste) Regulation 2005*. . The *Protection of the Environment Operations (Waste) Regulation 2005* makes requirements relating to non-licenced landfill sites, non-licenced waste activities and non-licenced waste transportation.

The approvals requirements for remediation works are prescribed by *State Environmental Planning Policy No 55 – Remediation of Land* (SEPP 55). Development consent is required for any Category 1 remediation works, which are listed under clause 9 of SEPP 55. The Drayton Mine bioremediation site does not constitute a Category 1 remediation work. Pursuant to clause 14(a) of SEPP 55, any remediation work which does not fall within Category 1 is deemed to be a Category 2 work. Development consent is not required for Category 2 remediation works, such as the Drayton Mine bioremediation site.

4.5 Bioremediation Cells Location and Design

4.5.1 Existing Design

The Drayton bioremediation area is located to the south of the workshop area, between the decommissioned DC2 conveyor and Drayton's erection pad. The current layout of the bioremediation area consists of four cells, as shown in **Figure 1**. To the east of the cells is a laydown area for trucks transporting material to the bioremediation area. Runoff currently drains from the laydown area towards the bioremediation cells, resulting in ponding within the cells (as evident in **Figure 1**). The existing layout does not readily allow for access by machinery to spread and aerate material within the bioremediation area.

4.5.2 Proposed Upgrade

The four existing cells will be divided into 10 cells, consisting of 5 matched pairs (see **Figure 2**). The cells forming each matched pair are denoted "A" and "B". The bioremediation area has been divided into "A" cells and "B" cells to segregate materials at different stages in the bioremediation process. The purpose of this segregation is explained in **Section 4.6**.

The existing four cells will be divided into 10 cells by constructing clay lined barrier walls. Each cell will have an area of approximately 50 m^2 and a depth of 1 m. Cells are to be clay lined to reduce the risk of causing groundwater contamination. The barrier walls will also be designed to allow a long reach excavator to transverse them in order to provide access to each of the cells for the purpose of spreading and aerating material within the bioremediation area.

The accumulation of water in the cells is not conducive to bioremediation. To rectify this problem, the laydown area will be re-graded so that water drains to the east (see **Figure 2**). The cells will also be bunded on all four sides to divert runoff away from the cells and the depth of the cells will be reduced. To manage any water that enters the cells via direct rainfall, the floors will be graded so that water drains towards a corner of the cell. This water will be removed by pumping as required and treated within the Drayton mine closed water management system.

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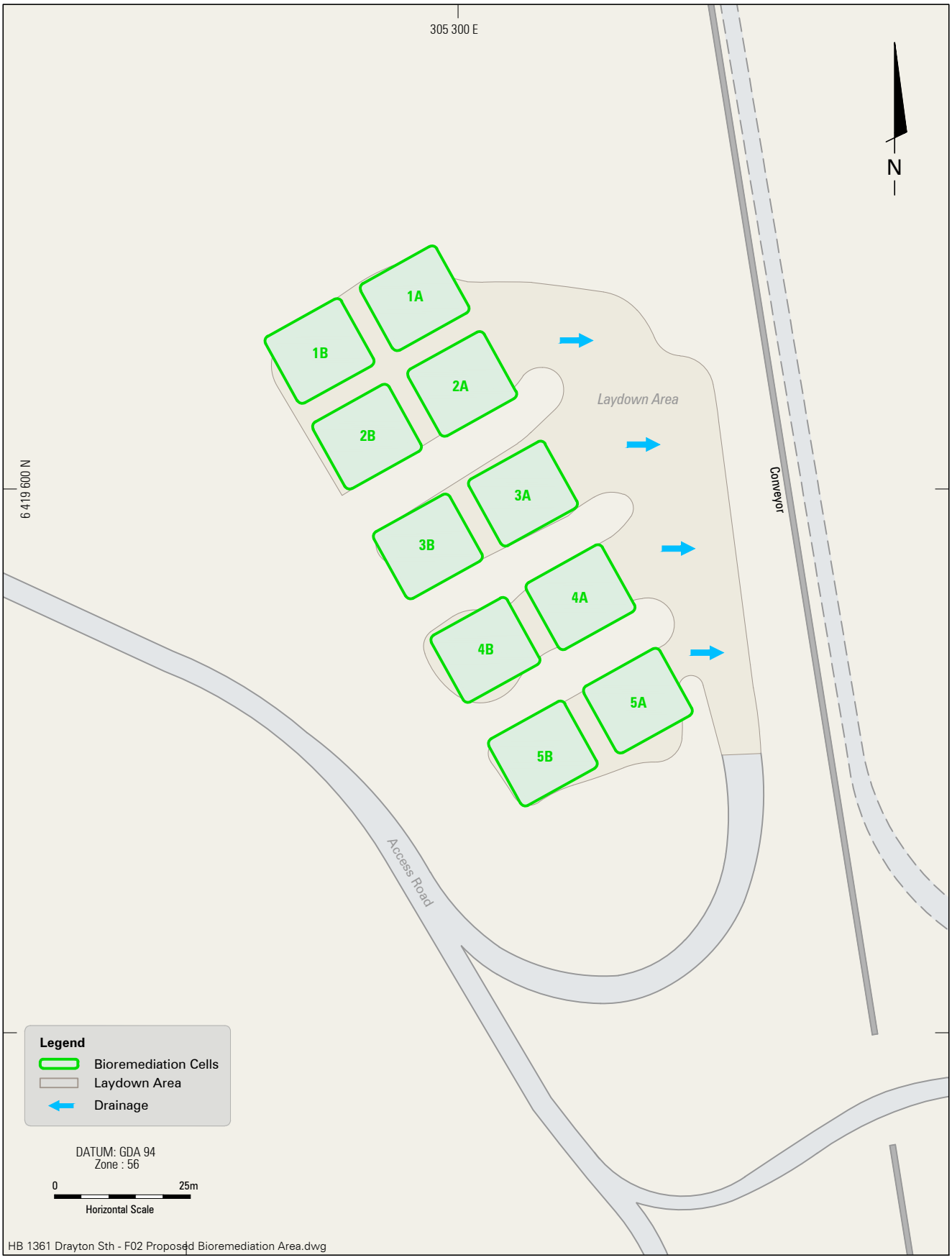
Existing Bioremediation Area Layout

FIGURE 1



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Proposed Bioremediation Area Layout

FIGURE 2

4.6 Procedure for Bioremediation

4.6.1 Identification of Suitable Material

Bioremediation of contaminated soils is only effective if the material meets the following criteria:

- No liquid hydrocarbon wastes (these are to be removed by a licenced waste contractor for offsite processing and disposal); and
- Material should not contain any rubbish or large rocks as they will interfere with treatment and aeration processes.

Bioremediation is a suitable method for the treatment of soil contamination by hydrocarbons. The preferred approach is to treat contaminated soils onsite wherever possible. There may be instances where the contaminated soil is excessively saturated, which may affect the efficiency of bioremediation. Contaminated materials will only be taken offsite for disposal if they are saturated to an extent that onsite remediation is likely to take too long and/or disrupt the typical day to day bioremediation process.

4.6.2 Source of Material

The majority of material required to be treated in the bioremediation process will be generated from the following sources;

- Oil Pollution Control Dam sump;
- Soils that have been contaminated by hydrocarbon spills; and
- Contaminated soils collected from the apron drains surrounding workshop areas.

4.6.3 Placing Soil

Prior to placing contaminated soils in the bioremediation cells, operators are to notify the Maintenance Supervisor that material is being sent to the bioremediation area. The contact details for the Maintenance Supervisor will be displayed on signs near the cells. The Maintenance Supervisor will record the volume of material to be deposited in the cells and the source of this material.

There will be signage at each of the cells to indicate whether the cell is open for depositing material or closed. Only one cell will be open at any given time. Once the open cell has reached 75% capacity, it will be closed and another cell will be opened.

Contaminated soils will be deposited into the cells by rear dump trucks. Contaminated material will only be deposited into the “A” cell that is open at the time. The process for depositing material is as follows:

1. Truck reports to the laydown area to the east of the cells;
2. Truck reverses to the bund of the open cell;
3. Truck lifts its tray to deposit material; and
4. Truck lowers its tray and leaves bioremediation area.

Truck operators are to ensure that they do not drive off prior to their tray being completely lowered. This is to reduce the risk of spillage outside of the bunded area. All spillages of material when tipping will be reported to the site Maintenance Supervisor who will arrange a clean-up immediately. All material that is spilt onto the laydown area will be returned to the bioremediation cells immediately. This is to ensure that contaminated materials are not carried away by rainfall runoff.

No liquid wastes are to be deposited in the bioremediation cells.

4.6.4 Drying of Material

Trucks will only dump contaminated material into one of the five “A” cells. The “A” cells will be utilised as drying cells for the material to partially dry out and be aerated. Once material in the open “A” cell has dried, it will be moved to the corresponding “B” cell for further aeration and amelioration treatment. Material will be spread and moved from the “A” cell to the “B” cell by an excavator sitting on the barrier wall between the cells. The excavator will have an arm length of 20 m, which is sufficient to service all areas of both cells.

The re-grading of the laydown area and construction of bunds around the cells will reduce the risk of pooling in the cells. If pooling occurs during periods of high rainfall, water will be removed by a vacuum truck and transferred to the Drayton Oil Pollution Control Dam sump.

At Drayton Mine, the long term average evaporation is 1576 mm and the average rainfall is 587 mm. As such the management of excessive moisture is not anticipated to be a major issue.

4.6.5 Aeration of Material

Material in the “B” Cells will be maintained in a damp condition in order to sustain microbial activity. It is important to note that the material should not be saturated as this will inhibit the flow of oxygen. The “B” Cells will also be spread and turned regularly to promote contact between contaminants and organisms and to aerate the soil. Soils will be turned when soil moisture is low (ie. not directly following any significant rainfall). Contaminated material in each of the cells will be aerated at least monthly. The excavator sitting on the barrier wall will turn the material over and shape the material to maximise aeration.

4.6.6 Amelioration of Material

Ameliorants will be added to material within the cells to assist in the bioremediation process. The ameliorants will be added as required and typically on a monthly basis. The ameliorants to be utilised will include, but are not limited to, micro-organisms to break down hydrocarbons, nitrates and bulking agents.

4.6.7 Soil Contamination Monitoring

All material that enters the bioremediation cells will be initially classified as hazardous waste. Initially soil samples will be taken from the “A” cells by the site environmental officer. One sample will be taken from each 10 m^2 area. Once the material is moved to the “B” Cells samples will be taken every 6 months to allow tracking of progress.

Samples will be taken in accordance with AS4482.1-2005. The parameters that will be recorded include:

- The name of the person taking the sample;
- The location of the sample; and
- Date and time of sample.

Once samples have been taken, they will be sent to a NATA accredited laboratory to be tested for:

- Benzene;
- Toluene;
- Ethylbenzene;
- C6-C9 petroleum hydrocarbons; and
- C10-C36 petroleum hydrocarbons.

4.6.8 Classification and Disposal of Bioremediated Soils

Upon receiving soil contamination results, the material will be reassessed using the *Waste Classification Guidelines*.

Soils that satisfy the contaminant concentration limits in **Table 1** will be classified as general solid waste and disposed of in pit, adjacent to the Drayton tailings facility. Bioremediated soils will be emplaced in the east void at Drayton Mine. The proposed final land use for the east void is as a tailings emplacement area for the Drayton South Coal Project. An alternative use for the voids is ash emplacement by Macquarie Generation. The disposal of bioremediated soils will not affect either of these proposed final land uses.

Table 1 – Target Criteria for Bioremediated Soils

Contaminant	Soil Contaminant Concentration limit (mg/kg)
Benzene	10
Lead	100
Toluene	288
Ethylbenzene	600
C6-C9 petroleum hydrocarbons	650
Xylene	1000
C10-C36 petroleum hydrocarbons	10000

The bioremediation process will target levels within those listed in **Table 1**. The targeted time for achieving these targets will be within 12 months.

If contaminated soils cannot be bioremediated to levels below the limits in **Table 1** within a 18 month period, the contaminated material will be dried and taken offsite by a licenced waste contractor for offsite processing and disposal. The soil contaminant concentration limits are based on the maximum specific contaminant concentrations for general solid waste, as prescribed by the *Waste Classification Guidelines*.

4.7 Inspections

The Environmental Officer will be responsible for conducting weekly inspections of the bioremediation area and documenting the findings. To prevent the risk of groundwater contamination, the Environmental Officer will inspect the condition of the clay lining for signs of damage. Any actions requiring attention are to be entered into the Drayton action database system, Enablon, to be tracked. Drayton will provide inspection documentation to DRE, EPA and DP&I as required upon request.

4.8 Reporting

Information and data collected throughout the bioremediation process will be compiled for reporting purposes. Drayton will report the following parameters in the Annual Review:

- Volume of material entered into the bioremediation cells;
- Ameliorants added to bioremediation cells;
- Volume of material bioremediated and disposed of in pit; and
- Volume of material bioremediated and taken offsite to an accredited waste facility.

DRE has requested quarterly reporting of bioremediation at Drayton. Reports will be sent to DRE in the months of January, April, July and October or as otherwise requested. These quarterly reports will include;

- Volume of material entered into the bioremediation cells;
- Dates that ameliorants were added to bioremediation cells;
- Volumes of ameliorants added;
- Dates that aeration activities were conducted;
- Volume of material bioremediated and disposed of in pit;
- Volume of material bioremediated and taken offsite to an accredited waste facility; and
- Photographs of bioremediation cells and immediate surroundings.

Standardised photographic reference sites will be established for each of the bioremediation sites. Photographs for the quarterly reports will be taken from these reference sites. Quarterly reports will contain details of the photographs including time and date, location and direction, camera settings etc.

Additional photographs will be provided if any concerns arise. The locations of these photographs will be adopted as standardised reference sites for future reports. Photographs will be taken from these references sites and included in quarterly reports until the issues of concern have been resolved.

5 References

- DECCW (2009), *Waste Classification Guidelines*

- Standards Australia (2005), *AS4482.1-2005 – Guide to investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*