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Lamberts North Water Conditioned Fly Ash Placement Water Quality Monitoring

Annual Update Report 2013/14

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Summary

Aurecon has been engaged to assist EnergyAustralia NSW in their statutory reporting on the surface and groundwater monitoring at the Lamberts North ash placement site. Specifically, Aurecon's brief is to:

- Review the water quality, trace metal and groundwater level data for the pre-placement baseline period of October, 2012 to August, 2013 and the initial post-placement period of September, 2013 to August, 2014 and report on potential effects on receiving surface water and groundwater
- Comment on the effects of water quality changes at the Mt Piper bores D10 and D11 on the assessment of effects of the Lamberts North placement on water quality
- Determine if groundwater level changes at the seepage detection bore MPGM4/D1, down-gradient of Huon Gully, can indicate water level changes inside the ash placement area
- Review the consultant report on the aquatic life changes in Neubecks Creek.

The key findings of the water quality data review are:

- The review of the Lamberts North water conditioned ash site monitoring data showed that the potential effects on receiving waters could not be distinguished from the Mt Piper ash placement effects, or the effects of background inputs from local mine water and mine spoil/coal wastes. Accordingly, as no adverse effects of the Lamberts North site could be identified and no ameliorative measures are indicated
- The review showed that the water quality and trace metal concentrations met the local and ANZECC (2000) guidelines in the receiving waters of the MPGM4/D8 and D9 groundwater bores and Neubecks Creek at WX22, apart from Mt Piper related salinity and sulphate at bore D9 and coal mine groundwater related manganese at bore D9
- The complexity and intermixing of the various trace metal sources, including those measured at bores D10 and D11, means that it is not possible to determine whether or not the Lamberts North ash placement has affected the local groundwater or Neubecks Creek
- The review also showed that it is unlikely that the groundwater level changes at bore MPGM4/D1 could indicate the groundwater level changes inside the ash placement area. Consequently, installation of two piezometers in the northern embankment wall is recommended to determine if the groundwater level at Lamberts North has increased and if it is in contact with the ash placement
- The report on the aquatic life in Neubecks Creek found no significant changes from the upstream background sites compared to that at the water quality and trace metal receiving water site, WX22.

The review highlighted the need for the Operational Environmental Management Plan (OEMP) to be updated. Specifically, it is recommended that it be updated to match the monitoring undertaken during the first year by EnergyAustralia NSW, but with improvements to the quality of the data collected. In addition, it is recommended that four new bores are installed. Two of the bores could be installed in the northern embankment wall of the Lamberts North site to provide a measure of the water quality and water levels in the ash placement area. The other two bores could be established for background measurements. Furthermore, the existing four bores south of Huon Gully could be replaced with new bores drilled and screened to sample mine spoil/coal waste leachates in the area and to confirm groundwater levels and flow directions.

The Mt Piper groundwater UTS model (Merrick, 2007) is recommended to be re-run, including the Lamberts North area, once the groundwater levels inside the ash placement area have been

adequately established from the monitoring data. The model would have to be reformulated to take into account the changes made to Huon Gully and to include the various inputs to the Lamberts north site.

1. Introduction

Due the Mt Piper ash placement area (Area 1) being filled to near capacity, an extension of the dry ash placement in the adjacent Lamberts North area (Area 2) was proposed for Delta Electricity (now EnergyAustralia NSW) in 2010[1] and approved by the Department of Planning and Infrastructure on 16th February, 2012 (Attachment 4). The approved extension includes ash placement over Huon Gully and the Groundwater Collection Basin (GCB), which was de-watered in advance. Placement of water conditioned flyash in the Lamberts North site has been undertaken in the re-contoured Huon Gully since September, 2013 (Figure 1). The water conditioned ash placement contours as at July, 2014 are shown in Figure 1.

Background, pre-placement, surface and groundwater monitoring for the Lamberts North placement began in October, 2012 and essentially follows the plan set out in the Operating Environmental Management Plan[2] (OEMP, CDM Smith, 2013). The water quality sampling sites, including the receiving waters for groundwater at bore MPGM4/D8 and surface water in Neubecks Creek at WX22, are shown on an aerial photograph of the Mt Piper and Lamberts North areas in Figure 2.

The aerial photograph shows the relationship between the surface and groundwater quality monitoring sites, the two “Mt Piper” brine conditioned co-placement areas, the “Mt Piper” water conditioned ash placement area and the initial Lamberts North water conditioned placement in Huon Gully. To assess the effects of leachates on aquatic life, monitoring for macroinvertebrates was undertaken in Neubecks Creek at the OEMP nominated sites upstream and downstream of the intersection with Huon Gully[3].

This report is the first annual surface and groundwater monitoring report and covers a pre-ash placement period from October, 2012 to August, 2013 and post-initial ash placement period from September, 2013 to July, 2014. The pre-ash placement monitoring has been used to establish the recent (2012/13) baseline conditions for the site. The post-placement data has been examined for indications of leachates from the Lamberts North water conditioned ash[4] placed in Huon Gully, the point at which up-gradient groundwater flows previously accumulated in the Groundwater Collection Basin.

The locally derived and ANZECC (2000) guideline trigger values for the groundwater and surface water receiving waters, set out in the Mt Piper Brine Conditioned Ash Water Management Plan (Connell Wagner, 2008), have been adopted as the Lamberts North ash placement environmental goals in the OEMP. Some of these goals have been adjusted using the Lamberts North pre-ash placement baseline data so any Mt Piper water and brine conditioned ash effects are not assigned to the Lamberts North placement. Hence, the effects, if any, of the Lamberts North placement on the receiving waters of Neubecks Creek, and the surrounding groundwater, have been assessed by comparison with these goals.

[1] Proposed in an Environmental Assessment (EA) by SKM (2010)

[2] EnergyAustralia NSW advised Aurecon that in setting up the monitoring program, they took into consideration the practicalities of applying a consistent approach to each sampling site.

[3] The OEMP is required to monitor and quantify the impacts on the ecology of Neubecks Creek and the associated riparian environment. The main focus of the GHD (2014) report was to analyse and investigate if any changes in macroinvertebrate community condition were evident in Neubecks Creek. Visual estimates of riparian vegetation cover are shown in an appendix to the report.

[4] The Lamberts North ash is conditioned with Mt Piper cooling tower blowdown water with a chloride concentration of about 250 mg/L. The blowdown water is also sprayed onto the ash to minimise dusting.

In comprehending this assessment, it should be noted that any effects of the Lamberts North placement on receiving waters is likely to be confounded by groundwater inflows from the Mt Piper areas, together with coal mine water inflows into Huon Gully (Aurecon, 2014). Notwithstanding these inputs, the post-placement surface and groundwater data has been examined with a view to identifying a tracer for ash, conditioned with cooling tower blowdown water, which may identify leachates in addition to those due to the up-gradient inflows. In this regard, it should be noted that the Lamberts North ash is also sprayed with blowdown water for dust suppression.

1.1 Outline of Report Structure

The report is structured to cover the issues in the EnergyAustralia NSW brief and includes:

- Describe the surface and groundwater quality monitoring program
- Examine the monitoring results to see if it is possible to separate Lamberts North effects from those due to Mt Piper inflows to Huon Gully and historic mining activities and thereby determine if leachates are being generated from the placement of ash at Lamberts North
- Examine the overall water conditioned ash effects on surface and groundwater quality in receiving waters during the 2013/14 post-placement period
- Review the aquatic life monitoring in Neubecks Creek undertaken by GHD (2014)
- Discuss the findings including potential exceedances of the environmental goals and the potential necessity for mitigation measures
- Present conclusions and recommendations.

The sequence of surface and groundwater quality findings, assessment and inferences drawn has been followed throughout the report.

1.2 Aims and Objectives of Monitoring

The Lamberts North OEMP for the water conditioned dry ash placement sets out the surface and groundwater quality monitoring to be undertaken to provide feed-back for ash placement and surface rainfall runoff management. The aim of the monitoring is to ascertain whether or not leachates[5] from the water conditioned fly ash cause a significant increase in concentrations above the local/ANZECC (2000) guideline trigger values (environmental goals) in surface and/or groundwater receiving waters. The overall aim is to have a neutral or beneficial effect on water quality due to the design of the ash placement or through implementation of mitigation measures in the event that the monitoring shows increases above the environmental goals at the groundwater bore MPGM4/D8 or in Neubecks Creek at WX22.

A most important consideration in the OEMP is that ameliorative measures are only to be implemented if exceedances of the local/ANZECC (2000) trigger values are observed and are considered likely to be attributable to the operation of the Lamberts North ash placement. Such attribution is to be based upon a targeted investigation of the likely sources of the salts or trace metals that caused the environmental goals to be exceeded, as well as the process by which the Lamberts North placement could have introduced leachates into the local groundwater.

[5] Leachates could be due to surface runoff from the ash placement into the local groundwater, by direct rainfall infiltration through the ash into the underlying groundwater or by a rise in the groundwater table under the ash causing salts and trace metals to be leached from the ash.

The OEMP suggests that, if the ash placement leachates are found to have entered the local groundwater and are seeping into Neubecks Creek, thereby causing exceedance of the environmental goals for the creek, then a pump-back well is to be installed down-gradient of the placement area to divert the local groundwater to the ash placement for dust suppression. The OEMP also suggests that this measure is to be applied if the groundwater level down-gradient of the ash placement rises significantly.

In view of a significant groundwater level rise, the OEMP suggests the submission of a report to the relevant Authorities[6] that provides a description of the proposed ameliorative measures, including a timeframe for the management actions to be implemented. This could allow informed consideration of the findings of the targeted investigation of the likely sources and causes, which may indicate a solution that does not involve a pump-back well.

To be consistent with the Mt Piper Brine Conditioned Ash Water Management Plan, the Lamberts North OEMP has adopted the approach of identification of early warning of potential effects on groundwater and surface water. This is undertaken by comparison of the measured post-placement median concentrations of parameters of interest with the relevant local (90^{th} percentile) and ANZECC (2000) trigger values at the groundwater bores D8 and D9 and in Neubecks Creek at WX22. The intent of this approach is to allow the ash placement managers time to investigate the cause of the early warning trigger being exceeded and to implement mitigation measures if the cause is the water conditioned ash placement. It should be noted that, the comparisons made in this report take any changes in water quality at the upstream sites in Neubecks Creek into account. This practice is also followed for the Mt Piper Brine placement surface and groundwater monitoring.

For the purposes of the OEMP, the final receiving waters are taken as being Neubecks Creek, just downstream of the ash placement area at WX22 (Figure 2) and the ANZECC (2000) guidelines and local guidelines for surface water apply to WX22. The ANZECC (2000) guidelines and local guidelines for the groundwater and surface water receiving waters are shown in Table 1 in Section 2.7, which also shows the recent (2012/2013) Lamberts North pre-placement baseline 90^{th} percentile concentrations.

1.3 Issues and Challenges

The groundwater monitoring plan (Section 6.4 of the OEMP) for Lamberts North does not include a background bore to take the local coal mine water inflows to Huon Gully into account. This means that any observed water quality changes at bores D8 and D9, relative to the local/ANZECC goals, cannot be fully understood. This issue is discussed in Section 3.

The internal ash placement bores MPGM4/D10 and D11 are included in the Lamberts North monitoring program to provide data on the groundwater quality flowing into Huon Gully from the Mt Piper placement. These bores provide early warning of potential effects of Mt Piper on the receiving waters, which are located outside the ash area property boundary. The challenge of the Lamberts North placement in Huon Gully is to assess potential effects on receiving waters with the ash placement in the path of groundwater flows from under the Mt Piper placement. The groundwater flows also include rainfall runoff from the Mt Piper water conditioned ash area. This is also discussed in Section 3.

[6] Other than included in the Annual Environmental Management Review Report (AEMR) by EnergyAustralia NSW

1.4 Scope

Aurecon has been engaged by EnergyAustralia NSW to prepare the first annual review report on surface and groundwater quality for the Lamberts North dry ash placement. The scope includes the following:

- Collate and set up a new database for the water quality characteristics at Lamberts North surface and groundwater monitoring sites[7]
- Review surface and groundwater water quality, trace metal and groundwater level data for the pre-placement baseline period of October, 2012 to August, 2013 and the initial post-placement period of September, 2013 to August, 2014 and report on potential effects on receiving surface water and groundwater[8].
- In the event that there is a significant water level increase at bore MPGM4/D1, estimate the rate of flow of the groundwater[9].
- Review the EnergyAustralia NSW groundwater data for the four bores installed in the Lamberts North area[10], as well as bore MPGM4/D19, which samples groundwater in washery waste or mine spoil outside the Lamberts North ash placement area, for possible interaction with Huon Gully and Neubecks Creek water quality
- Comment on the effects of water quality changes at the Mt Piper bores D10 and D11 on the assessment of effects of the Lamberts North placement on water quality in receiving surface water in Neubecks Creek[11]
- Examine the need for mitigation measures in relation to potential for Lamberts North to exceed the ANZECC (2000) guidelines and local guidelines for surface and groundwater. Include a list of occasions during September, 2013 to August, 2014 period when environmental goals/objectives/impact assessment criteria for the project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure. In this regard, the ANZECC (2000) guidelines and local guidelines are to take into account the pre-placement baseline concentrations from October, 2012 to August, 2013.
- Ecological Monitoring Program (Aquatic ecology- macro-invertebrates aquatic habitat). Review the consultant report on the aquatic life data sampling, data collection and baseline (at least one in-stream sampling at Neubecks Creek) during the pre-placement period, as well as the first year of the post-placement (at least two sampling periods) and review the consultant report for management measures to address any detected adverse ecological impacts of the Lamberts North ash placement.

[7] The water quality characteristics and monitoring sites described in the Development Consent Conditions referred to under condition A1b (from SKM 2010) - see Attachment 4 below - have changed since approval of the OEMP. Aurecon has been requested to report on the water quality characteristics monitored by EnergyAustralia NSW at the OEMP nominated sites.

[8] The assessment includes the two receiving water bores MPGM4/D8 and D9 nominated in the OEMP, which are located north and south of Neubecks Creek (the bores replace the Groundwater Collection Basin as the groundwater receiving waters for Lamberts North since July, 2013) and is intended to provide warning of potential effects of local groundwater seepage on Neubecks Creek.

[9] Table 7-1 of the OEMP requires calculating the groundwater flow rate at bore D1 but the OEMP does not provide the parameters of the soils that allow the flow to be calculated. This is to be commented on in the report, including the relevance of D1 to indicate potential for groundwater level rises in Huon Gully.

[10] Examination of the bore logs for bores (MPGM4/D15 to D18) indicates that they were drilled into rock and are not sampling the groundwater in the washery waste or mine spoil in the area. The scope requires this matter is to be commented on in the report.

[11] The Lamberts North Site does not have a background bore as the water quality at bores D10 and D11 are used to indicate inflows to the site from Mt Piper. The scope requires this matter to be commented on in the report.

1.5 Information provided by EnergyAustralia NSW

In connection with the assignment, EnergyAustralia NSW has provided copies of the following data and information (the sampling sites referred to are shown in Figure 2):

- Ash Placement Area Contours in July, 2014 (Figure 1) showing the areas and elevation of the placed ash and surface water runoff ponds used for management, including:
    - an unlined pond to collect rainfall runoff (LN Pond 1),
    - pipeline for pumping the runoff water to a lined pond (LN Pond 2) and
    - a seepage collection drain to collect seepage from the underground coal mine flowing into Huon Gully and divert it into Pond 2
- Lamberts North groundwater bore data for bores MPGM4/D15, D16, D17, D18 and D19, as well as the Mt Piper bores D1, D10, D11 and D8
- Water level data for the groundwater bores
- Mt Piper surface water monitoring sites at the power station Licence Discharge Point LDP1 (v-notch below the Holding Pond), used as up-stream background, and the Neubecks Creek receiving water site at WX22.
- Discharge flow data for the LDP01 v-notch is shown in Attachment 5.
- Stream flow data for WX22 gauge 212055 in Neubecks Creek is available from Department of Primary Industries Office of Water (http://realtimedata.water.nsw.gov.au/water.stm).
- Water quality data for a new surface water background site for Lamberts North, NC01, midway between LDP01 and WX22, located just downstream of the Neubecks Creek north arm and upstream of Huon Gully.

EnergyAustralia NSW has advised Aurecon that placement of water conditioned ash began in Lamberts North on 2nd September, 2013.

1.6 Water Conditioned Ash Placement and Rainfall Runoff Management

The current July, 2014 contours of the dry ash placement areas are shown in Figure 1 and the water conditioned ash already placed in Lamberts North is also shown. Prior to commencement of ash placement, the groundwater level in Huon Gully was reduced to approximately RL901m by pumping, at which level the sediment bottom of the Groundwater Collection Basin (Huon Void) was exposed. The Huon Void was then filled with compacted mine spoil to RL917m, 4m above the highest estimate of groundwater as recommended by the CDM Smith (2012) model. The model indicated that groundwater levels across Lamberts North were at their maximum during wet weather patterns and suggested that groundwater levels are expected to remain at least 4m below the base of the ash placement area. Therefore, effects of groundwater flows, or level rises, in Lamberts North on leaching salts and trace metals from the ash placement was not predicted to occur.

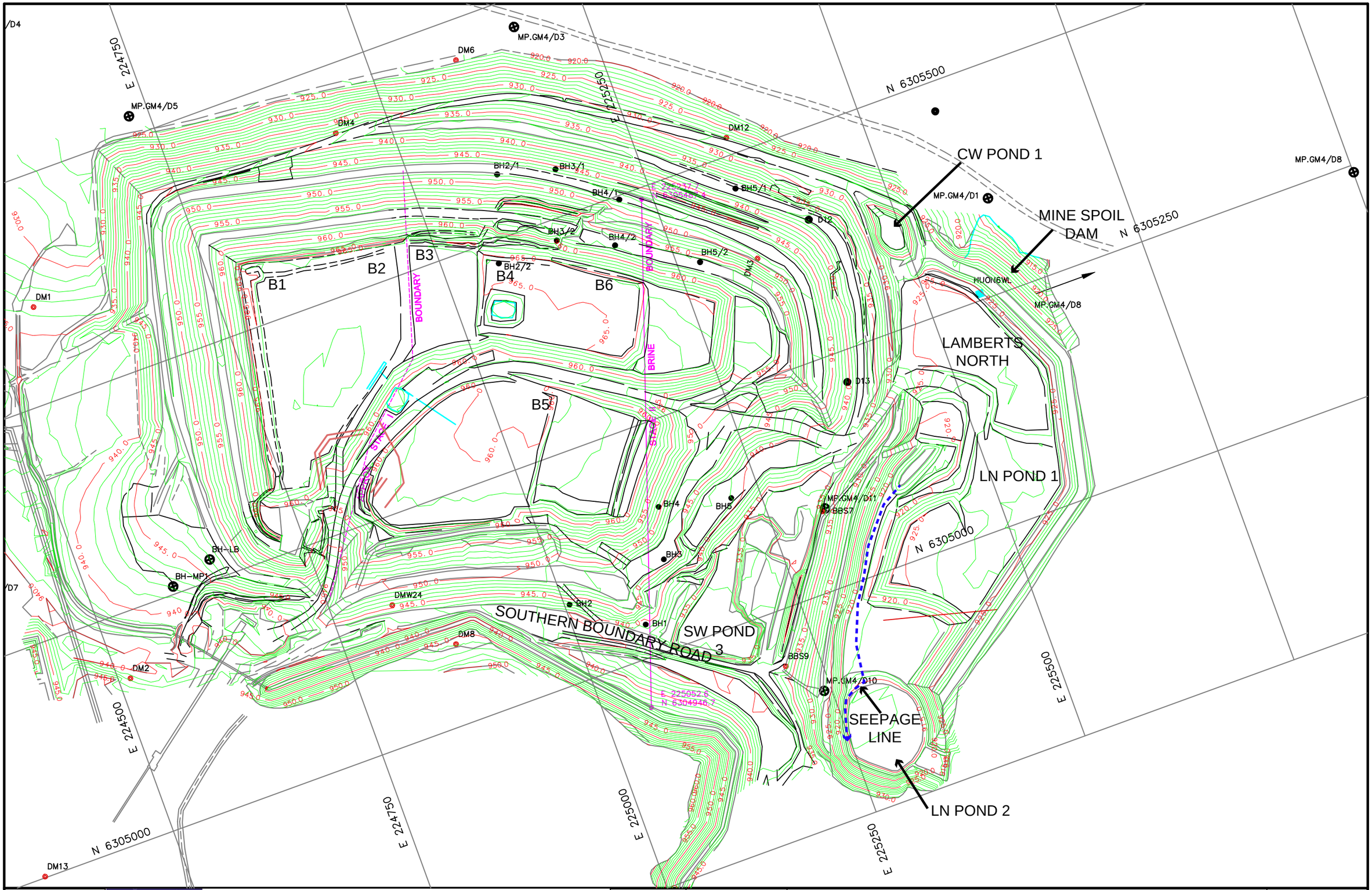
An embankment made up of compacted mine spoil was constructed at the northern end of Huon Gully to retain the ash placement as it was progressively placed up to the design height of RL980m and joined with the ash placement at Mt Piper (see CDM Smith, 2013).

1.6.1 Rainfall Runoff Management

Rainfall runoff management is important in preventing runoff from entering the groundwater under the ash placement. The information contained in Figure 1 shows an unlined pond to collect rainfall runoff, a pipeline for pumping the runoff water to a lined pond and a seepage collection drain to divert some of the underground coal mine seepage water from Huon Gully into the lined pond. On this basis, it was

assumed that the runoff management followed that required by the OEMP in section 2.2.5 “Water Management”. That section states: “A water management system will be implemented at Lamberts North to ensure that there is no adverse impact on existing surface water or groundwater conditions within and surrounding the site (refer to Soil and Surface Water sub plan for more information)”. However, no groundwater bores were installed within the ash placement site, so the effects of rainfall runoff on the local groundwater levels are unknown[12]. The possibility of installing groundwater bores in the northern embankment of the Lamberts North site to monitor the groundwater levels (as used at the Wallerawang Power Station ash repository) is discussed in Section 4.

[12] EnergyAustralia NSW advised Aurecon that they would have to receive permission from the Department of Planning & Environment as the OEMP states in Table 6.1.1 11 that no monitoring wells shall be installed or left in service in the ash placement area. All monitoring wells shall remain on the outer perimeter of the ash placement area at all times. Section D3 b (iii).



NOTES:

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LEND LEASE INFRASTRUCTURE SERVICES

MOUNT PIPER - ASH EMPLACEMENT

SURVEY - 9th JULY 2014

SCALE - 1 : 4000 (A3 SHEET)

DWG No

MPA0714

2. Surface and Groundwater Monitoring

This Section provides an overview of the groundwater and surface water quality monitoring at the Lamberts North dry ash placement during the period 2012 to 2014. The monitoring design, management of the water conditioned ash placement and receiving water quality guidelines are set out in the Lamberts North Operating Environmental Management Plan (CDM Smith, 2013).

The groundwater monitoring program was established in October 2012 and involves monthly sampling at the bores shown in Figure 2, which include both long-term Mt Piper monitoring bores and bores inside the previous Centennial Coal Mine open-cut area, which is now part of the Lamberts North area. Most of the bores are located south of Huon Gully, while D19 is outside the ash placement area and east of Huon Gully.

The Mt Piper ash placement area bores (MPGM4/D10 and D11) are on the western side of the Lamberts North ash placement area and are used to monitor groundwater inflows from Mt Piper to the Lamberts North placement in Huon Gully. Bore D1 is north of Huon Gully and is used for detection of seepage from the north-eastern Mt Piper brine placement. The groundwater bores D8, north of Neubecks Creek, and D9[13] south of the creek, are used as the Mt Piper receiving water bores. Bores D1, and D8 and D9, are used to provide a warning of leachates that may enter Neubecks Creek to enable management actions to be undertaken to minimise effects of the Lamberts North ash placement.

2.1 Surface Water

As well as routine monitoring of water quality in Neubecks Creek at WX22, the ash placement contractor, Lend Lease Infrastructure (LLI), monitors the water quality of rainfall runoff from the ash placement area collected in pond LN1. The monitoring is undertaken to provide water quality data on the ash leachates for potential effects on the down-gradient groundwater and Neubecks results indicating that leachates may be entering the groundwater in Huon Gully and flowing into the creek at WX22. To provide a background benchmark, LDP01, and the new NCO1, upstream on Neubecks Creek have been monitored monthly prior to ash placement and have continued to be monitored for comparison with results from WX22, downstream of Huon Gully.

[13] Bore D9 has been monitored by EnergyAustralia NSW because it was listed Table 6-13 “Monitoring Schedule” but inclusion of the bore was not discussed in the OEMP or shown in shown in Figure 5-1 “Monitoring locations” or in Figure 6-2 “Groundwater Monitoring Locations (MPGM4 Series)”

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Legend

- Operational groundwater bores
- Surface water sampling
- Contours
- Drainage
- LN Seepage Collection Pond
- Polygons
- LN Ash Placement
- Approved Area Stage 1
- Approved Extension Area Stage 2
- Lamberts North Ash Placement Area

Map by: DMcP P:\GIS\Library\ESRI\Templates\Aurecon\A3_landscape_right_panel.mxt 15/10/2009 09:41

A3 scale: 1:8,000

0 100 200 m

Job No:

Projection: MGA Zone 56

Date: 9/12/2014 Version: 1

Figure 2: Lamberts North Ash Placement Area and Neubecks Creek Groundwater and Surface Water Quality Monitoring Sites

2.2 Groundwater

Prior to construction and ash placement, groundwater monitoring started in October, 2012 at monthly intervals to establish baseline results for the bores located inside and outside the Lamberts North area. Monthly monitoring has continued since ash placement began in September 2013. Additionally, groundwater from outside Lamberts North is monitored at bores MPGM4/D1, D8 and D9 to detect groundwater seepage moving from the ash placement area toward Neubecks Creek.

The groundwater bore characteristics of water table depth, collar level and height of the PVC pipe were checked previously in 2011 and again in March, 2014 (see Attachment 3) in relation to the recent chloride increase at bore D10 and the associated groundwater level changes. These characteristics have been used to convert the groundwater level measurements, which are taken from the top of the pipe, to relative levels below the ground surface in AHDm.

2.3 Groundwater Levels

The OEMP places emphasis on the need to understand water level changes taking place in the ash placement in Huon Gully and uses bore D1 as a surrogate. Each groundwater bore is monitored to allow identification of the direction of water movement and, in the case of the bores installed for Mt Piper, to measure the predicted groundwater level rise due to mounding under the large water conditioned ash placement area. Note that the layer of compacted mine spoil placed in Huon Gully was designed such that the expected increase in height of the water table in Huon Gully should not come into contact with the bottom of the Lamberts North ash placement. The water level monitoring data for the groundwater bores monitored for Lamberts North since October, 2012, including bore D1, are shown in spread-sheet format in Attachment 1.

2.4 Groundwater Modelling Verification

Verification of the groundwater model prediction of a groundwater level rise lower than the base of the ash placement was suggested to be undertaken in the OEMP if there was a significant increase in the groundwater level at D1. The OEMP suggested that, if there is any significant increase, flow calculations should be undertaken and consideration given to re-running the CDM Smith (2012) groundwater model. This suggestion is further discussed in Section 3.1.1 in relation to the review of water level changes during 2013/14.

2.5 Methods

The surface and groundwater water quality characteristics monitored at each site are shown in Attachment 1. Sampling and analyses are undertaken as required on behalf of EnergyAustralia NSW by NALCO Analytical Resources, who measure conductivity, pH and dissolved oxygen in the field with a calibrated instrument and all other parameters in their NATA Accredited Laboratory. EnergyAustralia NSW has provided a copy of the NALCO laboratory data to Aurecon for the 2012 to 2014 assessment.

EnergyAustralia NSW monitors the discharge flow at the Mt Piper Power Station to Neubecks Creek at a v-notch (see Attachment 5) and has advised that the stream flow data for WX22 gauge 212055 in Neubecks Creek is available from Department of Primary Industries Office of Water (NOW) (http://realtimedata.water.nsw.gov.au/water.stm).

The OEMP requires the water quality and trace metal concentrations to be measured by the methods specified in DEC (2004). This method requires that all trace metal concentrations, except for iron and manganese, are measured on unfiltered samples. At collection, unfiltered trace metal samples are preserved with nitric acid and concentrations are measured on samples using the "acid extractable" method. This involves addition of hydrochloric acid and heating for 15 minutes on a stream bath, as set out in Standard Methods.

Since July, 2012, EnergyAustralia NSW has been determining the concentrations of aluminium, copper and zinc in filtered water collected at both the Mt Piper Licence Discharge Point LDP01 and at the Neubecks receiving water site, WX22. Similar filtered trace metal tests have been undertaken at the new upstream site NC01 since October, 2012.

To allow comparison with the ANZECC (2000) guideline trigger levels, Delta Electricity (now EnergyAustralia NSW) began low detection limit (DL) testing for trace metals in April/July, 2006, so that all the metals, except silver, were measured at DLs lower than the ANZECC trigger levels. Due to the use of low detection limits, and to be consistent with the previous reporting of trace metals at Mt Piper, the concentration of elements shown by NALCO as being less than the DL has been assumed to be the same as the DL in this report.

EnergyAustralia NSW has advised that silver has continued to be analysed at a higher DL than the guideline trigger value of 0.00005 mg/L because the matrix of elements present in the water samples prevents NALCO from measuring concentrations at the ANZECC (2000) guideline trigger value level (see Attachment 1). The silver data has continued to be tested at <0.001 mg/L, which is 20 times the ANZECC (2000) guidelines, so it has not been assessed in this report. As recommended in previous reports for the ash placement at Mt Piper, it is suggested that silver cease to be monitored as it provides no useful information.

Groundwater level measurements are undertaken at each bore using a dip meter, from the top of the bore pipe, before being bailed or pumped out. Nalco remove three bore volumes as suggested by the groundwater standard - 1998d, AS/NZS 5667.11:1998: Water quality – Sampling. Part 11: Guidance on Sampling of Ground Waters. After pumping, the water in the bore is allowed to recharge to a level suitable for sampling.

The OEMP requires level measurements to be undertaken as the "Total Bore Depth"[14] and "Recharge During Sampling". To be consistent with the OEMP, and to be consistent with the previous reporting for the Mt Piper ash placement, the groundwater level before bailing/pumping is shown as Water Level 1 (WL1) in Attachment 1 and is called "Total Bore Depth".

It is noted that the OEMP does not define the meaning of "Recharge During Sampling", which is shown in relation to "Groundwater connectivity" in Table 7-1 of the OEMP. Nor does the OEMP define the meaning of "Groundwater connectivity". Due to this situation, EnergyAustralia NSW has advised Aurecon that they have taken "Recharge During Sampling" to mean the groundwater level when it has refilled, to a level suitable for sampling, after the bore was bailed or pumped out. They have called this level the "Recharge Bore Level". As the refill level that is suitable for sampling is arbitrarily decided by the samplers, the usefulness of the "Recharge Bore Level" data is questionable and undefined, so it has not been used in this report.

[14] EnergyAustralia NSW calls "total bore depth" either "Initial Bore Level" or "Bore Water Level".

To be consistent with the OEMP and previous reporting for the Mt Piper ash placement, the groundwater level during sampling, after bailing/pumping, is shown as Water Level 2 (WL2) in Attachment 1 and is called “Recharge During Sampling”.

2.6 Guidelines

The Protection of the Environment Operations Act requires consideration of the ANZECC (2000) guidelines when assessing potential effects on water quality in receiving waters. To achieve this, the OEMP uses the locally derived and ANZECC (2000) guideline trigger values developed for the Mt Piper Brine Conditioned ash as the local environmental goals for the Lamberts North ash placement. The guideline trigger values apply to the receiving waters of the ash placement seepage, which are taken as being the two groundwater bores MPGM4/D8 and D9 and Neubecks Creek at WX22 (Figure 2). Hence, the Local/ANZECC (2000) trigger values shown in Table 1 for groundwater apply to bores D8 and D9[15] and the surface water guidelines apply to WX22, which is the final receiving water site for the Lamberts North ash placement.

[15] These bores replace the now de-watered and filled Groundwater Collection Basin (Huon Gully Void). The Mt Piper pre-placement background concentrations shown in Table 1 are based on pre-2000 data at the Mt Piper background bores and the Groundwater Collection Basin. They have been applied to these bores for assessing long-term effects of the Mt Piper brine conditioned ash placement on receiving waters since 2013 and have now been approved, in the OEMP, for use to assess the effects of the Lamberts North placement.

Table 1. Pre-2000 90th Percentile Baseline concentrations and Local/ANZECC (2000) Trigger Value Environmental Goals for the Groundwater Receiving Waters and Neubecks Creek with Lamberts North adjusted pre-placement 90th Percentile Goals applying to bores MPGM4/D8 and D9 and WX22 (bold and parentheses)

Element (mg/L)	Groundwater Collection Basin Pre-placement 90th Percentile	Groundwater ANZECC or Local Guidelines#	Neubecks Creek at WX22 Pre-placement 90th Percentile	Surface Water ANZECC or Local Guidelines#
General Water Quality				
pH		6.5 – 8.0	6.7-7.8	6.5 – 8.0
Cond/ (uS/cm)	1576	2600^	894	2200
TDS	1306	2000	580	1500^
Cl	31.5	350	22	350+
SO4	824	1000 **(1170)!**	332	1000++
Trace Metals				
As	0.001	0.024	<0.001	0.024
Ag	<0.001	0.00005	-	0.00005
Ba	0.037	0.7	0.029	0.7+++
Be	0.001	0.1	<0.001	0.1
B	0.244	0.37 **(0.55)!**	0.09	0.37
Cd	0.002	0.002	<0.001	0.00085
Cr	0.001	0.005	<0.001	0.002
Cu	0.001	0.005 **(0.0075)!**	<0.001	0.0035 **(0.005)!**
F	0.435	1.5	0.338	1.5+++
Fe	0.664	**0.664 (15.9)!**	0.281	0.3+++
Hg	<0.0001	0.00006	-	0.00006
Mn	5.704	**5.704 (8.57)!**	0.72	1.9
Mo	0.001	0.01	<0.001	0.01+
Ni	0.5509	**0.5509**	0.005	0.017 **(0.051)!**
Pb	0.001	0.005	<0.001	0.005
Se	0.002	0.005	<0.001	0.005
Zn	0.908	**0.908**	0.116	**0.116**

* high detection limits used when determining the baseline concentrations – see text

^ 2000 mg/L TDS/0.77 for groundwater; 0.68 x 2200 uS/cm low land river conductivity protection of aquatic life

ANZECC (2000) guidelines for protection of freshwaters, livestock, irrigation water or drinking water. Local guideline based upon 90th percentile pre-brine placement are shown in **bold** without parentheses – see text.

Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Current Ca, Mg in GCB 147, 113 mg/L: in Neubecks Creek 19.7, 11.8 mg/L, respectively.

+ irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water

! Lamberts North from pre-placement 90th Percentile baseline for October 2012 to August, 2013 at MPGM4/D9 and Neubecks Creek at WX22 in **parenthesis**

The Local/ANZECC (2000) trigger values for trace metals used in Table 1 were developed for unfiltered samples, in both surface and groundwater, to establish the pre-placement baseline for Mt Piper ash placement. The baseline data were collected prior to November, 2000 and are consistent with the DEC (2004) requirement for measurements on unfiltered samples.

The ANZECC Guidelines for Groundwater Protection in Australia (1995) and the NEPC (1999) require the background water quality in groundwater bores to be taken into account. As the NEPC (1999) did not define the meaning of "background" concentrations, the baseline concentrations were defined in previous reports for the Mt Piper ash placement as the 90th percentile of the pre-placement concentrations for naturally mineralised, highly disturbed groundwater (condition 3 waterbodies), or the ANZECC guideline default trigger values, whichever is higher.

The pre-placement 90th percentiles, that are higher than the default trigger values, are the local guidelines, which are shown in bold in Table 1. The local guidelines for salinity, chloride and sulphate take into account the protection of freshwater aquatic life (via groundwater seepage into Neubecks Creek), livestock, irrigation water or drinking water guidelines. Table 1 shows that the guidelines for groundwater may be different from those used in Neubecks Creek, where the effects on aquatic life are considered.

As the local/ANZECC trigger values shown in Table 1 are based on data pre-2000, any increases to the background water quality since then due to inputs from the catchment, including from the Mt Piper ash placement, prior to September, 2013, need to be taken into account so they are not assigned to the Lamberts North placement. This was achieved by calculating the 90th percentile of the pre-placement data at bores D8 and D9 and at WX22[16] from October, 2012 to August, 2013. The resulting increases in the 90th percentile baselines, that are applicable to Lamberts North only, are shown in bold and parenthesis in Table 1[17].

2.6.1 Early Warning of Water Quality Changes

As described in the OEMP, it is necessary to provide an early warning of water quality changes to allow time to undertake targeted investigations of the cause and to implement control measures before the environmental goals are exceeded at the receiving water sites. An early warning is triggered when the post- 50th percentiles for the various elements at the receiving water sites exceed their pre-placement 90th percentiles. This is supported by sampling at bore MPGM4/D1, one of the Mt Piper groundwater seepage detection bores, which has been used to provide an early warning of potential future changes at the surface and groundwater receiving waters. The OEMP has nominated that bore to provide early warning of water quality and water level changes possibly taking place due to the Lamberts North ash placement.

The aim of any targeted investigations that arise is to determine if the changes are due to the water conditioned ash placement or some other cause. If the increases are due to the placement, mitigation measures could be implemented to avoid parameter concentrations approaching or consistently exceeding the relevant ANZECC and local guideline goals in the groundwater at either bore D8 or D9 or at the Neubecks Creek receiving water site, WX22.

[16] Bores D8, D9 and WX22 are all in the path of groundwater seepage from the Mt Piper ash placement into Huon Gully, so the background measurements from October, 2012 to August, 2013 have been taken into account. Catchment inflows include the Mt Piper placement groundwater seepage to Huon Gully and local, up-stream, coal mine discharges to Neubecks Creek.

[17] The local, pre-placement Lamberts North 90th percentile baselines are not as reliable as those for Mt Piper because they are only based on eleven measurements at WX22 and four at D8 & D9, whereas the ANZECC (2000) guidelines require a minimum of 24 measurements to set local guidelines.

2.7 Control Charts

Long-term changes at the receiving water sites are tracked by control charts. The long-term changes were taken from January/February, 2009 to August, 2013[18] to provide 24 measurements (as recommended by the ANZECC (2000) guidelines) prior to ash placement in September, 2013.

At the groundwater receiving water site, the MPMG4/D8 and D9, long-term changes are indicated by comparison with the pre-90th baseline, post- 50th percentile and/or the groundwater trigger value environmental goals. The Lamberts North site does not have a background bore to sample the local mine water inflows to Huon Gully for comparison with the water quality conditions at the Mt Piper seepage detection bore, D1, or bores D8 and D9. This means changes at bore D1 and the receiving water sites may be difficult to interpret due to effects of mine water inflows, enriched with brine and water conditioned ash leachates, from under the Mt Piper ash placement.

At WX22, long-term changes are indicated by comparison with background conditions at the Mt Piper Power Station Licence Discharge Point, LDP01, on the upper Neubecks Creek, and the environmental goals. The new upstream site, NC01, in Neubecks Creek, just downstream of the Mt Piper Stage I brine conditioned ash placement and the Neubecks Creek north arm (Figure 1) are also compared with the changes at WX22.

The long-term changes are further put into context by use of the pre-Lamberts North placement 50th and 90th percentiles and the post-placement 50th and 90th percentiles. These are shown for each groundwater and surface water sampling site in the various water quality tables in the report as well as in Attachment 1. This allows pre- and post-placement “like for like” comparisons to be made, together with the pre- and post-placement averages, maxima and minima, as well as the summary data in tables for the current reporting.

2.8 Data Quality

The data contained in this report was provided by EnergyAustralia NSW and was checked for outliers using the ANZECC (2000) protocol. In accordance with the protocol, outliers of three times the standard deviation are removed from the dataset, provided no environmental changes have occurred that could account for such a significant change. No values were deleted from the 2012 to 2014 dataset.

Measurements of aluminium, copper and zinc concentrations on filtered water samples at LDP01, NC01 and the Neubecks receiving water site, WX22, have been undertaken since October, 2012. However, these measurements are likely to produce lower results than those which would be produced for unfiltered samples. Accordingly, they cannot be used to indicate no exceedance of the Local/ANZECC environmental goals shown in Table 1 because those goals are based on background measurements using unfiltered samples.

Silver concentrations have not been used in this report because the high detection limits used mean they cannot be compared to the ANZECC (2000) guideline of 0.00005 mg/L. The same applies to the high detection limits used for measurements of nitrite and oxidised nitrogen (nitrite plus nitrate) at the Neubecks Creek sites, which has a guideline of 0.015 mg/L. Hence, these measurements have not been used in this report and it is suggested that EnergyAustralia NSW have the tests undertaken at the appropriate detection limits.

[18] The January/February, 2009 to July, 2012 Mt Piper groundwater data is from Aurecon (2010, 2011 and 2012)

The bore drilling logs for bores MPGM4/D15, D16, D17 and D18 (see Attachment A in CDM Smith, 2012) indicate that these bores were drilled into the basement rock and the logs also indicate that the bore screens are sampling groundwater in the rocks and may not be efficiently sampling leachates from the coal washery wastes and/or mine spoil in the area. In addition, these bores may have misleadingly low groundwater levels because the pore pressure in rock could be lower than in the local mine spoil, causing the water level to rise less than if the bores were sampling the groundwater in the mine spoil.

In contrast, bore D19 is drilled into the coal washery wastes/mine spoil and samples the groundwater above the basement rock. Hence, the water levels measured at bore D19 are expected to reflect the actual levels that could flow down-gradient toward the lower levels south of Neubecks Creek.

2.8.1 Consistency in Water Quality Monitoring

As required by the Scope (Section 1.4), the water quality characteristics monitored by EnergyAustralia NSW at the OEMP nominated sites has been reviewed for consistency between the sampling sites. The review found that the characteristics monitored were the same for all the groundwater sites, but those for the surface water in Neubecks Creek, varied between the three sites. The parameters that varied were for nutrients (nitrite, nitrate, ammonia), dissolved oxygen and temperature.

The criteria for consistent monitoring in Neubecks Creek were those required for water quality use in the AUSRIVAS model assessment of macroinvertebrate condition. These are conductivity, dissolved oxygen (DO), pH, and turbidity (GHD, 2014). The water quality sites used for macroinvertebrate monitoring are NC01 and WX22. Examination of the data collected at each site showed:

- NC01 – the AUSRIVAS parameters were monitored, nitrite, nitrate were included but ammonia was only monitored at this site. The OEMP does not require ammonia to be monitored, so it is recommended that monitoring of this element at NC01 cease. Temperature was not monitored.
- WX22 – the AUSRIVAS parameters were monitored, the nutrients nitrite and nitrate were included but ammonia was not monitored. Temperature was monitored for the first time in August, 2014[19].
- LDP01 – although the Mt Piper Power Station discharge monitoring site was not used for the aquatic life assessment, monitoring of the same parameters may show potential downstream effects on sites NC01 and WX22, so it is reasonable that the same characteristics be monitored at LDP01.

  This site (LDP01) monitors the AUSRIVAS parameters except for dissolved oxygen, so it is recommended that dissolved oxygen be included. Nitrite, nitrate and ammonia were not monitored at this site. The OEMP requires nitrite and nitrate to be monitored in Neubecks Creek (see Table 7-2. “Surface water quality monitoring parameters” in CDM Smith, 2013), but not ammonia, so it is recommended that nitrite and nitrate be monitored at LDP01 to be consistent with that at the other sites. Temperature was not monitored.

Although the OEMP does not require monitoring of temperature in the creek, it is a fundamental determinate of the growth rate of aquatic life and is recommended to be included with the field measurements each month, at each of the three sites, in Neubecks Creek.

[19] Water temperatures are measured at the Department of Water (NOW) Stream gauge site 212055 site at WX22.

2.9 Climatic Conditions

The average annual rainfall over the pre- to post-water conditioned ash placement period from October, 2012 to August, 2014 was low at 667 mm/year (Attachment 2), which is 77% of the long-term annual rainfall of 863 mm/year. During this period, the monthly average rainfall of 56 mm/month, was below the long-term average of 72 mm/month, even though the rainfall in March, 2014 was 144 mm (Figure 3).

Figure 3 shows that there was a trend from above average rainfall in 2012 to below average in 2013/14. This trend has been highlighted by calculation of the corresponding change in the rainfall deficit, which is also shown in Figure 3.

The monthly rainfall deficit was calculated by subtracting the monthly rainfall each month from the long-term average rainfall of 72 mm/month. When the rainfall is lower than 72 mm/month, the difference is called the deficit. A positive deficit means a dominance of below average rainfall and a negative one indicates above average rainfall. The deficit (positive and negative) was accumulated each month until August 2014.

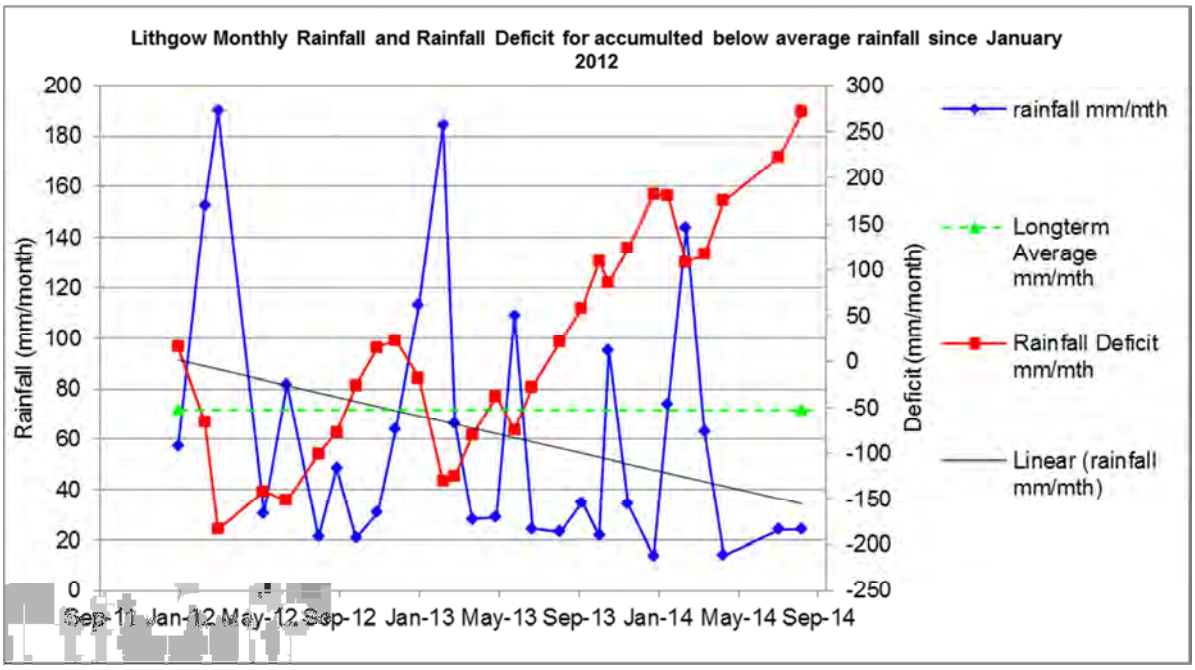

Figure 3. Lithgow Rainfall from January 2012 to August 2014 showing trend for decrease to below average rainfall and corresponding Rainfall Deficit

3. Water Conditioned Ash Placement Effects on Surface and Groundwater Quality

This Section reviews the Lamberts North surface and groundwater quality and trace metal data for the first year of monitoring from pre-ash placement (October, 2012 to August, 2013) to the post-ash placement (September, 2013 to August, 2014) period. The review covers the groundwater bores inside the Mt Piper brine conditioned ash placement area, its seepage detection bore, MPGM4/D1 and the Mt Piper receiving water bores D8 and D9, as well as Neubecks Creek, the final receiving water site. The data base for these sites has been updated from May, 2014 (the last date of the Mt Piper annual review report, Aurecon, 2014) to August, 2014 and changes since May, 2014 are commented on.

As the bore logs for bores MPGM4/D15 to D18 indicate that they were drilled into rock, rather than the local mine spoil/coal wastes, the water quality and water level data for those bores have not been used in this report, other than to comment on the mine spoil/coal wastes in the area being a potential source of trace metals to Huon Gully.

An assessment of the effects of the Lamberts North ash placement on the groundwater at bores D1, D8 and D9 or on Neubecks Creek could not be undertaken for the following reasons:

- The sampling design for Lamberts North uses the same down-gradient and receiving water sampling sites as used for the Mt Piper site and previous Mt Piper reports have shown effects of the groundwater flows from bore D10 on Huon Gully
- Local mine water from under the Mt Piper area, together with rainfall runoff from the water conditioned ash, also flows into Huon Gully. Previous reports showed that the mine water is most likely enriched with some Mt Piper brine leachate, giving elevated concentrations of salts and trace metals at bore D10, which appear to have flowed via Huon Gully to bore D1 and the receiving water sampling sites (see Aurecon, 2012 and 2014)
- Groundwater from the underground coal mine workings, up-gradient of Huon Gully flows into the ash placement area but there is no background bore to enable the effects of water quality or trace metal inflows from this source to be taken into account
- No groundwater bores were installed in the ash placement area to measure the changes in groundwater depth, water quality or trace metal concentrations
- The direction of groundwater flows (with the contained salts and trace metals) from bores MPGM4/D15 to D18, whether toward Huon Gully or away from it, is unknown because the water levels are uncertain. The concentrations of contained salts and trace metals are also uncertain as the bore logs indicate that they were drilled into rock rather than the local mine spoil/coal wastes.

The above issues are discussed as they arise in the various Sections of the report.

Nevertheless, it has been possible to review the changes in water quality and trace metals from pre- to post-ash placement in the following surface and groundwaters:

- Bore MPGM4/D10 inside the ash placement area
- Seepage detection bores MPGM4/D1, located between the ash placement area and Neubecks Creek
- Groundwater receiving water bores D8 and D9
- Neubecks Creek receiving water site WX22.

In addition, water quality at bore D19, which is to the east of the Lamberts North site, and samples groundwater in the local mine spoil/coal wastes was examined for potential input of salts and trace metals to bores D8 and D9 and WX22.

The Neubecks Creek aquatic life sampling by GHD (2014) is reviewed in Section 3.6.

3.1 Groundwater Level Changes

To put the groundwater level changes since October, 2012 into context, and as bores D10 and D11 have been used to provide water quality and groundwater level data for flows from the Mt Piper site into Huon Gully, the long-term changes at these bores, as well as at D1, D8, D9 and D19 are shown in Figure 4.

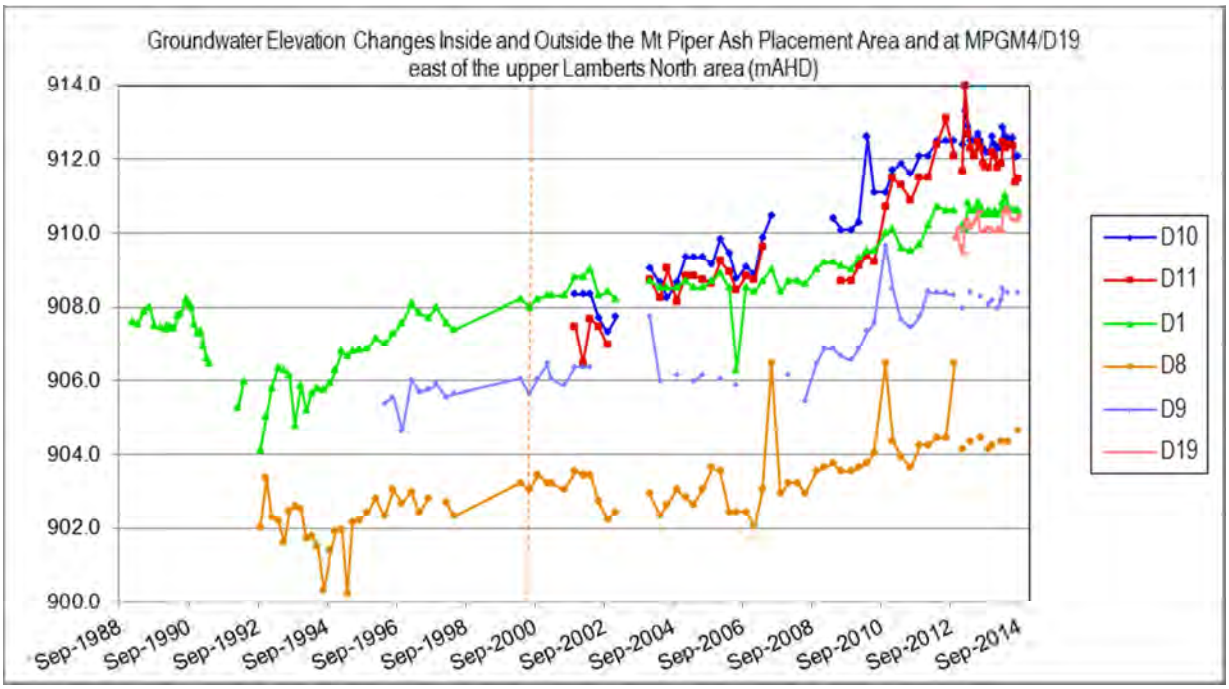

Figure 4. Groundwater Elevation changes at bores inside the Mt Piper ash placement area (MPGM4/D10 and D11 since 2001), at the Seepage Detection bore (D1 since 1989), at Groundwater Receiving Water Bores (D8 and D9 since 1992 and 1996) and upper Lamberts North ash placement area at D19 since October, 2012

Bore D19 is used to provide an indication of the potential Lamberts North groundwater inputs, so the groundwater elevation at bore D19 is also shown for the period since sampling began at that site in October, 2012. The groundwater level in the Mt Piper ash placement area was predicted to rise by about 2m by groundwater modelling (PPI, 1999). The increase was expected due to mounding as ash is placed over an increasing area from the levels present in 1999 (vertical line on Figure 4).

Figure 4 shows an overall long-term trend for increase in the height of the water table as the water conditioned ash placement at Mt Piper has approached the eastern boundary of the brine and water conditioned ash placement area, which is 50m from Huon Gully. The increases have been about the 2m predicted by the model other than at bores D10 and D11, where the increases have been about 4m to 5m. The additional 2 to 3m increase at these bores began in 2010 and may be due to rainfall runoff from the Mt Piper water conditioned ash placement entering the groundwater flowing under the

ash placement in the rubble drain (Aurecon, 2011). As mentioned in previous reports, these water level increases are unrelated to the brine placement, which is on top of the much larger water conditioned placement.

The groundwater elevations at D10 and D11 are higher than at bores D1, D9, D8 and at bore D19 in Lamberts North. This indicates that the groundwater inflows from the Mt Piper area (see Figure 6) could affect these bores and potentially the water quality in Neubecks Creek, thus preventing a separate assessment of effects of the Lamberts North site on these down-gradient bores and the receiving waters in Neubecks Creek.

3.1.1 Groundwater Level Changes at Bore D1 compared to D10

The OEMP places emphasis on the potential for water level increases in the ash placement area to leach salts and trace metals from the ash and suggests that bore D1 could be used to indicate if there has been a groundwater level increase inside the Lamberts North ash placement area in Huon Gully. Accordingly, the pre- to post-placement changes at bore MPGM4/D1 are reviewed.

Although there is no background bore in the underground mine working, up-gradient of the influence of any inflows from Mt Piper, for comparison of water level changes at bore D1, the relative groundwater level changes at D1 from pre- to the initial post-placement period are compared to those at D10 in Figure 5. Bore D10 was used because it is up-gradient of Lamberts North and groundwater level increases at both D10 and D1 have previously been shown to be related to the mounding effect of the Mt Piper ash placement. Bore D10 normally has a higher groundwater level than at D1, so relative changes are compared in Figure 5. Groundwater level changes were taken from January/February, 2009 when the water levels were similar and the two bores were not influenced by any site preparation effects prior to ash placement in September, 2013.

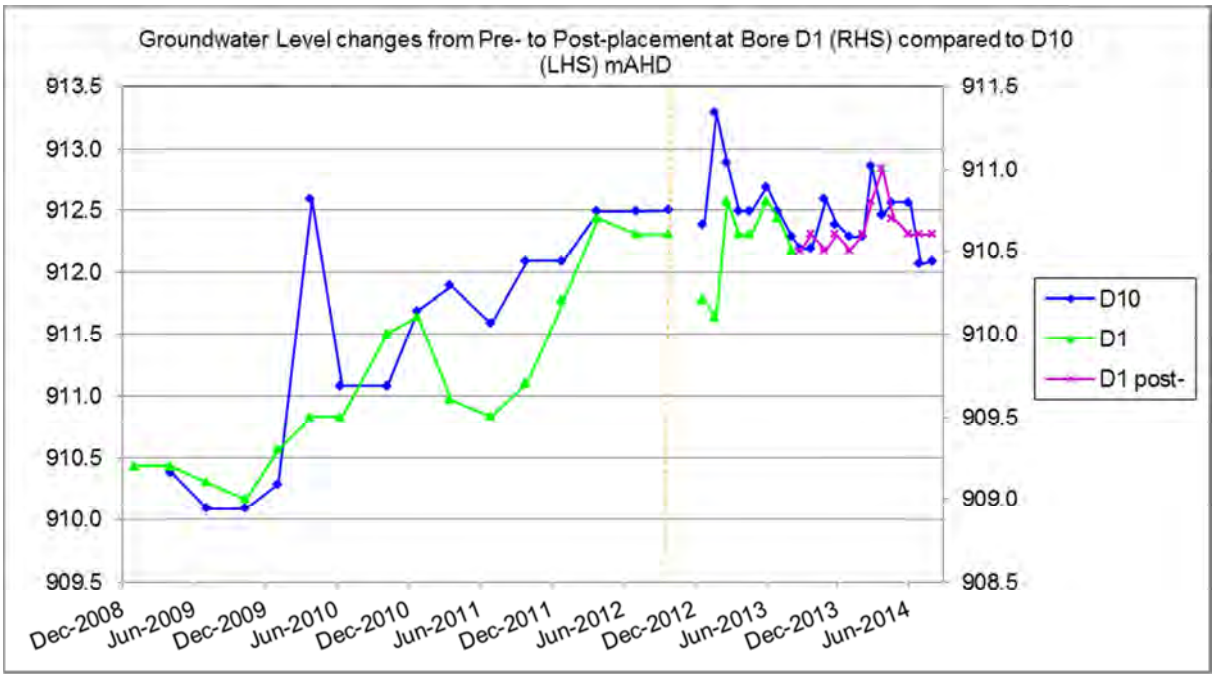

Figure 5. Groundwater Elevation changes at bores D1 and D10 from January, 2011 to August, 2014 with the Pre- (green) and Post-placement (violet) periods for D1 shown (Vertical line shows when Pre-placement water quality monitoring began in October, 2012)

The following background to the de-watering of the GCB, its infilling and ash placement is taken from the information provided to Aurecon (see Aurecon, 2012) to aid in understanding the changes shown in Figure 5. The initial de-watering of the GCB commenced several months prior to the beginning of Lamberts North site construction works in 2012 and that de-watering of the GCB started in earnest in December, 2012, with a concerted effort from mid-January, 2013 to remove all water from the void by mid-February 2013. Ash placement began in September, 2013.

Other than the relatively lower groundwater levels at D1 in 2011, which appears to be due to an extended period of low rainfall (see Attachment 2), both bores had similar relative levels, except during January and February, 2013 when groundwater was being rapidly pumped out of the void. There was a trend for increase in levels at both bores from 2009 to early 2012 and since then the levels have remained steady. In addition, since early 2013 the relative groundwater levels have been similar, indicating that there has been no groundwater level rise at D1 since ash placement began.

Although the D1/D10 comparison suggests there has been no groundwater level rise at D1 since ash placement began, it cannot be assumed that changes at D1 indicate a potential, corresponding water level change inside the ash placement area, for the following reasons:

- As shown in previous Mt Piper reports, groundwater level increases at bore D1 are influenced by the effects of mounding as the ash is placed over a larger area toward the eastern boundary of the Mt Piper area. It is not known if a similar rise due to this mounding effect could occur in Huon Gully
- Compacted mine spoil was placed in Huon Gully during 2012/13 before ash placement to minimise the likelihood of the groundwater levels rising inside the gully and wetting the placed ash. As bore D1 is not in mine spoil (see the bore log in Attachment 6), it appears unlikely that groundwater level changes at D1 could follow those under the ash. This view could not be confirmed because no groundwater bores were installed in the ash placement area to measure the water levels.

To allow assessment of the groundwater level rise in the Lamberts North ash placement, it is suggested that monitoring bores be installed in the northern wall of the Huon Gully placement embankment to determine whether the groundwater level in the ash placement area has risen into the ash.

3.1.2 Groundwater Flow Directions

The indicative groundwater flow directions into and under the Mt Piper brine/ash placement area and leaving the site toward Huon Gully and the Lamberts north ash area are discussed below to obtain an understanding of the sources of groundwater that could affect the local water quality.

As most of the groundwater bores inside the Mt Piper brine/ash placement area have been covered with ash, the groundwater flow directions were conceptualised from an understanding of the local coal seam structure and hydrogeology. A rubble drain was installed under the Mt Piper ash so the background groundwater can flow under the ash placement without coming in contact with the ash. This suggests that groundwater flows follow the dip in the mined coal seam strata, under the ash area, in a north-easterly direction from the ash placement up-gradient groundwater table areas to the Groundwater Collection Basin (GCB), which is now filled with mine spoil and the Lamberts North water conditioned ash, and to bore D9 (Figure 6).

The groundwater sampled by the internal bores, D10 and D11, is believed to flow to the nearby Huon Gully where it is expected to join that from upstream and flow down Huon Gully on the way to bore D9

and Neubecks Creek. Recent increases in chloride and water levels at bore D19 indicate that these flows may be affecting the eastern side of Huon Gully (Figure 6).

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P:\GIS\Project-2\project\Delta Western Power Stations\208557 - Mt Piper and Lamberts North\Maps\Delta Western Lamberts Gully GW Flow_06112014.mxd\JOB No.\06-11-14\anthony.ko\Rev 0

Legend

- Groundwater Flow Paths
- Indicative Groundwater Flow Paths
- Neubecks Creek
- Lamberts North Ash Placement Area
- LN Ash Placement

EnergyAustralia Monitoring Locations

- Groundwater Bores
- Covered Groundwater Bores
- Surface Water Sampling
- Surface Ponds
- Underground Mine Water Seepage

Source: Aurecon, EANSW, LPI

1:8,000

0 200 400 m

Projection: GDA 1994 MGA Zone 56

FIGURE 6: Schematic of Mt Piper Brine Co-Placement Area and Upper Lamberts North Indicative Groundwater flow paths to the in-filled Groundwater Collection Basin, bore MPGM4/D9 and Neubecks Creek

3.2 Sources of Salinity and Trace Metals to Bore MPGM4/D1 and Receiving Water Sites

The various sources of water quality and trace metals are examined in this Section to see if a tracer for leachates from the Lamberts North water conditioned ash only can be found. The aim is to see if the Lamberts North site can be assessed separately, or if the complex interaction between the various sources means that the site can only be assessed as part of a wider, combined Mt Piper/ Lamberts North ash placement area.

3.2.1 Potential Tracers for the Lamberts North Ash Placement

The following description of the local mineralised conditions and water quality and trace metals in ash conditioned with cooling tower blowdown water provide an indication of what the required characteristic of a suitable tracer for the Lamberts North placement could be. Table 2 provides a summary of the water quality and trace metals of the various potential sources entering the Lamberts North site in Huon Gully. These include:

- rainfall runoff from the ash placement
- cooling tower blowdown water
- underground coal mine seepage from a local abandoned mine
- groundwater sampled by bore MPGM4/D10
- Leachate test results for:
    - Mt Piper brine conditioned ash
    - Local mine spoil
    - Freshwater conditioned ash (the leachates tests are from PPI (1999) when freshwater was used to condition the ash. The use of cooling tower blowdown water was not envisioned at the time of the tests).

Comparison of the water quality and trace metals in these local sources with those present in bore D1, just below the Lamberts North placement, has been undertaken to try and identify a suitable tracer.

The local mineralised coal geology of the Mt Piper and Lamberts North area is mainly due to the placement of mine spoil and chitter/tailings (washery reject) in the catchment. Chitter contains pyrites, which release sulphate and trace metals (boron, nickel and zinc). These elements are also present in the local mine water and mine spoil leachate (Table 2), so they are not expected to be a sole characteristic of the Lamberts North ash placement site.

Due to these local mineralised conditions, none of the trace metals boron, nickel and zinc is expected to be a suitable tracer for freshwater conditioned ash leachates. However, to prevent dusting, the ash is conditioned and sprayed with cooling tower blowdown water, which contains elevated chloride, arsenic, barium, copper, fluoride, nickel and some zinc. Accordingly, these elements were examined for potential to indicate leachates from the Lamberts North ash.

Table 2: Average Water Quality of Lamberts North Runoff Ponds LN1 and LN2 and various sources of Salinity and Trace Metals (including groundwater sampled by bore MPGM4/D10) to the Lamberts North Site and to the Seepage Detection Bore MPGM4/D1, as well as down-gradient Surface and Groundwater receiving waters

Element (mg/L)	Water Conditioned Ash Rainfall Runoff		Sources of Salinity & Trace Metals to Lamberts North Ash Placement, Bore D1 and Receiving Waters						Bore D1 during 2013/14
	Unlined Pond LN1 Sept13 to July14	Lined Pond LN2 Sept13 to July14	Underground Mine Seepage to Huon Gully	Cooling Tower Blowdown	Brine Leachates (PPI, 1999)	Mine Spoil Leachates (PPI, 1999)	Freshwater conditioned ash Leachates (PPI, 1999)	Bore D10 during 2013/14	
pH	7.7	7.9	6.3 to 7.3	7.4	7.6	7.6	4.9	5.6	6.0
Cond (µS/cm)	1592	1943	2262	3000	10900	1212	745	5567	2933
TDS	1247	1525	1742	2200	8400	800	627	5242	2792
SO4	678	875	1172	1400	3750	349	351	3017	1617
Cl	62	120	133	250	1410	103	<1	513	200
Al	0.10	0.20	1.9	1.3	-	-	-	0.69	0.21
As	0.001	0.001	0.004	0.070	0.05	0.001	0.009	0.001	0.012
B	0.040	1.0	3	1.0	6.1	1.475	4.02*	3.38	2.03
Ba	0.030	0.035	0.02	0.220	0.072	0.245	0.107*	0.021	0.037
Cd	0.002	0.002	<0.0002	<0.002	0.003	0.002	0.024	0.0057	0.0002
Cr	<0.001	<0.001	0.003	<0.01	0.037	0.001	0.003	0.002	0.002
Cu	<0.01	<0.01	<0.01 - 0.016	1.50	0.078	0.002	0.179^	0.007	0.002
F	1.0	0.6	-	2.0	6	0.49	8.2	1.4	0.11
Fe Filt	0.14	0.32	<0.01	0.03	0.007	0.097	<0.10	9.32	13.7
Mn Filt	0.275	0.08	0.94	0.094	0.44	1.64	0.154*	8.5	13.08
Mo	-	-	<0.10	-	0.84	0.003	2.2	<0.001	<0.001
Ni	0.165	0.04	0.160	0.230	0.200	0.050	0.020* ^	0.85	0.73
Pb	<0.010	<0.010	0.005	0.002	<0.0002	0.0002	0.003	0.008	0.001
Se	0.008	0.040	0.014	<0.002	0.18	0.0115	0.179	0.006	<0.002
Zn	0.285	0.160	0.180	0.080	0.039	0.366	0.120*	1.4	0.074

* also leached from local mine spoil (PPI, 1999)

^ Expected to be increased due to conditioning with cooling tower blowdown water

Highlights: Blue: > ANZECC/local guidelines (see Table 1) for indication of source condition as the guidelines apply to receiving waters Red: potential tracer D1 >D10

Table 2 shows the various sources of salinity and trace metals that could enter the groundwater sampled by the seepage detection bore D1, down-gradient of the Lamberts North ash placement. These include:

- Rainfall runoff from the Lamberts North ash placement collected in the unlined Pond LN1
- Underground coal mine seepage into Huon Gully
- Cooling tower blowdown water used for conditioning of ash in Lamberts North, as well as at Mt Piper
- Leachate concentrations[20] for brine and freshwater (not blowdown water) conditioned ash, as well for the local mine spoil (from PPI, 1999). The mine spoil concentrations are included because a large volume of spoil was put in Huon Gully for the ash to be placed on. Hence, leachates coming from Lamberts North may be due to both ash and mine spoil, as well as up-gradient inputs from local coal mine groundwater and Mt Piper

[20] Leaching tests were undertaken with a water to ash ratio of 2:1 to simulate leaching by groundwater flows in contact with the ash or rainfall infiltration through the ash placements

- Bore D10 groundwater during 2013/14 to show mine water concentrations flowing from under the Mt Piper brine/ash placement into Huon Gully, enriched with leachates from the Mt Piper brine area and rainfall runoff from the blowdown water conditioned ash area
- Bore D1 groundwater during 2013/14 to show relationships with the up-gradient concentrations measured at D10 and potential effects, if any, of the Lamberts North ash placement.

From the above, the water quality in the surface water runoff ponds in the ash placement area during 2013/14 provides a measure of potential inputs from the ash into the groundwater under the ash via the unlined pond (LN Pond 1, see Figure 1). The LN Pond 1 concentrations were compared to the freshwater conditioned ash leachates in Table 2, taking into account conditioning of the Lamberts North ash with blowdown water. These comparisons indicate that arsenic, barium, copper, nickel and zinc, as well as selenium warranted further examination for possible use as a tracer for the Lamberts North ash[21]. It was noted that, apart from zinc, which was highest in the ash rainfall runoff, arsenic, barium, copper and nickel were highest in blowdown water. Selenium was eliminated as a potential tracer of water conditioned ash leachates at the Lamberts North site due to selenium inflows to Huon Gully from Mt Piper[22].

As cooling tower blowdown water is also used for water conditioned ash and dust suppression by spraying at Mt Piper, and rainfall runoff from there enters the local groundwater, which flows into Huon Gully, the concentrations of arsenic, barium, copper, nickel and zinc may be elevated at bore D10, as well as at the seepage detection bore D1. It was assumed that the concentration of these elements could be elevated at D1 due to the inflows into Huon Gully, but may be lower than at D10 due to dilution with groundwater from the surrounding area with lower concentrations of these elements. In terms of identifying possible tracers for Lamberts North, is was also assumed that elements with concentrations at D1, which were lower than at D10, be further investigated.

Of these metals, only arsenic and barium had higher concentrations at bore D1 than at D10 (Table 2), indicating that they were not dominated by inflows from the Mt Piper area. In the case of arsenic, the required assumption of dilution with groundwater from the surrounding area with lower concentrations appears reasonable because the arsenic concentrations in the underground mine water are lower than at D1 (Table 2). Furthermore, the water at bore D19, which samples the groundwater in the local mine spoil/washery waste has lower concentrations of arsenic than at D1 (Table 3, Section 3.3). Hence, arsenic is considered suitable as tracer for leachates from Lamberts North to the receiving waters and is trialled in Section 3.3.

However, in the case of barium, the abandoned underground mine water (as well as at D19 of average 0.021 mg/L) have only slightly lower concentrations than the 0.037 mg/L at D1 (the more frequent sampling at D19 during pre-placement shows a range of 0.016 to 0.030 mg/L, see Attachment 1). In addition, the mine spoil leachates show similar concentrations of barium as in blowdown water (Table 2), so the marginal increase at D1 may represent the combined effects of the ash placement and mine spoil beneath the ash. Hence, changes over time in barium concentrations,

[21] Chloride was eliminated due to its dominance at bore D10 and inflows from there to Huon Gully. Boron was eliminated due to high concentrations in mine water, brine leachates and elevated concentrations at D10. Copper, fluoride and nickel are elevated in blowdown water, which also is used to condition normal ash and for dust suppression at Mt Piper. Nickel has highest concentration in blowdown water and is elevated in ash runoff, mine water and brine leachates. Zinc is also present in the mine water at slightly lower concentrations than in the ash runoff Pond LN1 and the highest source of zinc is in mine spoil leachates. The nickel and zinc concentrations at D10 have recently increased to high concentrations (Attachment 1) and are most likely the source of the increases at D1.

[22] Although selenium is used as the tracer for leachates from water conditioned ash at Mt Piper, selenium leachates can arise from water conditioned ash as well as from brine conditioned ash. To date, selenium concentrations at D1 have been lower than the detection limit of the analytical method used, whereas concentrations at D10 have increased (Attachment 1).

relative to the D19 background at D1, as well as at the receiving water sites, are examined in Section 3.3.

3.3 Lamberts North Ash Placement Area Groundwater Quality

To prevent the effects of the Mt Piper inflows to Huon Gully from being assigned to the Lamberts North ash placement operations, the water quality at the groundwater bores D10 and D11, inside the Mt Piper placement area, are used to provide the concentrations of salts and trace metals entering Huon Gully from Mt Piper. Accordingly, the pre- and post-ash placement median water quality during 2012 to 2014 for bores D10 and D11 are summarised in Table 3, together with that for the seepage detection bore, D1, and the receiving water bores D8 and D9. The water quality is also compared with the Groundwater Guidelines or Goals, which apply to the receiving waters for bores D8 and D9. The concentrations are also compared to the background concentrations at D19 as an indication of potential effects of the local Mine Spoil/Coal Waste leachates.

The pre-and post-placement median and 90th percentile concentrations, at each sampling site and for each characteristic measured, are shown in Attachment 1.

The summary data in Table 3 for parameters with higher concentrations than the ANZECC or local guidelines, during and before the ash placement began in September, 2013, are highlighted in blue. Note that the local goals for boron, copper, iron and manganese have been increased (shown in parenthesis and bold), but only apply to the Lamberts North placement (these higher goals do not apply to D10 or D11, which uses the existing Mt Piper goals). These Lamberts North only goals were developed using the pre-placement baseline data from October 2012 to August, 2013 at bore MPGM4/D9. This was necessary to ensure that any increases at the down-gradient bores due to groundwater inflows to Huon Gully from under the Mt Piper area (measured at bores D10 and D11) are not assigned to the Lamberts North site.

Parameters triggering investigations of the causes (post-median greater than baseline) are highlighted in yellow. Elements with spikes in concentrations above the background are highlighted by comparison of the post-placement 90th percentiles with the pre-placement 90th percentiles and are shown as green. Concentrations of salts and trace metals in the Lamberts North groundwater monitoring bores, including the potential tracers arsenic and barium, are compared to the local Mine Spoil/Coal Waste concentrations at D19. These are highlighted in violet if the D1, D8 or D9 median is greater than the D19 median background concentrations.

Table 3: Median Water Quality for Mt Piper and Lamberts North Monitoring Bores during Pre-placement (October, 2012 to August, 2013) and Post-placement (September, 2013 to August, 2014) Periods Compared to ANZECC Groundwater Guidelines or Local Goals (including Lamberts North Pre-placement 90th Percentile Goals) and Background Mine Spoil/Coal Waste conditions at Bore MPGM4/D19

	Mt Piper and Lamberts North (LN) Ash Placement Area Groundwater Monitoring Bores^											
Element (mg/L)	Mt Piper Ash Placement Background* ^				Mt Piper & LN Seepage Detection^^		Mt Piper & LN Groundwater Receiving Waters				Mine Spoil/ Coal Waste at D19^^^	ANZECC Guideline Goals for Ground-water#
	Pre-D10	Post-D10	Pre-D11	Post-D11	Pre-D1	Post-D1	Pre-D9	Post-D9	Pre-D8	Post-D8		
pH***	5.6	5.6	7.2	6.2	6.1	6.0	6.2	6.1	5.9	5.9	6.1	6.5-8.0
Cond (µS/cm)	4600	5500	2100	4350	2400	2900	2050	2400	305	470	2800	2600
TDS	4500	5300	1400	4450	2200	2800	1700	2400	215	330	2400	2000^
SO4	2600	3000	110	2550	1300	1600	1025	1500	120	200	1500	1000++
Cl	390	475	220	445	101	190	110	190	6	15	190	350+
As	0.001	0.001	0.001	0.009	0.012	0.012	0.002	0.002	0.001	0.001	0.001	0.024
B	3.5	3.5	0.78	2.7	1.820	2.05	0.485	0.50	0.03	0.05	1.3	0.37 **(0.55)!**
Ba	0.023	0.021	0.85	0.092	0.038	0.039	0.058	0.048	0.040	0.030	0.020	0.7+++
Cd	0.0052	0.0058	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0006	0.001
Cr	0.001	0.002	0.0025	0.003	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.004
Cu	0.005	0.005	0.004	0.002	0.025	0.002	0.004	0.004	0.003	0.002	0.009	0.005 **(0.0075)!**
Fe**	2.5	10.0	0.03	19	17.0	11.5	7.5	5.8	0.02	0.055	0.005	**0.664 (15.9)!**
Mn**	7.7	8.55	0.35	15	10.0	12.5	7.7	9.6	0.195	0.87	0.48	**5.704 (8.57)!**
Mo	0.01	0.001	0.01	0.001	0.010	0.001	0.01	0.001	0.01	0.001	0.005	0.01+
F	1.6	1.35	0.5	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.05	1.5+++
Ni	0.69	0.845	0.039	0.29	0.52	0.71	0.27	0.34	0.041	0.085	0.24	**0.5509**
Pb	0.005	0.0075	0.002	0.001	0.001	0.001	0.003	0.004	0.002	0.002	0.004	0.005
Se	0.007	0.006	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005
Zn	1.2	1.4	0.04	0.051	0.048	0.070	0.096	0.11	0.06	0.088	0.65	**0.908**

*Pre-placement October, 2012 to August, 2013; post-placement September, 2013 to August, 2014

^Bore D10 samples groundwater flowing from underground coal mine goaf areas and D11 samples open-cut mine area under Mt Piper ash placement.

^^ Bore D1 samples groundwater seepage from the northern Mt Piper brine/ash placement, groundwater flows from Huon Gully, including any seepage from the Lamberts North placement in Huon Gully

^^^D19 groundwater mine spoil/coal waste background median for October, 2012 to August, 2013

Notes:

**filtered samples for iron and manganese

*** Acidic pH is due to mineralised coal geology of the area and mine spoil and chitter or washery waste containing pyrites

ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water apply to groundwater receiving water bores D8 & D9.

Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Ca, Mg in GCB 147, 113 mg/L:

Local guidelines using 90th percentile of pre-placement data in **bold**

! Lamberts North from pre-placement baseline data October 2012 to August, 2013 at MPGM4/D9 in **parenthesis**, which do not apply to bores D10 or D11

+ irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water

Highlights: Blue: > ANZECC/local guidelines, Yellow: post-median > 90th pre-placement baseline; Green: post-placement 90th > pre-placement 90th percentile, Voilet: D1, D8 or D9 median > D19 median of Mine Spoil/ coal Waste background

Table 3 shows the following changes and water quality characteristics during the pre- to post-placement period. Any changes potentially related to the Lamberts North placement are indicated:

- The ANZECC groundwater guideline values or local goals are used as a guide at the Mt Piper background bores, D10 and D11, for inflows to Huon Gully. They were exceeded for chloride, conductivity, dissolved solids and sulphate at these bores. The chloride concentrations indicate that most of the salts likely came from brine leachates.

  Some trace metals exceeded the guideline values or local goals. They were boron, iron and manganese (typically high in coal mine water) at both bores D10 and D11, and for cadmium, fluoride, nickel, selenium and zinc at bore D10 only. The barium concentration was only high at D11 at 0.85 mg/L during the pre-placement period but the concentration decreased during the post-placement period. The high concentration suggests its source may be the local coal mine water flowing under the ash placement. The high nickel and zinc concentrations at D10 and D11 (Table 2) also appear to be from local coal mine water[23]. The potential for the mine water to be enriched with brine conditioned ash leachates, mine spoil leachates as well as water conditioned ash rainfall runoff cannot be confirmed without installation of a bore/s to sample the current underground mine water inflows to the groundwater sampled by bores D10 and D11.

  The elevated selenium at D10 was most likely due to rainfall runoff from the water conditioned ash entering the local groundwater.

  There were significant increases between the pre- and post-placement periods at the D10 and D11 bores for all the salts at both bores and for most of the trace metals at D10. A significant increase for arsenic at D11 triggered an early warning trend (post-median > 90th pre-placement baseline), as did the increase for zinc.

- The seepage detection bore, D1, showed increases and exceedances for the same salinity characteristics as the Mt Piper bores, indicating the effects of their inflows to Huon Gully from the groundwater under the Mt Piper placement and migrations through or under the Lamberts North site to D1.

  Elevated trace metal concentrations were recorded for boron, iron and manganese. During the post-placement period, nickel increased to be above the local goal and the zinc increase highlighted an early warning trend. As the nickel and zinc increases correspond with the high concentrations and increases at bore D10, the post-placement increases for these metals at D1 are most likely due to the groundwater inflows from under the Mt Piper placement.

  Arsenic at D1 was higher than at the mine spoil/coal waste background at D19 and was also higher than at D10. However, although the arsenic increase at D11 noted above was significant, it was still lower than at D1. This suggests that the higher arsenic levels at D1 may have originated from the Lamberts North site and is discussed further in Section 3.4.2.

  Barium at D1 was also higher than at the D19 mine spoil/coal waste background during the pre- to post-placement periods but was lower than at the D11 bore. This suggests that inputs

[23] These elements are present in the local mineralised coal geology of the area and are mainly due to the placement of mine spoil and chitter or washery waste in the catchment. Chitter/washery waste contains pyrites, which release sulphate and trace metals into the local groundwater and surface waters.

from groundwater flowing from under the Mt Piper ash placement, which is also sampled by D11, may be the source of barium at D1.

- The results for bore D9 showed that all of the salts with elevated concentrations at the Mt Piper bores also increased during the post-placement period, but with lower concentrations due to attenuation as the groundwater moved down-gradient to the receiving water bores and Neubecks Creek. The increases triggered an early warning trend for conductivity and chloride and resulted in exceedances of the local goals for salinity and sulphate.

  As occurred at the Mt Piper D10 and D11 bores, as well as at the D1 bore, boron and manganese at D9 (but not iron which was lower than the Lamberts North baseline) were elevated, indicating effects of the mine water inflows as far down-gradient as D9.

  Both barium and nickel were both higher at D9 than at the D19 mine spoil/coal waste background, indicating that mine water enriched with leachates from Mt Piper had flowed from D1 to the lower groundwater level at D9. Table 3 shows that while the nickel concentration decreased from D1 to D9, barium increased. This suggests that the Lamberts North site did not add significantly to the nickel concentrations and that diluting groundwater from the surrounding area was low in nickel. The increase in barium is investigated further in Section 3.4.1.

- All of the ANZECC groundwater guideline values and local goals were met at bore D8. The increases from pre- to post-placement for salts, including chloride, and for iron, manganese and zinc were highlighted by the post-placement 90th percentiles being greater than the pre-placement 90th percentiles. This indicates increases in the spikes of concentrations in the groundwater, most likely due to inflows from Mt Piper.

  Barium at D8 was lower than at D9 but higher than for the D19 mine spoil/coal waste background. This was unexpected because the bore is on the northern side of Neubecks Creek. This suggests a higher, local source of barium, which is investigated in the next Section.

3.4 Examination of Barium and Arsenic as Tracers for Lamberts North Ash

This Section examines whether arsenic and barium concentrations at bore D1 represent leachates from the Lamberts North ash placement, the compacted mine spoil under the ash or have originated from the local coal mine groundwater containing leachates from the large spoil/coal waste deposit south of Huon Gully.

3.4.1 Barium

As Figure 5 shows that the groundwater level rise at bore D1 is related to that at D10, and the high concentrations at D11 (Table 3) indicate that barium is from the groundwater flows from under the Mt Piper ash placement. Hence, the long-term changes in barium and the groundwater levels at D1 from January/February, 2009 are compared in Figure 7.

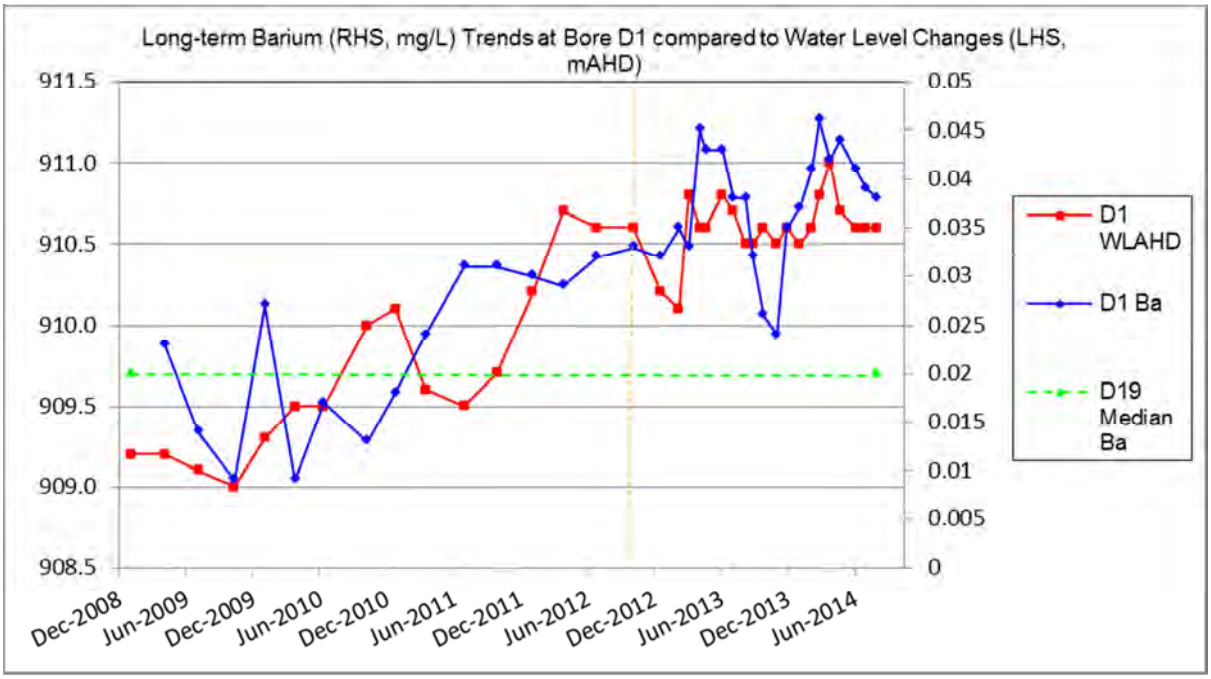

Figure 7. Long-term Barium and Groundwater Elevation changes at bore D1 from January, 2009. Pre-placement water quality monitoring began in October, 2012 (vertical line) and post-placement from September, 2013 to August, 2014

Figure 7 shows that the barium concentrations increased as the groundwater level rose at D1. As the increases occurred before ash placement began in September, 2013, it is reasonable to conclude that the source is not from the Lamberts North ash placement. However, it is possible that the barium may have been leached from the mine spoil placed in Huon Gully as the groundwater level rose. This depends upon the groundwater flow direction from the Lamberts North area to be in the direction of D1 (see Figure 6), but the actual flow direction is uncertain, as there are no monitoring bores within the ash deposit. In addition, the increased variability of barium since March, 2013 appears related to the dry weather and intermittent rainfall patterns since then (see Figure 3), indicating that barium was being leached from some local source.

Figure 7 also shows that the barium mine spoil/coal waste background at D19 of 0.020 mg/L has been consistently exceeded since April, 2011, indicating mine spoil leaching or a higher source, up-gradient of D19 and Huon Gully. Figure 6 shows that, of the four bores south of Huon Gully, D18 is the closest to the gully. Hence, the barium data in Attachment 1 for that bore was examined. Although the flow direction at this bore in unknown, the water quality may provide an indication of local mine spoil/coal waste leachates into the groundwater sampled by bore D11 and its flow-on effects to D1 and toward Neubecks Creek.

The D18 barium concentrations varied from 0.32 to 0.94 mg/L during the Lamberts North pre- to post-placement period and averaged 0.465 mg/L, which is about twice that at D19 (Table 3). These observations suggest that the mine spoil/coal waste deposits in the area are a potential source of barium, and accordingly, barium is not a suitable tracer for the water conditioned ash at Lamberts North.

3.4.2 Arsenic

The long-term changes in arsenic are compared to the groundwater level changes at bore D1 in Figure 8.

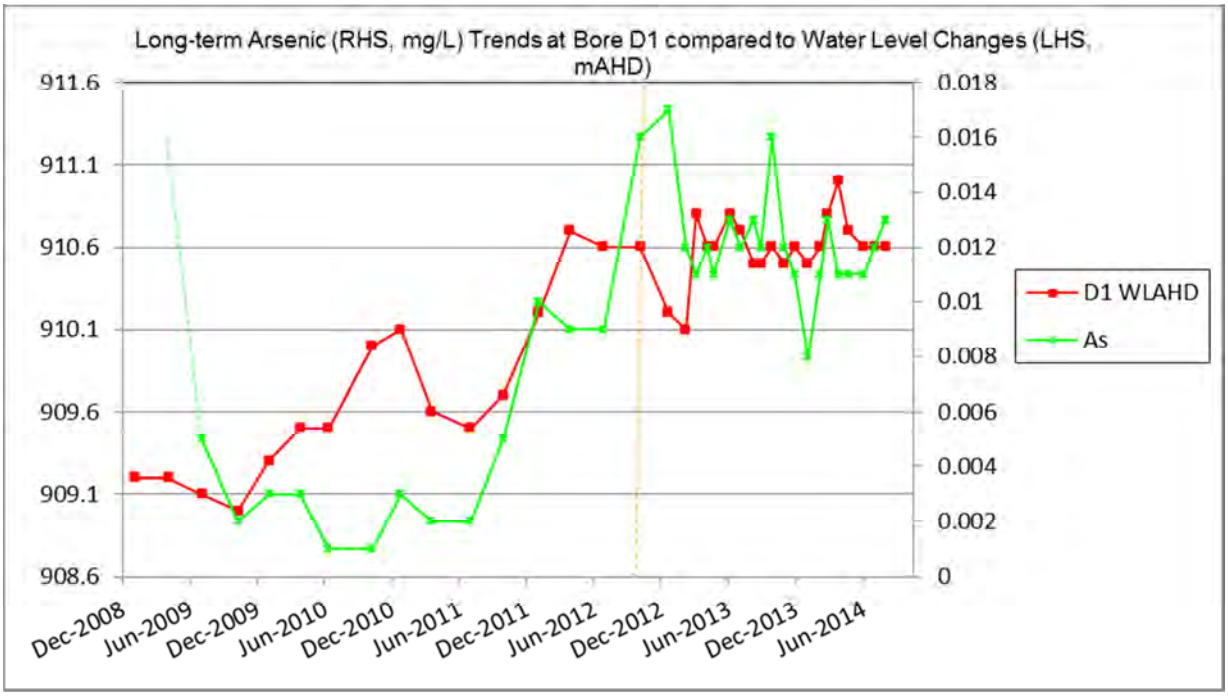

Figure 8. Arsenic and Groundwater Elevation changes at bore D1 from before beginning of Pre-placement water quality monitoring in October, 2012 (vertical line) to August, 2014 (Note: in January and April, 2009 the arsenic concentration was 0.022mg/L (off the graph) and 0.016 mg/L; shown as dashed line)

Figure 8 shows that the arsenic concentrations were much higher in early 2009 than the current concentrations of 0.012 mg/L. The concentrations decreased to low levels from July, 2009 to October, 2011, apparently due to the dry weather (see Figure 3) and began to follow the rise in groundwater level from January, 2012. The peaks in October, 2012 and January, 2013 may have been related to site preparation but significant rainfall in January and February, 2013 may have been the cause of the reduced concentrations to about 0.012 mg/L. Since then, arsenic concentrations have varied around that concentration up to August, 2014.

These observations indicate that the arsenic source is not from the Lamberts North ash because the increases occurred before placement began in September, 2013. In addition, Table 2 shows that the runoff collection ponds and mine spoil leachates are low in arsenic, as is the groundwater sampled by bore D19 in mine spoil/coal waste deposits (Table 3). This suggests a higher source up-gradient of D19 and Huon Gully, such as the mine spoil/coal waste deposits south of the gully.

The arsenic data in Attachment 1 for bore D18 was examined and concentrations varied from 0.007 to 0.056 mg/L during the Lamberts North pre- to post-placement period and averaged 0.022 mg/L, which is about twice that measured at bore D1 (Table 3). These observations suggest that the mine spoil/coal waste deposits in the area are a potential source of arsenic. Accordingly, arsenic is not a suitable tracer for the water conditioned ash at Lamberts North. This is expected to be confirmed by monitoring bores installed in the northern embankment wall of the ash placement area.

These findings mean that there is no suitable tracer for the cooling tower blowdown water conditioned ash placement at Lamberts North due to the overriding effects of groundwater inflows from under the Mt Piper ash placement into Huon Gully.

3.5 Neubecks Creek Surface Water Quality

The water quality at the three sampling sites in Neubecks Creek (see Figure 2) are summarised in Table 4. As the aquatic life in Neubecks Creek is required to be monitored, turbidity, nutrients, dissolved oxygen and temperature have been added to the monitoring characteristics at the three sites in Neubecks Creek. The pre-and post-placement median and 90th percentile concentrations, at each sampling site and for each characteristic measured, are shown in Attachment 1. The concentrations for filtered aluminium, copper and zinc are also shown in Attachment 1.

The local goals at WX22 were increased for copper and nickel (shown in parenthesis and bold) for the Lamberts North placement using the pre-placement 90th percentile baseline data from October 2012 to August, 2013 at WX22[24].

Parameters with higher concentrations than the ANZECC or local guidelines, during and before the ash placement began in September, 2013, are highlighted in blue. Parameters triggering investigations of the causes (post-median greater than baseline) and are highlighted in yellow. Elements with spikes in concentrations above the background are highlighted by comparison of the post-placement 90th percentiles with the pre-placement 90th percentiles and are shown as green.

As there is no tracer characteristic of potential leachates from the Lamberts North ash placement, changes in the water quality and trace metals at the Neubecks Creek receiving water site (WX22), from pre- to post-placement, highlighted in Table 4, have been examined for possible causes. These include:

- Inputs of mine water from Huon Gully apparently enriched with chloride from brine leachates reaching bores D1, D9 and D8, and
- Inputs from local coal mine seepage, upstream of site WX22, after rainfall events and upstream coal mine discharges and surface emplacements.

[24] Concentrations used for the goals are measured on unfiltered samples to be consistent with the ANZECC and local environmental goals in Table 1.

Table 4: Median Surface Water Quality for Neubecks Creek at Mt Piper Holding Pond Background Licence Discharge LDP01, Lamberts North NC01 Background and the Receiving Water Site WX22 Compared to ANZECC Surface Water Guidelines or Local Goals (including Lamberts North Pre-placement 90th Percentiles)

Element (mg/L)	Neubecks Creek Surface Water Monitoring						Surface Water Guidelines or Goals#
	Mt Piper Holding Pond Background		Lamberts North Ash Placement Background		Surface Water Receiving Water Site		
	Pre-LDP01 Background Oct, 2012 – Aug 2013**	Post-LDP01 Background Sept, 2013 – Aug 2014**	Pre-NC01 Background Oct, 2012 – Aug 2013**	Post-NC01 Background Sept, 2013 – Aug 2014**	Pre-WX22 Oct, 2012 –Aug 2013**	Post-WX22 Sept, 2013 – Aug 2014**	
pH	7.5	7.8	7.1	7.1	7.3	7.0	6.5 – 8.0
Cond/ (uS/cm)	440	460	310	455	620	640	2200
TDS	290	300	170	245	390	430	1500^
SO4	120	120	73	105	210	255	1000 ++
Cl	12	11	10	12	26	29	350 +
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.024
B	0.05	0.06	0.05	0.05	0.16	0.105	0.37
Ba	0.029	0.031	0.029	0.035	0.032	0.035	0.7+++
Cd	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00085
Cr	<0.001	0.002	<0.001	0.002	<0.001	0.002	0.002
Cu**	0.008	0.006	0.002	0.001	0.002	<0.001	0.0035 **(0.005)!**
Fe*	0.02	0.02	0.06	0.1	0.04	0.03	0.3+++
Mn*	0.034	0.001	0.19	0.335	0.55	0.415	1.9
Mo	<0.01	0.002	0.01	0.001	<0.01	<0.001	0.01+
F	0.2	0.2	0.2	0.1	0.1	<0.2	1.5+++
Ni	<0.01	0.006	0.005	0.004	0.0155	0.021	0.017 **(0.051)!**
Pb	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.005
Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005
Zn**	0.04	0.032	0.026	0.025	0.026	0.032	**0.116**
Turbidity	28	12	17	7.6	3.6	2.3	10 **(19.0)!**
DO	-	-	7.5	5.6	10.1	-	-
TN	-	-	0.45	0.5	0.35	0.35	0.250 **(0.55)!**
TP	0.020	0.010	0.02	0.1	0.01	0.01	0.020**(0.030)!**
Temp	-	-	-	-	-	-	-

* filtered samples for iron and manganese

** See Attachment 1 for aluminium, copper and zinc tested on filtered samples

^ River salinity from 0.68 x 2200 uS/cm low land river conductivity protection of aquatic life

ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water. Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Ca, Mg in Neubecks Creek 19.7, 11.8 mg/L, respectively. Local guidelines using 90th percentile of pre-placement data in **bold**

! Lamberts North pre-placement 90th percentile from October 2012 to August 2013 data at WX22 and NC01 in **parenthesis** (does not apply to LDP01)

+ irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water

Highlights: Blue: > ANZECC/local guidelines, Yellow: post-median > 90th pre-placement baseline; Green: post-placement 90th > pre-placement 90th percentile,

Table 4 shows the following changes and water quality characteristics during the pre- to post-placement period:

- Other than copper and turbidity at the upper Neubecks Creek background site, LDP01, all the ANZECC groundwater guideline values or local goals were met at all the sampling sites. As copper was not elevated at the site further down-stream at NC01, the higher copper at LDP01 appears to be from a local, upper Neubecks Creek source.

- At NC01, the manganese concentration increased and triggered an early warning trend. Salinity, chloride, boron, barium, nickel and zinc all showed recent increases in spike concentrations at NC01. The increased spikes in concentrations were highlighted by the post-placement 90th percentiles being greater than the pre-placement 90th percentiles. The salinity increases are related to the increasingly dry weather (see Figure 3 and Figure 9). The stream flow data at the Department of Water NSW gauge 212055 showed that there was no flow in the creek in January and February, 2014. Water quality sampling of the stagnant pools at WX22 at these times meant that the water quality and trace metal concentrations were artificially high.

  Boron and manganese, are typically associated with local coal mine groundwater seepage into the creek after rainfall events. As well as indicating local mine water seepage into the creek, the barium increase at NC01 may also indicate runoff from the large area of mine spoil used to cap the northern area of the Mt Piper ash placement (see arsenic in Table 2 and Figures 1 and 2). There was no increase in barium further downstream at WX22 (see below).

  The increasing trend in spikes of nickel and zinc appears to be related to local mine groundwater inflows to Neubecks Creek under the conditions of increasingly dry weather.

- The salinity, sulphate and chloride spike increases at WX22 are also related to the dry weather conditions (see Figure 9). The higher concentrations, compared to those at LDP01 and NC01, are most likely due to inflows from Mt Piper via Huon Gully. Their concentrations remained below the local ANZECC trigger values due to continuing flows in Neubecks Creek at the stream gauge, as well as during the cease to flow period in January and February, 2014.

  As for NC01, the trends in spikes of nickel and zinc at WX22 are most likely are due to local inflows during dry weather (see Figure 10). The nickel concentrations at WX22 are higher than at both the background sites, indicating groundwater inflows from Mt Piper via Huon Gully (see Table 3 for zinc at the D10 and D11 groundwater bores). However, the nickel concentration remained lower than the pre-placement baseline.

  In contrast, the concentration of zinc at WX22 is similar to that at the background sites, so the increased spikes in concentrations appear related to local mine groundwater seepage during dry weather.

Sampling in Neubecks Creek when there is no flow may cause changes to be assigned to the ash placements. Accordingly, it is suggested that EnergyAustralia NSW request the water quality samplers to indicate when there is no flow at the WX22 sampling site.

In the absence of water quality or trace metal tracers for the Lamberts North ash, the complex interactions between the various other sources is demonstrated by the changes in salinity (conductivity), chloride (tracer of Mt Piper brine leachates) and barium (mine spoil and coal waste tracer). These characteristics, together with the rainfall in the catchment, are used in Figures 9 and 10

to examine the causes of changes in salinity and the trace metals nickel and zinc from pre- to post-ash placement at the WX22 receiving water site.

The trend for increase in spikes of salinity at WX22 since October, 2012 is investigated in Figure 9.

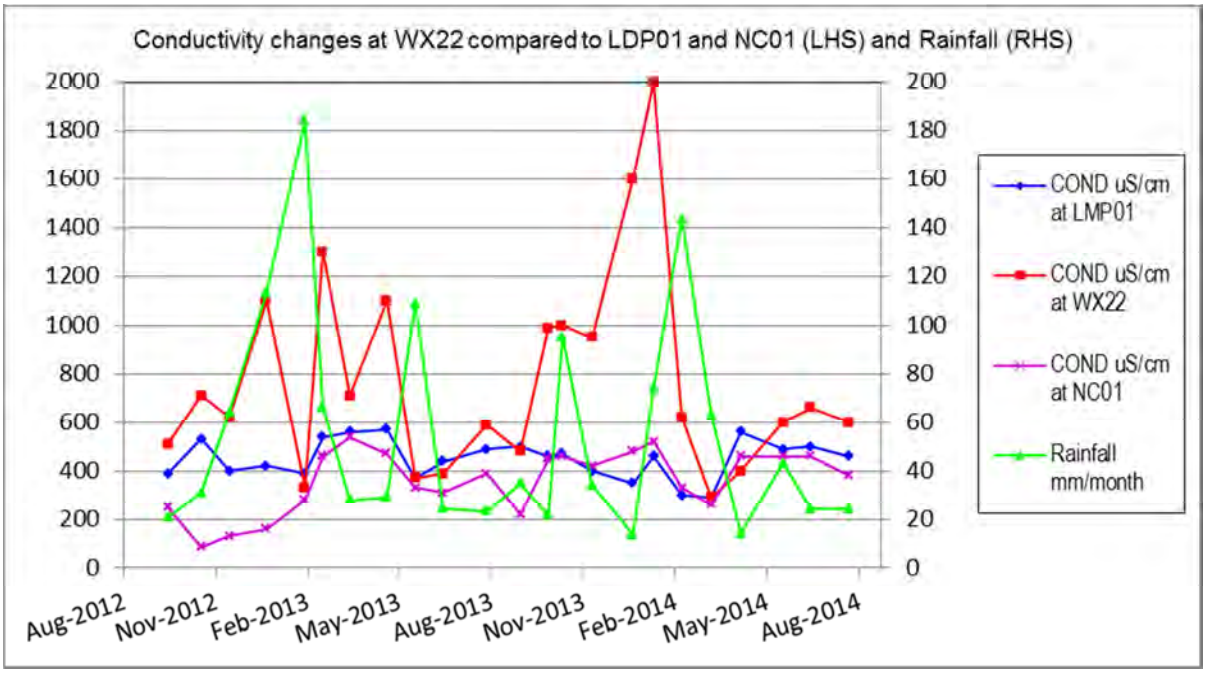

Figure 9. Trends in Salinity (Conductivity) in Neubecks Creek compared to Rainfall from October, 2012 to August, 2014

The salinity (represented here by conductivity) tended to increase during dry weather and be reduced by rainfall events such as in February and June, 2013 and March, 2014. The increase during January and February, 2014 occurred because the creek ceased to flow. However, the March, 2014 rainfall event reduced the conductivity to its normal level of about 600 uS/cm for the remainder of the monitoring period.

Figure 10 examines the effects of rainfall on concentrations of salinity (represented by chloride), barium, nickel and zinc at WX22.

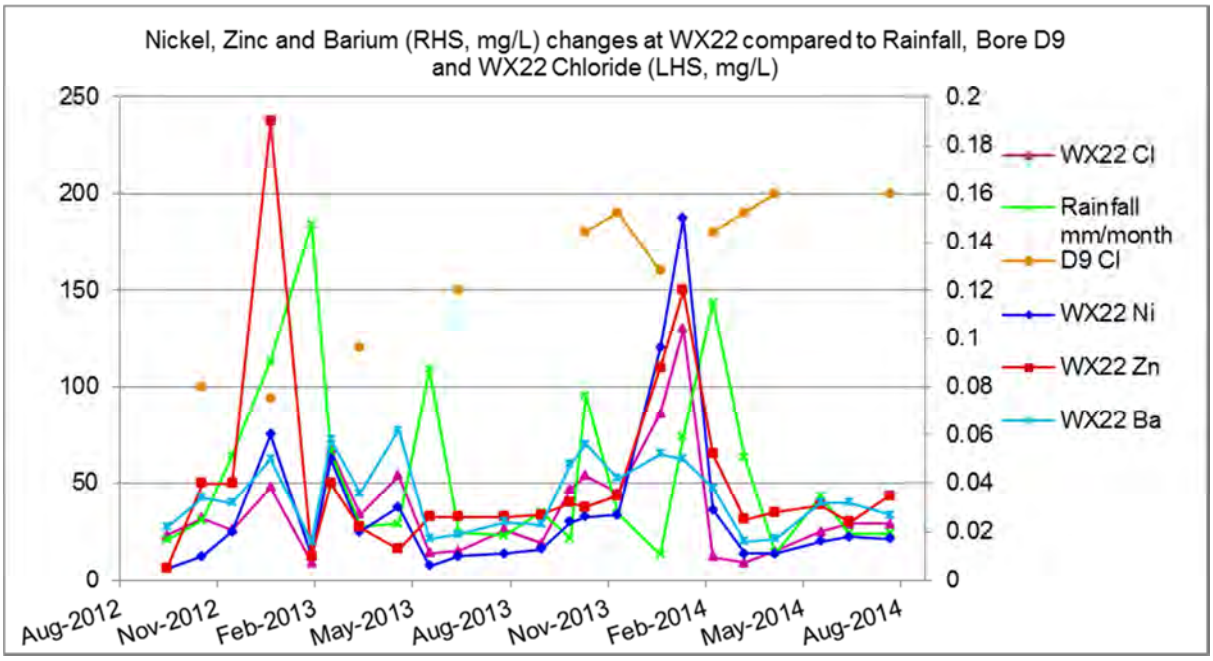

Figure 10. Trends in Nickel and Zinc concentrations at the Neubecks Creek Receiving water Site WX22 compared Chloride at Bore D9 and WX22 and changes in Barium and Rainfall

The rainfall event of January, 2013 (113 mm/month) and February, 2013 (184 mm/month) caused the zinc to increase to its highest level of 0.190 mg/L with a moderate increase in chloride. The zinc increase was higher than that expected from the local groundwater at bore D9 (Table 3), indicating additional inputs to the creek, above that from Mt Piper, during the rainfall event. These additional inputs are most likely from local coal mine groundwater, mine spoil and surface emplacements because barium increased to its highest level at this time (not counting the ceased to flow period in January and February, 2014).

The nickel concentration also increased to its highest level of 0.060 mg/L in January, 2013 (also not counting the ceased to flow period). The nickel concentrations at bore D9 are higher than in coal washery wastes/mine spoil at D19 (Table 3) and much higher than at D18 (Attachment 1), so it is likely that most of the nickel increase originated from the groundwater inflows to Huon Gully from under the Mt Piper ash placement.

The continued, higher rainfall in February, 2013 diluted the chloride and trace metals, which slightly recovered only to be reduced again by the June event. When the creek ceased to flow in January and February, 2014, sampling of the stagnant water at WX22 showed high concentrations of chloride and trace metals. This was the cause of the detected increased spikes in concentrations for salinity, nickel and zinc in Table 4.

The changes shown during the relatively short pre- to post-placement period demonstrate that the complexity and intermixing of the various trace metal sources means that it is not possible to determine whether or not the Lamberts North ash placement has affected the local groundwater or Neubecks Creek. This is discussed further in Section 4 and changes to the monitoring program are suggested to improve the ability to assess the potential effects, if any, of the Lamberts North ash placement.

3.6 Aquatic Life Monitoring

To assess the effects of leachates on aquatic life, monitoring for macroinvertebrates was undertaken in Neubecks Creek at sites near the OEMP nominated water quality sites, upstream (near NC01) and downstream of Huon Gully (near WX22), by GHD (2014). The study found that the water quality in the creek was such that the AUSRIVAS model predicted the macroinvertebrate community to be in 'reference condition' (Band A). This indicated the water quality had not been degraded by land use change within the catchment or inputs from Mt Piper or the Lamberts North site. These findings are consistent with the water quality and trace metal concentrations meeting the local and ANZECC trigger values at NC01 and at the receiving water site, WX22.

Although AUSRIVAS model predicted the macroinvertebrate community should be in good condition, the riffle habitat monitoring showed that they varied from 'severely' (Band C), or 'significantly impaired' (Band B) to 'reference condition' (Band A). The lower ratings were due to the effects of low stream flows in the creek causing limited riffle habitat to be present at both sites. Due to this effect, the macroinvertebrates were reduced to taxa tolerant of physical and chemical stressors, similar to those experienced by waterways in impacted, urban catchments.

Sampling at the edge habitat showed similar variability at both sites, ranging from 'reference condition' (Band A) to 'significantly impaired' (Band B). This was caused by erosion of the banks during high flows following significant rainfall events in the catchment, as well as possible flushing of the macroinvertebrates out of the sampling sites by the high flows.

Due to the prevailing conditions in the creek, no significant difference in macroinvertebrate community composition was found between the upstream and downstream sites.

The need for this monitoring is suggested to be reviewed after the groundwater levels inside the ash placement area are known and the potential effects on receiving waters are better understood.

4. Discussion

Any effects on local surface and groundwater from the Lamberts North water conditioned ash site could not be distinguished from the current Mt Piper effects described in Aurecon (2014). Accordingly, as no adverse effects of the Lamberts North site could be identified, no ameliorative measures are indicated.

In addition, the complex interaction between the various sources influencing water quality and trace metals, including from Mt Piper, abandoned coal mine groundwater and the local mine spoil/coal waste concentrations, it is suggested that the Lamberts North site be assessed as part of a wider, combined Mt Piper/Lamberts North ash placement area.

This approach appears to have been contemplated at the time of the Environmental Assessment for Lamberts North by SKM (2010) titled “Mt Piper Power Station Ash Placement Project”. It is understood that, as the ash level rises from the current levels shown in Figure 1, it is planned to join the ash placement with the water conditioned ash at the eastern end of the Mt Piper area. Hence, it is suggested that EnergyAustralia NSW seek approval from the Department of Planning and Environment to have the Lamberts North site water quality assessment included as part of the wider Mt Piper ash placement.

If the two sites are assessed as one, it would still be desirable to have some knowledge of the water quality and groundwater levels inside the ash placement area. To facilitate this, suggested changes to the water quality monitoring for the Lamberts North site are discussed in the next Section.

4.1 Proposed changes to Water Quality Monitoring

To improve the ability to assess the Lamberts North site separately from the Mt Piper ash placement (until they are physically joined together), the following changes to the monitoring program are suggested:

- Install two internal groundwater piezometers in the northern ash placement embankment to indicate the groundwater height and water quality within the Lamberts North site. One of the piezometers could sample the groundwater at the level of the interface of the ash base and mine spoil underneath (approximately RL919m) and the other to sample the groundwater at the level of the base of the compacted mine spoil placed above RL901m in Huon Gully.

  These piezometers are expected to enable a comparison of the water levels in the ash placement area with that at bore D1, and also show if the ash placement is subject to leaching by groundwater flowing through Huon Gully.

- Install a background monitoring bore for the Lamberts North site to sample the local underground coal mine water inflows to Huon Gully. The current sampling of the mine water seepage point on the southern Huon Gully embankment (see Figure 6) is infrequent and unplanned. Installation of a permanent bore could provide regular monthly monitoring and allow the contribution of this source of water quality and trace metals to be taken into account at the Mt Piper bores, as well as at bores D1, D8 and D9, and in Neubecks Creek.

- Re-drill bores MPGM4/D15, D16, D17 and D18 to sample the groundwater in the coal washery wastes/mine spoil in the area south of Huon Gully. These new bores are to be

installed to provide certainty of the water quality and trace metal data, as well as the groundwater levels in the area to determine if the groundwater flows into or away from Huon Gully.

As part of the re-drilling program, install a monitoring bore near the coal washery waste ponds between bores D15 and D18 (see Figure 6). This is expected to provide an understanding of the contribution of the southern part of the Lamberts North site, now abandoned, coal mine and washery workings on the water quality and trace metals in Huon Gully.

EnergyAustralia NSW has advised Aurecon that there were some inconsistencies in the Operation Environmental Management Plan's surface and groundwater quality monitoring program, so the monitoring implemented by them may not be the same as in the OEMP. Accordingly, it is suggested that EnergyAustralia NSW have the OEMP updated to match the monitoring undertaken during the first year, together with the above suggested changes for groundwater bores and data quality in Section 2.8.1.

Due to the current inflows of coal mine groundwater into Huon Gully, most likely enriched with brine and water conditioned ash leachates, it is suggested that the Mt Piper UTS groundwater model (Merrick, 2007) be re-run. The model is expected to make clearer any potential effects of the combined sites on water quality in the receiving waters and better inform any necessary management actions. Hence, the model re-run is suggested to include the extended area of Lamberts North to provide an indication of the overall effects on receiving waters.

Due to the changes made to the situation in Huon Gully, it is suggested that the model re-run be undertaken after the groundwater inflows to Huon Gully, from under the Mt Piper ash placement and rainfall runoff from the water conditioned ash have been managed. The timing of the re-run is suggested to be decided after the groundwater levels inside the ash placement area are known.

The UTS model predicts the salinity and chloride plume distribution and the final water quality and trace metal concentrations at the receiving water groundwater bores and at WX22 in Neubecks Creek. It would have to be reformulated to take into account removal of the groundwater collection basin in the now filled Huon Void. Data obtained from the groundwater bores recommended above, could be included in the model so the effects of inflows of underground coal mine groundwater, coal washery wastes and mine spoil are not assigned to the extended site. These model predictions are expected to provide guidance in separating the potential effects of the ash placement areas from that of the highly mineralised, background conditions in the area.

The finding of the aquatic life study in Neubecks Creek of no significant differences between the upstream background site and at the Lamberts North downstream site, WX22, is consistent with the water quality and trace metal concentrations meeting the local and ANZECC trigger values at the receiving water site, WX22. The need for this monitoring is suggested to be reviewed after the groundwater levels inside the ash placement area are known and the potential effects on receiving waters are better understood.

5. Conclusions

The review of the 2012 to 2014 surface and groundwater monitoring undertaken for the Lamberts North ash placement has shown that the monitoring could not distinguish the potential effects, if any, of the Lamberts North water conditioned ash placement from those from other sources. Nor has it been possible to reconcile groundwater level changes at the seepage detection bore MPGM4/D1, down-gradient of Huon Gully, with potential water level changes inside the ash placement area.

It is concluded that four new groundwater bores/piezometers could be installed after an investigation into the appropriate locations has been undertaken. In addition it was concluded that the four bores in the coal washery waste/mine spoil in the area south of Huon Gully be re-drilled after an investigation into the appropriate depths and screen placements has been undertaken to allow:

- Measurement of the groundwater level in the ash placement area to determine if the ash is subject to leaching by groundwater flowing through Huon Gully
- Measurement of the background groundwater quality in the underground coal mine groundwater, coal washery wastes and mine spoil areas so that their contributions are not assigned to Mt Piper, Lamberts North or the receiving waters.

This first annual report of the water quality and trace metal data has confirmed that the local and ANZECC (2000) guidelines in the receiving waters of the MPGM4/D8 and D9 groundwater and Neubecks Creek at WX22 have been met, other than salinity, manganese and sulphate at bore D9. Elevated salinity, manganese and nickel concentrations at the groundwater seepage detection bore, D1, were concluded to be due to underground mine water inflows to Huon Gully from under the Mt Piper placement, enriched with salts, most likely from brine leachates. The concentrations were attenuated as they continued down-gradient to the receiving water bores and Neubecks Creek. The acceptable levels of water quality and trace metals at WX22 are consistent with the aquatic life study, which found no differences in macroinvertebrates at the upstream and downstream sampling sites.

6. Recommendations

From the review of water quality data collected in 2012 to 2014, the following recommendations are made for the water conditioned ash placement at the Lamberts North ash storage area:

- Install two groundwater piezometers in the northern embankment wall of the Lamberts North site for sampling the groundwater height and water quality
- Install a background monitoring bore for the underground coal mine water inflows to Huon Gully
- Re-drill bores MPGM4/D15, D16, D17 and D18 after an investigation into the appropriate depths and bore screen depths required to sample the local mine spoil and coal wahery waste leachates
- Investigate the requirement to install a monitoring bore near the coal washery waste ponds south of Huon Gully
- Update the OEMP to align with the monitoring undertaken by EnergyAustralia NSW in 2012 to 2014, to include any new groundwater bores that are established, and to have all water quality characteristics in Neubecks Creek monitored with detection limits that are lower than the ANZECC (2000) guidelines for protection of aquatic life
- Finalise the necessary groundwater investigations so the University of Technology Sydney (UTS, Merick, 2007) Mt Piper groundwater model can be re-formulated and re-run, if required, including the Lamberts North area.

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Attachment 1

Surface and Groundwater Data for October, 2012 to August, 2014

1. a) Water Quality Data and Summary for Neubecks Creek WX22 and

   b) Mt Piper Power station Licence Discharge Point LDP01 with

   c) Neubecks Creek background site for Lamberts North NC01

2. Water Quality Data and Summary for Mt Piper Groundwater Receiving Water Bores and MPGM4/D8 and MPGM 4/D9

3. Water Quality Data and Summary for Mt Piper Groundwater Seepage Detection Bore MPGM4/D1

4. Water Quality Data and Summary for Mt Piper Ash Placement Area Groundwater Bores MPGM4/D10 and MPGM4/D11

5. Water Quality Data and Summary for Lamberts North Groundwater Bores MPGM4/D15, MPGM4/D16, MPGM4/D17, MPGM4/D18 and MPGM4/D19

6. Lamberts North Water Conditioned Ash Runoff Pond Water Quality October, 2012 to July, 2014 for Ponds LN1 and LN2 and mine water seepage

1. Water Quality Data and Summary for Neubecks Creek WX22 and Lamberts North Power station Licence Discharge Point

1a. Water Quality Data and Summary for Neubecks Creek WX22

Pre-Water conditioned ash Placement - Background Summary Data in Neubecks Creek at WX22 October, 2012 - August, 2013 (mg/L)																					
	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.11	0.01	68.0	0.001	0.18	0.034		50	0.0002	32		703	0.001		0.003	0.001	0.18	0.07	<0.00005	7	
Maximum	<0.001	0.61	0.01	86.0	0.001	0.47	0.062		83	0.0002	67		1300	0.002		0.009	0.003	0.70	0.32	<0.00005	11	
Minimum	<0.001	0.02	<0.01	51.0	<0.001	0.06	0.016		26	<0.00002	9		330	<0.001		<0.001	<0.001	<0.01	0.02	<0.00005	4	
90th Percentile	<0.001	0.21	0.01	85.0	0.001	0.28	0.058		81	0.0002	54		1100	0.001		0.005	0.002	0.38	0.07	<0.00005	9	
Pre-50th Percentile Trend	<0.001	0.06	0.01	61.0	0.001	0.16	0.032		48	0.0002	26		620	0.001		0.002	0.001	0.10	0.04	<0.00005	6	
ANZECC 2000	0.00005	0.055	0.055		0.024	0.370	0.700			0.00085	350		2200	0.002		0.0035 **(0.005)**		1.5	0.3	0.00006		

Continued…….. Neubecks Creek summary data at WX22 October, 2012 - August, 2013 (mg/L)																					
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	TDS	TFR	Turbidity	V	Zn	Zn-f	DO	Temp
Average	35	0.83	0.007	48		0.023	<1	<0.5	0.41	0.001	7.2	0.01	0.002	253	455		6.22		0.040	0.012	10.8	
Maximum	63	3.30	0.010	110		0.060	<1	<0.5	0.70	0.003	7.6	0.02	0.002	570	880		31.00		0.190	0.040	15.3	
Minimum	15	0.14	<0.001	22		0.006	<1	<0.5	0.35	<0.001	6.8	<0.001	<0.002	86	210		1.50		0.005	0.005	8.2	
90th Percentile	62	1.50	0.010	76		0.051	<1	<0.5	0.50	0.002	7.5	0.01	0.002	450	800		9.10		0.040	0.022	14.2	
Pre-50th Percentile Trend	31	0.55	0.010	40		0.0155	<1	<0.5	0.35	0.001	7.3	0.01	0.002	210	390		3.60		0.026	0.007	10.1	
ANZECC 2000		1.900	0.010		10.0	0.017 **(0.051)**		0.015	0.250 **(0.55)**	0.005	6.5-8.0	0.020 **(0.030)**	0.005	1000	1500	10.0 **(19.0)**	10.0		0.116			

Neubecks Creek WX22 Water conditioned ash Placement Water Quality Data October 2012 to August 2014

Sample Date	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li	Mg:	Mn
12/10/2012	<0.001	0.07	0.01	61	<0.001	0.14	0.022		35	<0.0002	23		510	<0.001		0.002	0.001	0.1	0.32	<0.00005	6		23	0.23
14/11/2012	<0.001	0.04	<0.01	79	0.001	0.21	0.034		49	0.0002	32		710	0.001		0.002	0.002	0.05	0.07	<0.00005	6		33	0.55
12/12/2012	<0.001	0.06	0.01	86	0.001	0.16	0.032		49	<0.00002	26		620	0.001		0.001	0.001	0.3	0.07	<0.00005	7		33	0.66
17/01/2013	<0.001	0.61	<0.01	56	0.001	0.16	0.05		76	0.0002	48		1100	0.001		0.009	0.001	0.7	0.03	<0.00005	9		63	0.45
24/02/2013	<0.001	0.07	0.01	55	0.001	0.07	0.016		26	0.0002	9		330	0.001		0.002	0.001	0.1	0.07	<0.00005	4		15	0.61
14/03/2013	<0.001	0.02	0.01	80	0.001	0.47	0.058		81	0.0002	67		1300	0.001		0.004	0.003	<0.01	0.02	<0.00005	11		62	3.3
10/04/2013	<0.001	0.02	0.01	84	0.001	0.22	0.036		48	0.0002	34		710	0.001		0.001	<0.001	0.2	0.02	<0.00005	6.7		31	0.98
16/05/2013	<0.001	0.03	0.01	85	0.001	0.28	0.062		83	0.0002	54		1100	0.001		<0.001	0.001	0.01	0.04	<0.00005	9		61	1.5
14/06/2013	<0.001	0.16	0.01	51	0.001	0.06	0.017		27	0.0002	14		370	0.001		0.004	0.001	0.1	0.04	<0.00005	5		18	0.14
11/07/2013	<0.001	<0.05	0.01	51	0.001	0.07	0.019		27	0.0002	15		390	<0.001		<0.001	0.001	0.1	0.05	<0.00005	4		19	0.33
23/08/2013	<0.001	0.05	<0.01	60	<0.001	0.11	0.024		45	<0.0002	26		590	0.002		0.001	<0.001	<0.01	0.02	<0.00005	5		31	0.37
26-Sep-13	<0.001	0.15	0.03	60	<0.001	0.09	0.023		33	<0.0002	19		480	<0.001		0.001	0.001	<0.2	0.36	<0.00005	5		23	0.52
23-Oct-13	<0.001	0.06	<0.01	75	0.001	0.2	0.048		76	0.0002	47		990	0.002		<0.001	<0.001	<0.2	0.03	<0.00005	8		53	0.39
06-Nov-13	<0.001	0.3	0.01	73	0.001	0.21	0.056		87	0.0002	54		1000	0.002		<0.001	0.001	<0.2	0.04	<0.00005	8		60	0.63
06-Dec-13	<0.001	0.09	<0.01	75	0.001	0.19	0.042		72	0.0002	45		950	0.003		0.001	0.001	0.2	0.04	<0.00005	6		52	0.55
15-Jan-14	<0.001	0.08	0.01	53	0.001	0.25	0.052		110	0.0002	86		1600	0.002		0.001	0.001	<0.2	0.1	<0.00005	9		99	0.98
05-Feb-14	<0.001	0.03	<0.01	<25	0.001	0.25	0.05		140	0.0002	130		2000	0.002		<0.001	0.001	0.2	0.1	<0.00005	11		140	1.9
05-Mar-14	<0.001	0.03	0.01	25	0.001	0.11	0.038		54	0.0002	12		620	0.001		0.002	<0.001	0.2	0.01	<0.00005	6		29	0.42
03-Apr-14	<0.001	0.06	0.01	27	0.001	0.08	0.016		19	0.0002	9		290	0.002		0.002	0.001	0.2	0.02	<0.00005	3		11	0.16
02-May-14	<0.001	0.02	0.01	29	0.001	0.06	0.017		28	0.0002	15		400	<0.001		<0.001	<0.001	0.2	0.03	<0.00005	4		17	0.33
13-Jun-14	<0.001	0.01	0.01	25	0.001	0.08	0.032		43	0.0002	25		600	0.001		0.001	0.001	0.2	<0.01	<0.00005	6		26	0.41
10-Jul-14	<0.001	0.01	0.01	25	0.001	0.1	0.032		47	0.0002	29		660	0.001		0.001	0.001	0.2	0.01	<0.00005	6		30	0.41
17/08/2014	<0.001	<0.01	<0.01	<25	<0.001	0.07	0.027		38	<0.0002	29		600	<0.001		<0.001	<0.001	<0.2	0.03	<0.00005	5		26	0.37

Continued…….. Neubecks Creek WX22 Water conditioned ash Placement Water Quality Data October 2012 to August 2014

Sample Date	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	TDS	TFR	Turbidity	V	Zn	Zn-f	DO	Temp	Rainfall
12/10/2012	<0.01	33		<0.01		<0.5	0.7	<0.001	7	<0.01	<0.002	150	290		3.6		0.005	0.005	10.2		20.8
14/11/2012	0.01	47		0.01		<0.5	0.35	<0.001	7	0.01	0.002	230	490		2.6		0.04	0.005	9		30.9
12/12/2012	0.01	40		0.02		<0.5	0.35	0.001	7.6	<0.01	0.002	200	380		3.9		0.04	0.005	9		64.1
17/01/2013	<0.01	64		0.06		<0.5	0.5	0.003	7.3	0.02	0.002	440	720		31		0.19	0.04	8.2		113.2
24/02/2013	0.01	22		0.01		<0.5	0.35	<0.001	7.4	<0.01	0.002	86	210		6.3		0.01	0.005	8.7		184.2
14/03/2013	<0.01	110		0.05		<0.5	0.35	0.001	7.3	0.01	0.002	570	880		2.7		0.04	0.02	9.2		66.2
10/04/2013	0.01	50		0.02		<0.5	0.35	0.001	7.5	0.01	0.002	228	400		2.1		0.022	0.005	10.1		28.1
16/05/2013	0.01	76		0.03		<0.5	0.35	0.001	7.1	0.01	0.002	450	800		1.5		0.013	0.011	12		29
14/06/2013	<0.001	27		0.006		<0.5	0.4	0.001	7.2	0.01	0.002	110	230		9.1		0.026	<0.005	14.2		109
11/07/2013	0.001	26		0.01		<0.5	0.5	0.001	6.8	0.01	0.002	110	220		2		0.026	0.017	15.3		24.4
26-Sep-13	<0.001	33		0.013	<1	<0.5	0.45	<0.001	7.2	<0.01	<0.002	150	330		5.2		0.027	0.025	10.4		35
23-Oct-13	<0.001	61		0.024	<1	<0.5	0.35	0.001	7.4	0.01	0.002	380	720		2.1		0.032	0.009	5.3		21.8
06-Nov-13	0.001	69		0.026	<1	<0.5	0.35	0.001	7.4	0.01	0.002	420	780		6.6		0.03	0.009	4.8		95.2
06-Dec-13	0.001	63		0.027	<1	<0.5	0.35	0.001	7.4	0.01	0.002	360	620		2.5		0.035	0.012	9.9		34.2
15-Jan-14	0.001	110		0.096	<1	<0.5	0.35	0.001	7.3	0.01	0.002	750	1200		13		0.088	0.046	4.4		13.6
05-Feb-14	0.001	140		0.15	<1	<0.9	0.55	0.001	6.9	0.01	0.002	1000	1600		4.4		0.12	0.1	6		74
05-Mar-14	0.001	28		0.029	<1	<0.5	0.35	0.001	6.7	0.01	0.002	280	460		1.6		0.052	0.028	9		143.8
03-Apr-14	0.001	17		0.011	<1	<0.5	0.4	0.001	7	0.01	0.002	86	180		2.9		0.025	0.009	9.2		63
02-May-14	0.001	21		0.011	<1	<0.5	0.35	0.001	7	0.01	0.002	130	260		0.95		0.028	0.011	12.2		14
13-Jun-14	0.001	36		0.016	<1	<0.5	0.45	0.001	6.9	0.01	0.002	210	400		0.9	<0.01	0.031	0.011	14.1		43.2
10-Jul-14	0.001	41		0.018	<1	<0.5	0.35	0.001	6.9	0.01	0.002	230	390		0.85	<0.01	0.024	0.013	14		24.2
17/08/2014	<0.001	39		0.017	<1	<0.5	<0.7	<0.001	6.9	<0.01	<0.002	230	400		1	<0.01	0.035	0.013	13.3	10.5	24.2

Neubecks Creek WX22 Post- water conditioned ash Placement summary September 2013 - August 2014 (mg/L)																					
	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.08	0.01	46.7	0.001	0.14	0.036		62	0.0002	42		849	0.002		0.001	0.001	0.20	0.070	<0.00005	6	
Maximum	<0.001	0.30	0.03	75.0	0.001	0.25	0.056		140	0.0002	130		2000	0.003		0.002	0.001	0.20	0.360	<0.00005	11	
Minimum	<0.001	<0.01	<0.01	25.0	<0.001	0.06	0.016		19	<0.0002	9		290	<0.001		<0.001	<0.001	<0.02	<0.01	<0.00005	3	
90th Percentile	<0.001	0.15	0.02	75.0	0.001	0.25	0.052		108	0.0002	83		1540	0.002		0.002	0.001	0.20	0.100	<0.00005	9	
Pre-50th Percentile Trend	<0.001	0.06	0.01	41.0	0.001	0.11	0.035		51	0.0002	29		640	0.002		0.001	0.001	0.20	0.030	<0.00005	6	
ANZECC 2000	0.00005	0.055	0.055		0.024	0.370	0.700			0.00085	350		2200	0.002		0.0035 **(0.005)**		1.5	0.3	0.00006		

Continued…….. Neubecks Creek WX22 Post-water conditioned ash Placement summary September 2013 - August 2014 (mg/L)																					
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	TDS		Turbidity	V	Zn	Zn-f	DO	Temp
Average	47	0.59	0.001	55		0.037	<1	<0.5	0.39	0.001	7.1	0.01	0.002	352	612		3.50	<0.01	0.044	0.024	9.4	10.5
Maximum	140	1.90	0.001	140		0.150	<1	<0.5	0.55	0.001	7.4	0.01	0.002	1000	1600		13.00	<0.01	0.120	0.100	14.1	10.5
Minimum	11	0.16	<0.001	17		0.011	<1	<0.5	0.35	<0.001	6.7	<0.001	<0.002	86	180		0.85	<0.01	0.024	0.009	4.4	10.5
90th Percentile	95	0.95	0.001	106		0.089	<1	<0.5	0.45	0.001	7.4	0.01	0.002	717	1158		6.46	<0.01	0.084	0.044	13.9	10.5
Pre-50th Percentile Trend	30	0.42	0.001	40		0.021	<1	<0.5	0.35	0.001	7.0	0.01	0.002	255	430		2.30	<0.01	0.032	0.013	9.6	10.5
ANZECC 2000		1.900	0.010		10.0	0.017 **(0.051)**		0.015	0.250 **(0.55)**	0.005	6.5-8.0	0.020 **(0.030)**	0.005	1000	1500	10.0 **(19.0)**	10.0		0.116			

1b. Water Quality Data and Summary for Mt Piper Power station Licence Discharge Point

Pre-Water conditoned ash Placement - Background summary Data at Mt Piper Power Station Licence Discharge Point LMP01 October, 2012 - August, 2013 (mg/L)																					
Sample Date	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Ave	<0.001	0.43	0.03	80	0.001	0.05	0.030	<0.001	34	0.0002	13		464	0.001		0.016	0.005	0.2	0.06	<0.00005	6	
Max	<0.001	1.10	0.10	91	0.001	0.07	0.041	<0.001	43	0.0003	18		570	0.002		0.07	0.012	0.4	0.34	<0.00005	8	
Min	<0.001	0.13	0.01	52	0.001	0.03	0.022	<0.001	24	<0.00002	8		370	<0.001		0.005	0.001	0.1	<0.01	<0.00005	5	
90th Baseline	<0.001	0.72	0.05	91	0.001	0.06	0.035	<0.001	39	0.0003	16		560	0.001		0.029	0.008	0.3	0.10	<0.00005	7	
Pre-50th Percentile Trend	<0.001	0.4	0.01	81	0.001	0.05	0.029	<0.001	33	0.0002	12		440	0.001		0.008	0.003	0.2	0.02	<0.00005	6.6	
ANZECC 2000	0.00005	0.055	0.055		0.024	0.370	0.700			0.00085	350		2200	0.002		0.0035 **(0.005)**		1.5	0.3	0.00006		

Continued…… Background summary data – Mt Piper Power Station Licence Discharge Point LDP01 October, 2012 – August, 2013 (mg/L)																		
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn
Average	21	0.070	0.007	29		0.009				0.002	7.6	0.028	0.002	128		292	35.9		0.045455
Maximum	31	0.190	0.010	35		0.010				0.008	7.9	0.080	0.002	180		400	100.0		0.070
Minimum	12	0.002	0.002	23		0.006				0.001	7.3	0.010	0.002	90		210	7.3		0.030
90th Percentile	30	0.165	0.01	34		0.010				0.0045	7.9	0.050	0.002	172		380	75.0		0.060
Pre-50th Percentile Trend	21	0.034	0.01	30		0.010				0.0015	7.5	0.020	0.002	120		290	28.0		0.040
ANZECC 2000		1.900	0.010		10.0	0.017 **(0.051)**		0.015	0.250 **(0.55)**	0.005	6.5-8.0	0.020 **(0.030)**	0.005	1000	1500	10.0 **(19.0)**	10.0		0.116

Mt Piper Power Station Licence Discharge Point LDP01 Water conditioned ash Placement Water Quality Data October, 2012 to August, 2014 (mg/L)																					
Date	**Ag**	**Al**	**Al-f**	**ALK**	**As**	**B**	**Ba**	**Be**	**Ca:**	**Cd**	**Cl:**	**Co**	**COND uS/cm**	**Cr**	**Cr-6**	**Cu**	**Cu-f**	**F**	**Fe**	**Hg**	K:	Li
12/10/2012	<0.001	0.72	0.1	71	<0.001	0.03	0.023		30	<0.0002	12		390	<0.001		0.029	0.012	0.2	0.34	<0.00005	6	
14/11/2012	<0.001	0.13	<0.01	91	0.001	0.06	0.029		39	0.0002	18		530	0.001		0.01	0.008	0.4	0.02	<0.00005	7	
12/12/2012	<0.001	0.55	0.02	78	0.001	0.04	0.028		30	<0.00002	12		400	0.001		0.008	0.005	0.3	<0.01	<0.00005	7	
17/01/2013	<0.001	0.54	<0.01	84	<0.001	0.07	0.033		30	<0.0002	14		420	0.001		0.011	0.005	0.3	0.02	<0.00005	7	
21/02/2013	<0.001	0.49	0.01	77	0.001	0.05	0.035		32	0.0002	8		390	0.001		0.006	0.003	0.3	0.01	<0.00005	5	
14/03/2013	<0.001	0.21	0.01	81	<0.001	0.04	0.029		38	0.0002	13		540	0.001		0.07	0.003	0.1	0.01	<0.00005	7	
10/04/2013	<0.001	0.18	<0.01	90	0.001	0.05	0.031		38	<0.0002	11		560	0.001		0.016	0.001	0.2	<0.01	<0.00005	6.6	
16/05/2013	<0.001	0.22	0.01	91	<0.001	<0.05	0.041		43	0.0003	16		570	<0.001		0.008	0.006	0.3	0.02	<0.00005	8	
14/06/2013	<0.001	1.1	0.01	52	0.001	<0.05	0.022		24	<0.0002	8		370	0.001		0.008	0.003	0.2	0.04	<0.00005	5	
11/07/2013	<0.001	0.23	<0.01	76	0.001	0.06	0.028	<0.001	33	0.0002	12		440	<0.001		0.006	0.002	0.2	0.02	<0.00005	6	
23/08/2013	<0.001	0.4	0.02	90	<0.001	0.05	0.026	<0.001	38	<0.0002	14		490	0.002		0.005	0.003	0.2	0.02	<0.00005	6	
15-Sep-13													500									
23-Oct-13	<0.001	0.37	0.02	87	0.001	<0.05	0.026	<0.001	33	<0.0002	13		460	0.002		0.013	0.006	<0.2	0.02	<0.00005	6	
06-Nov-13	<0.001	0.27	0.03	100	<0.001	0.06	0.025	<0.001	29	0.0002	13		470	0.002		0.009	0.006	0.2	0.02	<0.00005	6	
06-Dec-13	<0.001	0.28	0.02	80	0.001	0.06	0.03	<0.001	31	0.0002	10		400	0.003		0.009	0.004	0.3	0.02	<0.00005	5	
15-Jan-14	<0.001	0.22	0.02	86	<0.001	0.08	0.025	<0.001	28	0.0002	7		350	0.002		0.005	0.003	0.3	0.01	<0.00005	5	
05-Feb-14	<0.001	0.3	0.02	120	0.001	0.07	0.038	<0.001	39	0.0002	11		460	0.002		0.005	0.002	0.3	0.02	<0.00005	6	
05-Mar-14	<0.001	1.2	0.01	41	0.001	<0.05	0.029	<0.001	22	0.0002	6		300	0.002		0.008	0.004	<0.2	<0.01	<0.00005	5	
03-Apr-14	<0.001	0.82	<0.01	58	0.001	0.06	0.034	<0.001	25	0.0002	10		290	0.002		0.007	0.003	0.2	0.01	<0.00005	5	
02-May-14	<0.001	0.14	0.01	89	<0.001	<0.05	0.031	<0.001	40	0.0002	14		560	<0.001		0.002	0.001	<0.2	0.01	<0.00005	6	
13-Jun-14	<0.001	0.2	<0.01	78	0.001	0.05	0.032	<0.001	34	0.0002	15		490	0.001		0.004	0.002	0.2	0.02	<0.00005	6	
10-Jul-14	<0.001	0.36	0.01	69	0.001	0.06	0.032	<0.001	33	0.0002	17		500	<0.001		0.005	0.004	0.2	0.02	<0.00005	7	
17/08/2014	<0.001	0.15	<0.01	75	<0.001	0.05	0.033	<0.001	29	<0.0002	6		460	0.001		0.006	0.004	0.2	0.02	<0.00005	6	

Continued.....Mt Piper Power Station Licence Discharge Point LDP1 Water Conditioned Ash Placement Water Quality Data October, 2012 to August, 2014 (mg/L)																			
Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f
12/10/2012	16	0.19	<0.01	23		<0.01			0.7	<0.001	7.3	0.02	0.002	100		220	50		0.06	0.05
14/11/2012	22	<0.001	0.01	35		0.01			<0.9	0.001	7.3	0.01	<0.002	140		370	9.6		0.03	0.005
12/12/2012	15	0.002	0.01	30		0.01			<1.0	0.008	7.8	0.03	0.002	100		220	28		0.06	0.005
17/01/2013	15	<0.001	0.01	32		0.01			<1.0	0.001	7.8	0.02	0.002	96		210	45		0.04	0.005
21/02/2013	18	0.026	0.01	29		0.01			<0.7	0.002	7.3	0.02	0.002	100		400	75		0.04	0.005
14/03/2013	31	<0.001	0.01	26		0.01			<0.8	0.003	7.5	0.01	0.002	160		330	15		0.04	0.005
10/04/2013	29	0.019	0.01	26		0.01			<0.7	0.001	7.8	<0.01	0.002	172		300	7.3		0.033	0.005
16/05/2013	30	0.14	<0.01	32		<0.01			<0.8	<0.001	7.4	<0.01	0.002	180		380	14		0.049	0.042
14/06/2013	12	<0.001	0.002	26		0.006			<1.0	0.002	7.9	0.08	0.002	90		220	100		0.07	0.012
11/07/2013	21	0.042	0.002	31		0.008			<1.0	0.001	7.4	0.0366	0.002	120		270	34		0.047	<0.005
23/08/2013	24	<0.001	0.002	34		0.006			<1.0	<0.001	7.9	<0.1	<0.002	150		290	17		0.031	<0.005
15-Sep-13											8.1									
23-Oct-13	20	<0.001	0.002	34		0.006			<1.0	<0.001	7.9	<0.1	<0.002	120		300	14		0.038	<0.005
6-Nov-13	19	0.001	0.003	44		0.005			<1.0	0.001	7.9	0.01	0.002	120		320	7.9		0.03	0.005
6-Dec-13	15	0.001	0.007	27		0.006			<1.0	0.001	7.8	0.01	0.002	98		200	3.3		0.053	0.005
15-Jan-14	13	0.001	0.002	21		0.005			<1.0	0.001	7.8	0.01	0.002	98		200	8.1		0.023	0.005
5-Feb-14	18	0.001	0.004	31		0.006			<0.5	<0.001	8.2	<0.1	0.002	98		300	12		0.025	<0.005
5-Mar-14	8	0.001	0.002	19		0.009			<1.0	0.002	7.3	0.015	0.002	100		200	55		0.058	0.012
3-Apr-14	14	<0.001	0.002	20		0.009			<1.1	0.002	7.7	<0.1	0.002	90		220	60		0.048	0.007
2-May-14	30	0.031	0.002	23		0.007			<1.0	<0.001	7.8	0.01	0.002	180		340	5.9		0.028	<0.005
13-Jun-14	21	0.089	0.002	31		0.006			<1.0	0.001	7.8	<0.1	0.002	140		300	9.1	<0.01	0.038	0.009
10-Jul-14	20	0.066	0.004	39		0.005			<1.0	0.001	7.8	0.015	0.002	140		270	14	<0.01	0.03	0.009
17-Aug-14	17	0.05	0.004	39		0.006			<1.0	<0.001	7.8	<0.03	<0.002	150		300	14		0.032	0.007

Mt Piper Power Station Licence Discharge Point LDP01 Post-water conditioned ash Placement Summary October 2012 to August, 2014 (mg/L)																					
	Ag	Al	Al-f	ALK	As	B	Ba	Ag	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.39	0.02	80	0.001	0.06	0.030	<0.001	31	0.0002	11		437	0.002		0.007	0.004	0.24	0.02	<0.00005	6	
Maximum	<0.001	1.20	0.03	120	0.001	0.08	0.038	<0.001	40	0.0002	17		560	0.003		0.013	0.006	0.30	0.02	<0.00005	7	
Minimum	<0.001	0.14	0.01	41	0.001	0.05	0.025	<0.001	22	<0.0002	6		290	0.001		0.002	0.001	0.20	0.01	<0.00005	5	
50th Percentile	<0.001	0.28	0.02	80	0.001	0.06	0.031	<0.001	31	0.0002	11		460	0.002		0.006	0.004	0.20	0.02	<0.00005	6	
Post-90th Percentile Trend	<0.001	0.82	0.02	100	0.001	0.07	0.034	<0.001	39	0.0002	15		500	0.002		0.009	0.006	0.30	0.02	<0.00005	6	

Continued……Mt Piper Power Station Licence Discharge Point LDP01 Post-water conditioned ash Placement Summary October 2012 to August, 2014 (mg/L)																				
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f
Average	18	0.027	0.003	30		0.006				0.001	7.8	0.012	0.002	121		268	18.5	<0.01	0.037	0.007
Maximum	30	0.089	0.007	44		0.009				0.002	8.2	<0.03	0.002	180		340	60.0	<0.01	0.058	0.012
Minimum	8	0.001	0.002	19		0.005				0.001	7.3	0.010	0.002	90		200	3.3	<0.01	0.023	<0.005
50th Percentile	18	0.001	0.002	31		0.006				0.001	7.8	0.010	0.002	120		300	12.0	<0.01	0.032	0.007
Post-90th Percentile Trend	21	0.071	0.004	39		0.009				0.002	8.1	0.015	0.002	150		320	55.0	<0.01	0.053	0.010

1C. *Water Quality Data and Summary for Neubecks Creek at upstream site NC01*

Neubecks Creek NC01 Pre-water conditioned ash Placement - Background summary Data October, 2012 – August, 2013 (mg/L)																					
	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.33	0.03	71	0.001	0.04	0.032	<0.001	23	0.0002	10		310	0.001		0.002	0.002	0.16	0.18	<0.00005	4.2	
Maximum	<0.001	0.73	0.08	94	0.001	0.05	0.042	<0.001	40	0.0002	15		540	0.002		0.005	0.003	0.30	0.55	<0.00005	6.3	
Minimum	<0.001	0.06	0.01	34	0.001	0.02	0.024	<0.001	4	<0.00002	5		85	0.000		0.001	0.001	0.10	0.02	<0.00005	2.0	
90th Percentile	<0.001	0.49	0.07	87	0.001	0.05	0.042	<0.001	35	0.0002	13		470	0.001		0.004	0.002	0.21	0.38	<0.00005	6.0	
Pre-50th Percentile Trend	<0.001	0.37	0.02	70	0.001	0.05	0.029	<0.001	24	0.0002	10		310	0.001		0.002	0.002	0.15	0.06	<0.00005	4.0	
ANZECC 2000		0.055			0.024	0.37	0.700			0.00085	350		2200	0.002		0.0035 (0.005)		1.50	0.30	0.0006		

Continued……..Neubecks Creek NC01 Pre- water conditioned ash Placement - Background summary Data October, 2012 – August, 2013 (mg/L)																					
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	Ammonia Nitrogen	DO
Average	14	0.23	0.007	19		0.004	<1	<0.5	0.46	0.001	7.1	0.02	0.002	72		184	15.7		0.022	0.006	<0.1	8.0
Maximum	27	1.00	0.020	27		0.005	<1	<0.5	0.70	0.002	7.4	0.03	0.002	156		280	40.0		0.039	0.012	<0.1	14.3
Minimum	3	0.01	0.005	8		0.003	<1	<0.5	0.35	<0.001	6.5	0.00	<0.002	4		61	5.7		0.005	0.005	<0.1	1.7
90th Percentile	24	0.31	0.010	26		0.005	<1	<0.5	0.55	0.002	7.4	0.03	0.002	130		280	19.0		0.031	0.007	<0.01	11.7
Pre-50th Percentile Trend	14	0.19	0.005	22		0.005	<1	<0.5	0.45	0.001	7.1	0.02	0.002	73		170	17.0		0.026	0.005	<0.01	7.5
ANZECC 2000		1.9	0.010		10.0	0.017 (0.051)			0.250 (0.55)	0.005	6.5-8.0	0.020 (0.030)	0.005	1000		1500			0.116		0.013	

Neubecks Creek Upstream NC01 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																						
Date	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
12/10/2012	<0.001	0.37	0.07	<20	<0.001	0.02	0.027		17	<0.0002	10		250	<0.001		0.004	0.002	0.1	0.55	<0.00005	4	
14/11/2012	<0.001	0.45	0.08	<20	0.001	<0.01	0.027		4	0.0002	8		85	0.001		0.002	0.002	<0.1	0.38	<0.00005	2	
12/12/2012	<0.001	0.49	0.05	34	0.001	0.05	0.029		8.2	<0.00002	8		130	0.001		0.002	0.002	0.1	0.35	<0.00005	2	
17/01/2013	<0.001	0.35	0.03	69	0.001	0.03	0.042		13	<0.0002	7		160	<0.001		0.003	0.003	0.1	0.27	<0.00005	3	
21/02/2013	<0.001	0.39	<0.01	83	0.001	0.05	0.029		24	0.0002	5		280	0.0002		0.002	0.001	0.3	0.03	<0.00005	4	
14/03/2013	<0.001	0.11	0.01	82	0.001	0.05	0.035		34	0.0002	12		460	0.001		0.005	0.001	0.2	0.06	<0.00005	6	
10/04/2013	<0.001	0.06	0.01	94	0.001	0.05	0.042		40	0.0002	13		540	<0.001		0.001	<0.001	0.2	0.02	<0.00005	6.3	
16/05/2013	<0.001	0.06	0.01	85	0.001	<0.05	0.04		35	0.0002	15		470	0.001		0.001	0.001	0.2	0.15	<0.00005	6	
14/06/2013	<0.001	0.73	0.01	62	0.001	<0.05	0.024		25	0.0002	10		330	0.001		0.004	0.002	0.2	0.06	<0.00005	5	
11/07/2013	<0.001	0.42	<0.01	63	0.001	0.04	0.025	<0.001	24	0.0002	9		310	<0.001		0.002	0.001	0.1	0.04	<0.00005	4	
23/08/2013	<0.001	0.21	<0.01	70	<0.001	<0.05	0.027	<0.001	30	<0.0002	12		390	0.002		0.001	<0.001	0.1	0.03	<0.00005	4	
26/09/2013	<0.001	0.78	0.14	54	<0.001	<0.05	0.031	<0.001	15	<0.0002	11		220	<0.001		0.004	0.003	<0.2	1.1	<0.00005	4	
23/10/2013	<0.001	0.16	<0.01	91	0.001	0.05	0.032	<0.001	32	0.0002	12		450	0.002		0.002	0.002	<0.2	0.02	<0.00005	5	
6/11/2013	<0.001	0.14	0.01	110	0.001	<0.05	0.041	<0.001	32	0.0002	13		460	0.002		0.001	<0.001	<0.2	0.02	<0.00005	5	
6/12/2013	<0.001	0.16	0.01	97	0.001	0.06	0.026	<0.001	30	0.0002	10		420	0.003		0.002	0.001	0.3	0.03	<0.00005	5	
15/01/2014	<0.001	0.06	0.01	130	0.001	0.07	0.051	<0.001	37	0.0002	13		480	0.002		0.001	<0.001	0.2	0.03	<0.00005	6	
5/02/2014	<0.001	0.1	0.01	170	<0.001	0.05	0.051	<0.001	37	0.0002	18		520	0.002		0.001	<0.001	0.2	0.02	<0.00005	6	
5/03/2014	<0.001	0.1	<0.01	<25	0.002	0.06	0.033	<0.001	22	0.0002	6		330	0.002		0.003	0.002	<0.2	0.14	<0.00005	4	
3/04/2014	<0.001	0.13	0.02	49	0.001	0.07	0.028	<0.001	21	0.0002	6		260	0.002		0.002	0.002	<0.2	0.13	<0.00005	4	

2/05/2014	<0.001	0.04	<0.01	63	<0.001	0.05	0.04	<0.001	34	0.0002	12		460	<0.001		0.001	<0.001	<0.2	0.13	<0.00005	5	
13/06/2014	<0.001	0.03	0.01	61	0.001	0.05	0.038	<0.001	32	0.0002	13		460	0.001		0.001	<0.001	<0.2	0.19	<0.00005	5	
10/07/2014	<0.001	0.02	0.01	55	0.001	0.05	0.036	<0.001	31	0.0002	14		460	0.001		0.001	<0.001	<0.2	0.13	<0.00005	5	
17/08/2014	<0.001	0.06	<0.01	59	<0.001	<0.05	0.031	<0.001	24	<0.0002	12		380	<0.001		0.001	<0.001	<0.2	0.07	<0.00005	4	

Continued……. Neubecks Creek Upstream NC01 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)

Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	Ammonia Nitrogen	DO
12/10/2012	10	0.24	0.005	15		0.005		0.5	0.7	<0.001	6.9	0.02	<0.002	54		130	19		0.005	0.005		9.3
14/11/2012	3	0.016	0.005	8		0.005		<0.5	0.45	<0.001	6.5	0.03	0.002	8		61	17		0.02	0.005		6.6
12/12/2012	5	0.016	0.02	10		0.005		<0.5	0.45	0.002	6.9	0.03	0.002	16		65	18		0.03	0.005		5.6
17/01/2013	7	1.00	0.005	11		0.005		<0.5	0.55	0.001	7.2	0.03	0.002	4		160	14		0.03	0.005		1.7
21/02/2013	12	0.008	0.005	21		0.005		<0.5	0.4	<0.001	7.1	0.01	0.002	46		170	17		0.005	0.005		4.7
14/03/2013	23	0.16	0.005	25		0.005		<0.5	0.35	0.001	7.2	<0.01	0.002	120		260	9.9		0.03	0.005		5.9
10/04/2013	27	0.31	0.005	27		0.005		<0.5	0.35	0.001	7.4	<0.01	0.002	156		280	5.7		0.026	0.005		7.5
16/05/2013	24	0.27	0.005	25		0.005		<0.5	0.4	<0.001	7	<0.01	0.002	130		280	5.8		0.014	0.012		8.8
14/06/2013	14	0.073	<0.001	22		0.003		<0.5	0.45	0.001	7.2	0.02	0.002	82		210	40		0.039	0.006		11.7
11/07/2013	15	0.24	<0.001	22		0.003		<0.5	0.5	0.001	7	<0.1	0.002	73		170	18		0.031	<0.005	<0.1	14.3
23/08/2013	19	0.19	<0.001	26		0.003	<1	<0.5	0.5	<0.001	7.4	0	<0.002	100		240	8.2		0.017	<0.005	<0.1	11.7
26-Sep-13											8.1							0.036	0.034	<0.1	4.9	0.036
23-Oct-13	20	<0.001	0.002	34		0.006			<1.0	<0.001	7.9	<0.1	<0.002	120		300	14	0.025	<0.005	<0.1	6	0.025

6-Nov-13	19	0.001	0.003	44		0.005			<1.0	0.001	7.9	0.01	0.002	120		320	7.9	0.021	<0.005	<0.1	4.7	0.021
6-Dec-13	15	0.001	0.007	27		0.006			<1.0	0.001	7.8	0.01	0.002	98		200	3.3	0.023	<0.005	<0.1	7.7	0.023
15-Jan-14	13	0.001	0.002	21		0.005			<1.0	0.001	7.8	0.01	0.002	98		200	8.1	0.018	<0.005	<0.1	4.1	0.018
5-Feb-14	18	0.001	0.004	31		0.006			<0.5	<0.001	8.2	<0.1	0.002	98		300	12	0.017	<0.005	<0.1	4.7	0.017
5-Mar-14	8	0.001	0.002	19		0.009			<1.0	0.002	7.3	0.015	0.002	100		200	55	0.068	0.043	<0.1	5.2	0.068
3-Apr-14	14	<0.001	0.002	20		0.009			<1.1	0.002	7.7	<0.1	0.002	90		220	60	0.028	<0.005	<0.1	5	0.028
2-May-14	30	0.031	0.002	23		0.007			<1.0	<0.001	7.8	0.01	0.002	180		340	5.9	0.044	<0.005	<0.1	7.5	0.044
13-Jun-14	21	0.089	0.002	31		0.006			<1.0	0.001	7.8	<0.1	0.002	140		300	9.1	0.032	<0.005	<0.1	10.5	0.032
10-Jul-14	20	0.066	0.004	39		0.005			<1.0	0.001	7.8	0.015	0.002	140		270	14	0.021	<0.005	<0.1	10.7	0.021
17/08/2014	15	0.3	<0.001	28		0.003	<1	<0.5	<1.0	<0.001	7.1	<0.03	<0.002	110		240	7.5	<0.01	0.025	<0.005	<0.1	10.7

Neubecks Creek NC01 Post-water conditioned ash Placement Summary Data September, 2013 – August, 2014 (mg/L)																					
	Ag	Al	Al-f	Ca:	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.15	0.03	85	0.001	0.06	0.037	<0.001	29	0.0002	12		408	0.002		0.002	0.002	0.23	0.17	<0.00005	4.8	
Maximum	<0.001	0.78	0.14	170	0.002	0.07	0.051	<0.001	37	0.0002	18		520	0.003		0.004	0.003	0.30	1.10	<0.00005	6.0	
Minimum	<0.001	0.02	0.01	49	0.001	0.05	0.026	<0.001	15	<0.0002	6		220	0.001		0.001	0.001	0.20	0.02	<0.00005	4.0	
90th Percentile	<0.001	0.10	0.01	63	0.001	0.05	0.035	<0.001	32	0.0002	12		455	0.002		0.001	0.002	0.20	0.10	<0.00005	5.0	
Pre-50th Percentile Trend	<0.001	0.16	0.06	130	0.001	0.07	0.050	<0.001	37	0.0002	14		478	0.002		0.003	0.003	0.28	0.19	<0.00005	5.9	
ANZECC 2000		0.06			0.024	0.37	0.700	0.1	175	0.0005	350	0.05	2200	0.002		0.0035		1.500	0.300			2.5

Continued…….. Neubecks Creek NC01 Post-water conditioned ash Placement Summary Data September, 2013 – August, 2014 (mg/L)																					
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	Ammonia Nitrogen	DO
Average	18	0.43	0.001	27		0.005	<1	<0.5	0.52	0.001	7.1	0.10	0.002	99		252	9.8	<0.01	0.030	0.039	<0.01	6.8
Maximum	24	0.63	0.002	37		0.017	<1	<0.5	0.65	0.001	7.5	0.10	0.002	140		330	31.0	<0.01	0.068	0.043	<0.01	10.7
Minimum	8	0.25	0.001	16		0.003	<1	<0.5	0.50	<0.001	6.3	0.10	<0.002	34		170	2.0	<0.01	0.017	0.034	<0.01	4.1
90th Percentile	20	0.39	0.001	29		0.004	<1	<0.5	0.50	0.001	7.1	0.10	0.002	105		245	7.6	<0.01	0.025	0.039	<0.01	5.6
Pre-50th Percentile Trend	23	0.59	0.002	35		0.007	<1	<0.5	0.60	0.001	7.5	0.10	0.002	129		300	15.8	<0.01	0.043	0.042	<0.01	10.7
ANZECC 2000		1.9	0	230.00	10.000	0			0.35	0.005	6.5-8.0	0.025	0.005	1000.00		1500		0.1	0.015			

2. Water Quality Data and Summary for the Groundwater at Bores MPGM4/D8 and 4/D9

MPGM4/D8 – Pre-water conditioned ash Background Summary October, 2012 – August, 2013 (mg/L)																				
	Ag	**Al**	**ALK**	**As**	**B**	**Ba**	**Be**	**Ca:**	**Cd**	**Cl:**	**Co**	**COND uS/cm**	**Cr**	**Cr-6**	**Cu**	**F**	**Fe**	**Hg**	**K:**	**Li**	**Mg:**
Average	<0.001	0.46		0.001	0.063	0.048		78	0.0003	18.3		525	0.001		0.005	0.10	0.17	<0.00005	8.0		41
Maximum	<0.001	0.72		0.001	0.180	0.080		180	0.0004	56.0		1200	0.001		0.010	0.10	0.47	<0.00005	20.0		67
Minimum	<0.001	0.03		<0.001	0.010	0.032		21	<0.0002	5.0		290	<0.001		0.003	<0.10	<0.01	<0.00005	2.0		16
90th Percentile	<0.001	0.71		0.001	0.138	0.068		153	0.0004	41.3		933	0.001		0.009	0.10	0.38	<0.00005	16.1		66
Pre-50th Percentile Trend	<0.001	0.55		0.001	0.030	0.040		56	0.0002	6.0		305	0.001		0.003	0.10	0.02	<0.00005	5.0		41
ANZECC 2000	0.00005	0.06		0.024	0.37	0.700			0.002	350		2600	0.005		0.005(0.0075)	1.50	0.664(15.9)	0.00006			

Continued……. MPGM4/D8 - Background Summary October, 2012 – August, 2013 (mg/L)																	
	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Average	1.34	0.01	23.3		0.098			0.002	5.9	0.002	216		393		2.1		904.3	0.083
Maximum	4.90	0.01	59.0		0.270			0.003	6.3	0.002	514		940		2.3		904.4	0.160
Minimum	0.06	<0.001	6.0		0.040			<0.001	5.6	<0.002	110		200		2.0		904.1	0.050
90th Percentile	3.50	0.01	47.3		0.201			0.003	6.21	0.002	396		727		2.3		904.4	0.130
Pre-50th Percentile Trend	0.20	0.01	14		0.041			0.002	5.85	0.002	120		215		2.1		904.3	0.060
ANZECC 2000	5.704(8.57)	0.010	230	10.0	0.5509	-	-	0.005	6.5-8.0	0.005	1000(1170)	-	2000	-	-	-	-	0.908

MPGM4/D8 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)

Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
4-Nov-12	<0.001	0.72		<0.001	0.01	0.039		21	<0.0002	5		290	<0.001		<0.001	<0.1	0.02	<0.00005	2	
13-Jan-13	<0.001	0.7		0.001	0.02	0.04		22	0.0002	7		310	0.001		0.003	0.1	0.02	<0.00005	3	
14-Apr-13	<0.001	0.39		0.001	0.18	0.08		89	0.0004	56		1200	0.001		0.01	0.1	0.47	<0.00005	6.9	
28-Jul-13	<0.001	0.025		0.001	0.04	0.032		180	0.0002	5		300	0.001		0.003	0.1	<0.01	<0.00005	20	
3-Nov-13	<0.001	0.57		0.001	0.025	0.043		35	0.0002	14		470	0.002		0.002	<0.2	<0.01	<0.00005	2	
1-Dec-13	<0.001	0.39		0.001	0.025	0.03		37	0.0002	16		480	0.002		0.001	0.2	0.01	<0.00005	3	
23-Feb-14	<0.001	0.91		0.001	0.06	0.026		23	0.0002	15		320	0.002		0.006	0.2	0.07	<0.00005	3	
25-May-14	<0.001	0.09		0.001	0.19	0.072		140	0.0002	100		1800	<0.001		0.001	0.2	3.6	<0.00005	10	
24-Aug-14	<0.001	1.4		<0.001	0.05	0.025		15	<0.0002	3		220	0.001		0.002	<0.2	0.04	<0.00005	2	

Continued……. MPGM4/D8 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)

Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
4-Nov-12	16	0.17	<0.01	6		0.04			<0.001	5.6	Se	110		200					0.06
13-Jan-13	18	0.22	0.01	8		0.04			0.003	5.7	<0.002	120		200		2.3		904.1	0.05
14-Apr-13	67	4.9	0.01	59		0.27			0.002	6.3	0.002	514		940		2.1		904.3	0.16
28-Jul-13	63	0.056	<0.001	20		0.041			0.002	6	0.002	120		230		2		904.4	0.06
3-Nov-13	28	0.54	0.001	16		0.09			0.002	5.7	0.002	200		330		2.3		904.1	0.11
1-Dec-13	30	1	0.001	18		0.085			0.001	5.9	0.002	230		420		2.2		904.2	0.088
23-Feb-14	17	0.87	0.001	11		0.05			0.003	5.8	0.002	120		290		2.1		904.3	0.053
25-May-14	110	7.1	0.001	94		0.19			<0.001	6	0.002	760		1400		2.1		904.3	0.16
24-Aug-14	12	0.1	<0.001	5		0.025			0.002		<0.002	83		150	<0.01	1.8	1.9	904.6	0.054

MPGM4/D8 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	0.67		0.001	0.070	0.039		50	0.0002	29.6		658	0.002		0.002	0.20	0.93	<0.00005	4.0	
Max	<0.001	1.40		0.001	0.190	0.072		140	0.0002	100.0		1800	0.002		0.006	0.20	3.60	<0.00005	10.0	
Min	<0.001	0.09		<0.001	0.025	0.025		15	<0.0002	3.0		220	<0.001		0.001	<0.20	<0.01	<0.00005	2.0	
Post-90th for Trend	<0.001	1.20		0.001	0.138	0.060		99	0.0002	66.4		1272	0.002		0.004	0.20	2.54	<0.00005	7.2	
50th Investigation Trigger	<0.001	0.57		0.001	0.050	0.030		35	0.0002	15.0		470	0.002		0.002	0.20	0.06	<0.00005	3.0	
ANZECC 2000		0.055		0.024	0.37(0.55)	0.7			0.002	350		2200	0.005		0.005(0.0075)	1.5	0.664(15.9)	0.00006		

Continued……. MPGM4/D8 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	39	1.92	0.001	29		0.088			0.002	5.9	0.002	279		518	<0.01	2.1		904.3	0.093
Max	110	7.10	0.001	94		0.190			0.003	6.0	0.002	760		1400	<0.01	2.3		904.6	0.160
Min	12	0.10	<0.001	5		0.025			<0.001	5.7	<0.002	83		150	<0.01	1.8		904.1	0.053
Post-90th for Trend	78	4.66	0.001	64		0.150			0.003	6.0	0.002	548		1008	<0.01	2.3		904.5	0.140
50th Investigation Trigger	28	0.87	0.001	16		0.085			0.002	5.9	0.002	200		330	<0.01	2.1		904.3	0.088
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5-8.0	0.005	1000		1200					0.908

MPGM4/D9 – Pre-water conditioned ash Background Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.06	45	0.002	0.47	0.055		178	0.0002	116		2000	0.001		0.005	0.13	8.26	<0.00005	13.5	
Max	<0.001	0.08	52	0.003	0.56	0.060		210	0.0002	150		2200	0.001		0.009	0.20	18.00	<0.00005	15.0	
Min	<0.001	0.03	40	0.002	0.36	0.044		150	0.0002	94		1700	<0.001		<0.001	<0.10	0.02	<0.00005	13.0	
90th Baseline	<0.001	0.075	50	0.003	0.55	0.059		204	0.0002	141		2170	0.001		0.0075	0.18	15.90	<0.00005	14.4	
Pre-50th for Trend	<0.001	0.055	44	0.002	0.49	0.058		175	0.0002	110		2050	0.001		0.0035	0.10	7.50	<0.00005	13.0	
ANZECC 2000	0.00005	0.055		0.024	0.37	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664(15.9)	0.00006		

Continued… .MPGM4/D9 – Pre-water conditioned ash Background Summary October, 2012 – August, 2013 (mg/L)																		
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	133	7.73	0.01	135		0.273			0.003	6.1	0.002	1048		1675		1.5		908.1	0.120
Max	170	8.90	0.01	180		0.340			0.004	6.3	0.002	1200		1800		1.7		908.3	0.220
Min	110	6.60	<0.001	100		0.210			0.001	5.8	<0.002	940		1500		1.4		908.0	0.070
90th Baseline	158	8.57	0.01	168		0.328			0.004	6.3	0.002	1170		1800		1.6		908.2	0.184
Pre-50th for Trend	125	7.70	0.01	130		0.270			0.003	6.2	0.002	1025		1700		1.5		908.2	0.096
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5-8.0	0.005	1000(1170)		2000					0.908

MPGM4/D9 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																				
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
4-Nov-12	<0.001	0.08	40	0.003	0.56	0.06		150	<0.0002	100		2000	<0.001		0.004	<0.1	11	<0.00005	13	
13-Jan-13	<0.001	<0.01	46	0.002	0.36	0.058		160	0.0002	94		1700	0.001		0.003	0.1	4	<0.00005	13	
14-Apr-13	<0.001	0.03	52	0.002	0.46	0.058		190	0.0002	120		2100	0.001		0.009	0.2	18	<0.00005	13	
14-Jul-13	<0.001	<0.05	42	0.002	0.51	0.044		210	0.0002	150		2200	0.001		0.003	0.1	0.02	<0.00005	15	
3-Nov-13	<0.001	0.02	54	0.003	0.54	0.058		230	0.0002	180		2400	0.002		0.012	0.2	3.3	<0.00005	14	
1-Dec-13	<0.001	0.05	50	0.002	0.49	0.044		220	0.0002	190		2000	0.002		0.011	0.2	2	<0.00005	16	
26-Jan-14	<0.001	0.06	45	0.002	0.47	0.045		200	0.0002	160		2400	0.002		0.004	0.2	9.7	<0.00005	15	
2-Mar-14	<0.001	0.01	50	<0.001	0.5	0.048		220	0.0002	180		2200	0.002		0.003	0.2	23	<0.00005	17	
23-Mar-14	<0.001	<0.01	58	<0.001	0.47	0.051		230	0.0002	190		3100	0.001		0.004	0.2	6.8	<0.00005	17	
25-May-14	<0.001	0.01	60	<0.001	0.6	0.052		230	0.0002	200		3000	0.001		0.001	0.2	5.8	<0.00005	16	
24-Aug-14	<0.001	<0.01	59	<0.001	0.59	0.039		220	<0.0002	200		2700	<0.001		<0.001	<0.2	3.4	<0.00005	16	

Continued….MPGM4/D9 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)

Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
4-Nov-12	120	7.6	<0.01	140		0.34			0.004	5.8	<0.002	950		1600		1.5		908.2	0.22
13-Jan-13	110	6.6	0.01	100		0.21			0.001	6.1	0.002	940		1500		1.7		908.0	0.07
14-Apr-13	130	7.8	0.01	120		0.24			0.002	6.3	0.002	1100		1800		1.5		908.2	0.091
14-Jul-13	170	8.9	<0.001	180		0.3			0.004	6.2	0.002	1200		1800		1.4		908.3	0.1
3-Nov-13	170	9.6	0.001	200		0.37			0.004	6	0.002	1400		2400		1.6		908.1	0.15
1-Dec-13	170	9.5	0.001	210		0.34			0.01	6.1	0.002	1500		2500		1.5		908.2	0.11
26-Jan-14	150	8.8	0.001	200		0.3			0.007	6	0.002	1200		2100		1.7		908.0	0.11
2-Mar-14	170	9.7	0.001	200		0.35			0.001	6.1	0.002	1400		2300		1.5		908.2	0.11
23-Mar-14	170	9.3	0.001	210		0.34			0.002	6.1	0.002	1500		2700	<0.01	1.2		908.5	0.096
25-May-14	180	11	0.001	210		0.32			<0.001	6.1	0.002	1500		2600		1.3		908.4	0.086
24-Aug-14	180	11	<0.001	210		0.34			<0.001	6.1	<0.002	1500		2400	<0.01	1.3	1.3	908.4	0.093

MPGM4/D9 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	0.03	54	0.002	0.52	0.048		221	0.0002	186		2543	0.002		0.006	0.20	7.71	<0.00005	15.9	
Max	<0.001	0.06	60	0.003	0.60	0.058		230	0.0002	200		3100	0.002		0.012	0.20	23.00	<0.00005	17.0	
Min	<0.001	0.01	45	0.002	0.47	0.039		200	<0.0002	160		2000	<0.001		<0.001	<0.20	2.00	<0.00005	14.0	
Post-90th for Trend	<0.001	0.06	59	0.003	0.59	0.054		230	0.0002	200		3040	0.002		0.012	0.20	15.02	<0.00005	17.0	
50th Trigger	<0.001	0.02	54	0.002	0.50	0.048		220	0.0002	190		2400	0.002		0.004	0.20	5.80	<0.00005	16.0	
ANZECC 2000	0.00005	0.055		0.024	0.37(0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664(15.9)	0.00006		

Continued……. MPGM4/D9 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	170	9.84	0.001	206		0.337			0.005	6.1	0.002	1429		2429	<0.01			908.2	0.108
Max	180	11.00	0.001	210		0.370			0.010	6.1	0.002	1500		2700	<0.01			908.5	0.150
Min	150	8.80	<0.001	200		0.300			0.001	6.0	<0.002	1200		2100	<0.01			908.0	0.086
Post-90th for Trend	180	11.00	0.001	210		0.358			0.009	6.1	0.002	1500		2640	<0.01			908.4	0.126
50th Trigger	170	9.60	0.001	210		0.340			0.004	6.1	0.002	1500		2400	<0.01			908.2	0.110
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

3. Water Quality Data and Summary for Groundwater Seepage Detection Bore MPGM4/D1

MPGM4/D1 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.07	108	0.013	1.8	0.038		254	0.0002	101		2300	0.001		0.011	0.10	18.0	<0.00005	18	
Max	<0.001	0.36	130	0.017	2.1	0.045		290	0.0002	130		2400	0.002		0.073	0.1	37	<0.00005	19	
Min	<0.001	0.01	92	0.011	1.6	0.032		220	<0.0002	69		2100	0.001		0.001	0.1	5.3	<0.00005	16	
90th Baseline	<0.001	0.157	130	0.0162	1.94	0.0434		282	0.0002	122		2400	0.0013		0.0254	0.1	33	<0.00005	19	
Pre-50th Trend	<0.001	0.03	100	0.012	1.80	0.038		260	0.0002	110		2400	0.001		0.0025	0.1	17.0	<0.00005	18	
ANZECC 2000	0.00005	0.055		0.024	0.37(0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664(15.9)	0.00006		

Continued..... MPGM4/D1 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																		
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	177	10	0.007	126		0.53			0.001	6.2	0.002	1289		2189		2.1		910.5	0.047
Max	200	12	0.010	150		0.62			0.004	6.3	0.002	1400		2500		2.5		910.8	0.065
Min	150	8.5	<0.001	100		0.43			0.001	6.1	<0.002	1100		1900		1.8		910.1	0.030
90th Baseline	200	11.2	0.01	142		0.604			0.0022	6.3	0.002	1400		2420		2.4		910.8	0.061
Pre-50th Trend	180	10.0	0.010	130		0.52			0.001	6.1	0.002	1300		2200		2.0		910.6	0.048
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D1 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND µS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
26/10/2012	<0.001	0.04	110	0.016	1.6	0.033		220	<0.0002	69		2200	0.001		<0.001	<0.1	32	<0.00005	16	
9/01/2013	<0.001	<0.01	100	0.017	1.7	0.032		220	0.0002	78		2100	<0.001		0.001	0.1	7.6	<0.00005	18	
27/02/2013	<0.001	0.01	100	0.012	1.8	0.035		260	0.0002	94		2100	0.001		0.001	0.1	17	<0.00005	18	
27/03/2013	<0.001	0.02	100	0.011	1.9	0.033		250	0.0002	86		2400	0.001		0.073	0.1	12	<0.00005	18	
26/04/2013	<0.001	0.02	130	0.012	1.9	0.045		260	0.0002	110		2400	0.001		0.001	0.1	5.3	<0.00005	18	
13/05/2013	<0.001	0.02	130	0.011	1.7	0.043		250	0.0002	110		2400	0.001		0.004	0.1	13	<0.00005	19	
26/06/2013	<0.001	0.36	110	0.013	1.8	0.043		260	0.0002	110		2400	0.001		0.005	0.1	17	<0.00005	17	
25/07/2013	<0.001	0.07	92	0.012	2.1	0.038		290	0.0002	120		2400	0.002		0.001	0.1	21	<0.00005	19	
29/08/2013	<0.001	0.04	100	0.013	1.9	0.038		280	0.0002	130		2300	0.001		0.004	0.1	37	<0.00005	18	
19/09/2013	<0.001	0.24	110	0.012	2	0.032		300	0.0002	140		2600	0.002		0.002	0.1	9.7	<0.00005	18	
17/10/2013	<0.001	0.13	120	0.016	2.2	0.026		280	0.0002	150		2800	0.002		0.002	0.1	11	<0.00005	19	
21/11/2013	<0.001	0.02	100	0.012	1.8	0.024		270	0.0002	150		2200	0.002		0.002	0.1	12	<0.00005	18	
20/12/2013	<0.001	0.01	130	0.011	2	0.035		290	0.0002	160		2800	0.001		0.004	0.1	1.7	<0.00005	18	
24/01/2014	<0.001	0.14	94	0.008	2	0.037		300	0.0002	170		2800	0.001		0.001	0.1	14	<0.00005	22	
26/02/2014	<0.001	0.29	110	0.011	1.9	0.041		300	0.0002	190		2600	0.002		0.003	0.1	9.8	<0.00005	21	
19/03/2014	<0.001	0.48	99	0.013	1.7	0.046		280	0.0002	190		3100	0.001		0.003	0.1	8.7	<0.00005	20	
17/04/2014	<0.001	0.53	98	0.011	2.1	0.042		320	0.0002	230		3000	0.003		0.002	0.1	11	<0.00005	22	
14/05/2014	<0.001	0.46	130	0.011	2.2	0.044		320	0.0002	230		3500	0.001		0.001	0.1	24	<0.00005	24	
26/06/2014	<0.001	0.04	110	0.011	2.1	0.041		350	0.0002	230		3500	0.001		0.003	0.1	19	<0.00005	26	
24/07/2014	<0.001	<0.01	130	0.012	2.2	0.039		340	0.0002	290		3200	0.001		<0.001	0.25	22	<0.00005	25	
24/08/2014	<0.001	0.02	130	0.013	2.2	0.038		340	<0.0002	270		3100	<0.001		0.001	<0.2	21	0.0001	25	

Continued….MPGM4/D1 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)

Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
26/10/2012	150	8.5	0.01	100		0.43			0.001	6.1	<0.002	1100		1900		2.0		910.6	0.03
9/01/2013	150	9.4	<0.01	110		0.48			<0.001	6.1	0.002	1100		1900		2.4		910.2	0.03
27/02/2013	180	9.8	0.01	130		0.52			0.001	6.1	0.002	1300		2100		2.5		910.1	0.05
27/03/2013	170	10	0.01	120		0.54			0.004	6.1	0.002	1300		2200		1.8		910.8	0.06
26/04/2013	180	10	0.01	130		0.54			<0.001	6.3	0.002	1300		2000		2.0		910.6	0.048
13/05/2013	180	11	0.01	130		0.52			0.001	6.1	0.002	1400		2400		2.0		910.6	0.041
26/06/2013	180	11	<0.001	120		0.6			0.001	6.2	0.002	1300		2300		1.8		910.8	0.065
25/07/2013	200	11	0.001	140		0.62			0.001	6.3	0.002	1400		2500		1.9		910.7	0.049
29/08/2013	200	12	0.001	150		0.52			0.001	6.1	0.002	1400		2400		2.1		910.5	0.047
19/09/2013	210	12	0.001	160		0.58			<0.001	5.9	0.002	1500		2500		2.1		910.5	0.047
17/10/2013	200	11	0.001	160		0.65			0.002	6	0.002	1500		2200		2.0		910.6	0.07
21/11/2013	180	12	0.001	150		0.69			0.001	6	0.002	1500		2700		2.1		910.5	0.073
20/12/2013	200	12	0.001	150		0.69			0.002	6.1	0.002	1600		2500		2.0		910.6	0.069
24/01/2014	210	12	0.001	180		0.67			0.001	6	0.002	1600		2600		2.1		910.5	0.067
26/02/2014	200	13	0.001	170		0.73			0.002	6	0.002	1600		2600		2.0		910.6	0.064
19/03/2014	190	12	0.001	160		0.66			0.001	5.9	0.002	1400		2900	<0.01	1.8		910.8	0.063
17/04/2014	220	14	0.001	180		0.73			0.001	6.1	0.002	1800		3000		1.6		911.0	0.065
14/05/2014	220	14	0.001	190		0.8			0.001	6.1	0.002	1600		3000		1.9		910.7	0.08
26/06/2014	240	14	0.001	210		0.8			0.001	6	0.002	1700		3100		2.0	2.6	910.6	0.093
24/07/2014	230	16	0.001	210		0.89			0.001	6.2	0.002	1900		3200		2.0	2.8	910.6	0.09
24/08/2014	240	15	<0.001	220		0.88		6.2	<0.001	6.2	<0.002	1700		3200	<0.01	2.0	2.7	910.6	0.11

MPGM4/D1 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND mS/m	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	0.21	113	0.012	2.03	0.037		308	0.0002	200		2933	0.002		0.002	0.11	13.7	<0.00005	22	
Max	<0.001	0.53	130	0.016	2.20	0.046		350	0.0002	290		3500	0.003		0.004	0.25	24.0	0.0001	26	
Min	<0.001	0.01	94	0.008	1.70	0.024		270	<0.0002	140		2200	0.001		0.001	0.10	1.7	<0.00005	18	
Post-90th for Trend	<0.001	0.48	130	0.013	2.20	0.044		340	0.0002	266		3470	0.002		0.003	0.10	21.9	<0.00005	25	
50th Investigation Trigger	<0.001	0.14	110	0.012	2.05	0.039		300	0.0002	190		2900	0.001		0.002	0.10	11.5	<0.00005	22	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664(15.9)	0.00006		

Continued……. MPGM4/D1 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																		
Date	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	13.08	0.001	178		0.73			0.001	6.0	0.002	1617		2792	<0.01	2.0		910.6	0.074
Max	16.00	0.001	220		0.89			0.002	6.2	0.002	1900		3200	<0.01	2.1		911.0	0.110
Min	11.00	<0.001	150		0.58			<0.001	5.9	<0.002	1400		2200	<0.01	1.6		910.5	0.047
Post-90th for Trend	14.90	0.001	210		0.87			0.002	6.2	0.002	1790		3190	<0.01	2.1		910.8	0.093
50th Investigation Trigger	12.50	0.001	175		0.71			0.001	6.0	0.002	1600		2800	<0.01	2.0		910.6	0.070
ANZECC	5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 - 8.0	0.005	1000(1170)		2000					0.908

4. Water Quality Data and Summary for Ash Placement Area Groundwater Bores MPGM4/D10 and MPGM4/D11

MPGM4/D10 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	1.06	32	0.001	3.46	0.024		308	0.005	382		4533	0.001		0.012	1.7	3.71	<0.00005	88	
Max	<0.001	1.90	44	0.001	5.10	0.035		380	0.008	480		5500	0.002		0.028	2.5	11.00	<0.00005	110	
Min	<0.001	0.63	13	<0.001	1.90	0.018		230	0.004	220		3100	0.001		0.001	1.4	0.38	<0.00005	54	
90th Baseline	<0.001	1.34	40	0.001	4.86	0.031		348	0.007	472		5180	0.002		0.026	2.0	7.64	<0.00005	102	
Pre-50th for Trend	<0.001	1.00	34	0.001	3.50	0.023		320	0.005	390		4600	0.001		0.005	1.6	2.50	<0.00005	92	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued..... MPGM4/D10 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	208	7.3	0.007	623		0.69			0.007	5.6	0.007	2456		4267		13.5		912.6	1.333
Max	270	8.9	0.01	780		0.82			0.015	5.9	0.010	2900		5100		13.8		913.3	1.700
Min	140	4.5	0.001	390		0.46			0.003	5.4	0.004	1800		2700		12.8		912.3	1.000
90th Baseline	254	8.9	0.01	756		0.80			0.009	5.7	0.010	2820		5100		13.7		913.0	1.700
Pre-50th for Trend	210	7.7	0.01	620		0.69			0.005	5.6	0.007	2600		4500		13.6		912.5	1.200
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 - 8.0	0.005	1000(1170)		2000					0.908

MPGM4/D10 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																			
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
19-Oct-12	<0.001	1.9	21	<0.001	3	0.03		260	0.005	310		4400	0.001		0.005	1.4	2.9	0.00005	81	
15-Jan-13	<0.001	1.2	36	0.001	4.8	0.018		330	0.006	390		4400	<0.001		0.004	2.5	1.6	<0.00005	100	
15-Feb-13	<0.001	0.78	44	0.001	3.5	0.02		320	0.004	350		3800	<0.001		0.005	1.6	2.1	<0.00005	82	
15-Mar-13	<0.001	1	34	0.001	3.8	0.018		320	0.006	400		5100	<0.001		0.015	1.8	4.6	<0.00005	93	
15-Apr-13	<0.001	1.1	39	0.001	3.6	0.023		340	0.0062	480		5500	0.001		0.028	1.9	2.5	<0.00005	100	
15-May-13	<0.001	1.2	31	0.001	2.7	0.024		300	0.0049	430		4800	0.001		0.02	1.7	1.5	<0.00005	92	
26-Jun-13	<0.001	0.63	35	0.001	2.7	0.035		290	0.0052	390		4600	<0.001		0.002	1.4	11	<0.00005	78	
25-Jul-13	<0.001	1	34	0.001	5.1	0.023		380	0.0078	470		5100	0.002		0.001	1.6	6.8	<0.00005	110	
29-Aug-13	<0.001	0.69	12.5	<0.001	1.9	0.026		230	0.0038	220		3100	0.002		0.026	1.4	0.38	<0.00005	54	
19-Sep-13	<0.001	0.48	12.5	<0.001	1.8	0.029		230	0.0037	200		3100	0.002		0.024	1.3	0.03	<0.00005	50	
17-Oct-13	<0.001	0.86	31	0.001	3	0.024		280	0.0027	370		4700	0.002		0.008	1.5	8.5	<0.00005	77	
21-Nov-13	<0.001	0.64	32	0.003	3.4	0.016		300	0.0072	470		4400	0.004		0.008	2.2	8	<0.00005	100	
20-Dec-13	<0.001	0.96	12.5	0.001	2.5	0.023		270	0.0047	340		4400	0.001		0.005	1.7	15	<0.00005	82	
24-Jan-14	<0.001	0.92	26	0.001	4.1	0.026		340	0.0064	470		5500	0.002		0.007	1.4	12	<0.00005	96	
27-Feb-14	<0.001	1	31	0.001	3.6	0.02		350	0.0072	510		4900	0.003		0.007	1.3	0.03	<0.00005	110	
20-Mar-14	<0.001	0.83	29	0.001	2.7	0.02		310	0.0055	460		6000	0.002		0.004	1.1	10	<0.00005	98	
17-Apr-14	<0.001	0.56	39	0.001	3.2	0.021		330	0.005	480		5500	0.001		0.005	0.9		<0.00005	100	
14-May-14	<0.001	0.56	43	0.001	3.9	0.02		360	0.006	570		6800	<0.001		<0.001	1.3	12	<0.00005	130	
26-Jun-14	<0.001	0.47		0.001	3.6	0.018		380	0.0055	610		7300			0.001	1	10	<0.00005	140	
24-Jul-14	<0.001	0.46		0.001	4.3	0.019		400	0.0064	830		7100			0.003	2	13	<0.00005	150	
31-Aug-14	<0.001	0.48	50	<0.001	4.4	0.021		380	0.008	840		7100	<0.001		0.002	1.4	14	0.00007	160	

Continued….MPGM4/D10 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																		
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
19-Oct-12	170	6.1	0.01	560		0.68			0.015	5.4	0.005	2100		3500		13.6		912.5	1.7
15-Jan-13	200	8.6	0.01	620		0.82			0.005	5.6	0.007	2600		4400		13.7		912.4	1.6
15-Feb-13	200	6.4	0.01	570		0.69			0.004	5.7	0.004	2300		3800		12.8		913.3	1.4
15-Mar-13	220	7.9	0.01	670		0.78			0.005	5.6	0.006	2600		4500		13.2		912.9	1.7
15-Apr-13	250	8.9	0.01	780		0.73			0.008	5.6	0.01	2800		5100		13.6		912.5	1.1
15-May-13	210	7.7	0.01	660		0.65			0.008	5.6	0.007	2600		4800		13.6		912.5	1.1
26-Jun-13	210	7	0.001	610		0.65			0.005	5.7	0.004	2400		4500		13.4		912.7	1.2
25-Jul-13	270	8.9	0.001	750		0.79			0.006	5.9	0.01	2900		5100		13.6		912.5	1.2
29-Aug-13	140	4.5	0.001	390		0.46			0.003	5.5	0.007	1800		2700		13.8		912.3	1
19-Sep-13	140	4.4	0.001	360		0.5			0.002	5.9	0.008	1600		2700		13.9		912.2	1
17-Oct-13	190	6.3	0.001	650		0.68			0.008	5.5	<0.002	2500		3700		13.9		912.2	1.3
21-Nov-13	220	7.7	0.001	760		0.76			0.009	5.5	0.006	3000		5300		13.5		912.6	1.3
20-Dec-13	180	6.3	0.001	690		0.72			0.01	5.4	0.005	2500		4100		13.7		912.4	1.5
24-Jan-14	230	8.6	0.001	760		0.84			0.008	5.5	0.009	3000		5300		13.8		912.3	1.4
27-Feb-14	250	9.4	0.003	780		0.97			0.016	5.6	0.007	3100		5300		13.8		912.3	1.5
20-Mar-14	220	7.7	0.002	730		0.81			0.014	5.4	0.005	2900		5300		13.2		912.9	1.4
17-Apr-14	240	8.5	0.001	760		0.85			0.006	5.6	0.005	2800		3700		13.3		912.8	1.8
14-May-14	280	10	0.001	940		0.9			0.006	5.6	0.006	3200		6000		13.5		912.6	1.3
26-Jun-14	330	10	0.001	1100		0.98			0.006	5.7	0.005	3400		6500		13.5		912.6	1.3
24-Jul-14	360	12	<0.001	1200		1.1			0.005	5.8	0.008	4100		7400		14.0		912.1	1.5
31-Aug-14	360	11	0.001	1300		1.1			0.007	5.8	0.007	4100	<0.01	7600	<0.01	14.0	14.0	912.1	1.9

MPGM4/D10 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.69	31	0.001	3.38	0.021		328	0.0057	513		5567	0.002		0.007	1.4	9.32	<0.00005	108	
Max	<0.001	1.00	50	0.003	4.40	0.029		400	0.0080	840		7300	0.004		0.024	2.2	15.00	0.00007	160	
Min	<0.001	0.46	13	<0.001	1.80	0.016		230	0.0027	200		3100	0.001		0.001	0.9	0.03	<0.00005	50	
Post-90th for Trend	<0.001	0.96	44	0.00120	4.28	0.026		380	0.0072	808		7100	0.003		0.008	2.0	14.00	<0.00005	149	
50th Investigation Trigger	<0.001	0.60	31	0.001	3.50	0.021		335	0.0058	475		5500	0.002		0.005	1.4	10.00	<0.00005	100	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued..... MPGM4/D10 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	250	8.5	0.001	836		0.85			0.008	5.6	0.006	3017		5242	<0.01	13.7		912.4	1.4
Max	360	12.0	0.003	1300		1.10			0.016	5.9	0.009	4100		7600	<0.01	14.0		912.9	1.9
Min	140	4.4	<0.001	360		0.50			0.002	5.4	0.005	1600		2700	<0.01	13.2		912.1	1.0
Post-90th for Trend	357	10.9	0.002	1190		1.09			0.014	5.8	0.008	4030		7310	<0.01	14.0		912.7	1.8
50th Investigation Trigger	235	8.6	0.001	760		0.85			0.008	5.6	0.006	3000		5300	<0.01	13.8		912.3	1.4
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 - 8.0	0.005	1000(1170)		2000					0.908

MPGM4/D11 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.11	737	0.003	1.02	0.833		207	0.0002	227		2278	0.003		0.005	0.53	0.07	<0.00005	54	
Max	<0.001	0.29	900	0.008	2.30	1.400		340	0.0002	270		3200	0.005		0.015	0.80	0.28	<0.00005	61	
Min	<0.001	0.01	200	0.001	0.66	0.350		170	<0.0002	210		1800	0.001		0.001	0.20	0.01	<0.00005	45	
90th Baseline	<0.001	0.21	892	0.007	1.74	1.080		292	0.0002	238		2880	0.004		0.011	0.73	0.16	<0.00005	59	
Pre-50th for Trend	<0.001	0.07	840	0.001	0.78	0.850		180	0.0002	220		2100	0.003		0.004	0.50	0.03	<0.00005	55	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D11 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																		
Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	94	2.2	0.008	221		0.055			0.005	7.1	0.002	345		1433		25.1		912.4	0.045
Max	170	11.0	0.010	290		0.140			0.024	7.6	0.002	1700		2100		25.8		914.0	0.080
Min	76	0.2	<0.001	200		0.030			0.001	6.4	0.002	10		1200		23.5		911.7	0.014
90th Baseline	138	7.6	0.010	242		0.100			0.011	7.3	0.002	1036		1620		25.64		912.9	0.080
Pre-50th for Trend	77	0.4	0.010	210		0.039			0.002	7.2	0.002	110		1400		25.2		912.3	0.040
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 - 8.0	0.005	1000(1170)		2000					0.908

MPGM4/D11 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND µS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
19-Oct-12	<0.001	0.15	470	0.005	1.6	0.65		280	0.0002	220		2800	0.001		0.004	0.6	0.01	<0.00005	48	
10-Jan-13	<0.001	0.19	200	0.008	2.3	0.35		340	<0.0002	270		3200	<0.001		0.01	0.2		<0.00005	45	
27-Feb-13	<0.001	0.07	860	<0.001	0.68	1.4		180	0.0002	220		1800	<0.001		0.001	0.8		<0.00005	58	
27-Mar-13	<0.001	0.06	840	0.001	0.76	1		200	0.0002	230		2400	<0.001		0.003	0.5		<0.00005	61	
26-Apr-13	<0.001	0.29	800	0.001	0.66	0.87		170	0.0002	210		2100	0.005		0.015	0.5	0.02	<0.00005	53	
13-May-13	<0.001	0.05	820	<0.001	0.69	0.63		170	0.0002	230		2100	0.001		0.004	0.4	0.03	<0.00005	55	
26-Jun-13	<0.001	0.05	900	<0.001	0.81	0.85		170	0.0002	210		2000	0.003		0.001	0.7	0.04	<0.00005	57	
25-Jul-13	<0.001	0.09	890	0.001	0.9	0.9		180	0.0002	220		2000	0.003		0.006	<0.1	0.03	<0.00005	59	
29-Aug-13	<0.001	0.01	850	0.001	0.78	0.85		170	<0.0002	230		2100	0.002		0.001	0.5	0.28	<0.00005	53	
19-Sep-13	<0.001	0.02	840	<0.001	0.83	0.86		170	<0.0002	220		2100	0.003		<0.001	<0.2	0.03	<0.00005	53	
17-Oct-13	<0.001	0.59	760	0.003	1.3	0.77		220	0.0002	270		2600	0.003		0.002	0.6	0.04	<0.00005	51	
21-Nov-13	<0.001	<0.1	140	0.008	2.8	0.077		450	0.0002	460		3700	0.002		<0.001	0.2	18	<0.00005	50	
20-Dec-13	<0.001	0.01	230	0.007	2.7	0.091		430	0.0002	440		4700	0.002		0.001	0.2	1.5	<0.00005	44	
24-Jan-14	<0.001	0.22	770	0.006	0.94	0.6		180	0.0002	260		2300	0.005		0.002	0.5	23	<0.00005	56	
27-Feb-14	<0.001	0.01	120	0.008	3	0.45		480	0.0002	470		4200	0.003		0.006	0.2	24	<0.00005	58	
20-Mar-14	<0.001	0.03	120	0.009	2.7	0.43		480	0.0002	460		5500	0.002		0.002	0.2	25	<0.00005	56	
17-Apr-14	<0.001	0.01	130	0.010	2.7	0.071		460	0.0002	450		4300	0.003		0.001	0.2	12	<0.00005	55	
21-May-14	<0.001	<0.01	180	0.009	2.7	0.067		430	0.0002	390		4800	0.004		0.001	0.2	14	<0.00005	50	
26-Jun-14	<0.001	0.05	170	0.01	2.4	0.092		480	0.0001	370		4900	0.001		0.015	0.2	20	<0.00005	56	
24-Jul-14	<0.001	0.01	150	0.01	2.7	0.04		460	0.0001	480		4400	<0.001		0.001	0.2	34	<0.00005	52	
31-Aug-14	<0.001	<0.1	150	0.009	2.8	0.04		480	<0.0002	510		4500	0.001		<0.001	<0.2	32	0.00007	56	

Continued….MPGM4/D11 Water conditioned ash Placement Water Quality Data October, 2012 – August, 2014 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
19-Oct-12	130	6.8	<0.01	210		0.09			0.002	6.7	0.002	870		2100		25.4		912.1	0.06
10-Jan-13	170	11	0.01	290		0.14			0.006	6.4	<0.002	1700		1400		25.8		911.7	0.08
27-Feb-13	76	0.38	0.01	200		0.03			0.002	7.2	0.002	10		1200		23.5		914.0	0.04
27-Mar-13	86	0.36	0.01	220		0.04			0.003	7.2	0.002	160		1500		24.8		912.7	0.05
26-Apr-13	76	0.28	0.01	200		0.039			0.024	7.2	0.002	110		1200		25.2		912.3	0.08
13-May-13	76	0.35	<0.01	200		0.038			0.002	7.2	0.002	140		1400		25.4		912.08	0.027
26-Jun-13	77	0.21	<0.001	210		0.037			0.001	7.2	0.002	35		1400		25		912.5	0.014
25-Jul-13	82	0.26	0.001	230		0.044			0.002	7.6	0.002	44		1400		25.2		912.3	0.025
29-Aug-13	77	0.26	<0.001	230		0.034			<0.001	7.1	<0.002	37		1300		25.6		911.9	0.025
19-Sep-13	77	0.26	0.001	230		0.037			<0.001	7.1	<0.002	42		1300		25.7		911.8	0.025
17-Oct-13	100	2.5	0.001	250		0.098			0.001	6.9	0.002	440		1600		25.7		911.8	0.029
21-Nov-13	240	15	0.001	480		0.24			0.001	6.1	0.002	2600		4800		25.3		912.2	0.034
20-Dec-13	230	14	0.001	460		0.26			0.001	6.4	0.002	2500		4400		25.4		912.1	0.036
24-Jan-14	85	1.1	0.001	250		0.23			0.014	7.2	0.002	140		1500		25.7		911.8	0.039
27-Feb-14	260	16	0.001	540		0.33			0.005	6.0	0.002	2800		4800		25.6		911.9	0.048
20-Mar-14	250	15	0.001	550		0.32			0.004	5.9	0.002	2700		5100		25		912.4	0.058
17-Apr-14	240	15	0.001	480		0.31			0.001	6.1	0.002	2600		4500		24.5		912.9	0.054
21-May-14	220	14	0.001	430		0.28			0.001	6.2	0.002	2200		4100		25.1		912.3	0.065
26-Jun-14	250	15	0.001	500		0.3			0.001	6.2	0.002	2100		4300		25		912.4	0.063
24-Jul-14	240	16	0.001	510		0.36			0.001	6.2	0.002	2700		4700		26	25.7	911.4	0.064
31-Aug-14	260	16	<0.001	600		0.38			<0.001	6.3	<0.002	2800		5100	<0.01	25.9	25.9	911.5	0.08

MPGM4/D11 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	0.11	313	0.008	2.30	0.299		393	0.0002	398		4000	0.003		0.003	0.27	16.96	<0.00005	53	
Max	<0.001	0.59	840	0.010	3.00	0.860		480	0.0002	510		5500	0.005		0.015	0.60	34.00	0.00007	58	
Min	<0.001	0.01	120	0.003	0.83	0.040		170	<0.0002	220		2100	0.001		0.001	0.20	0.03	<0.00005	44	
Post-90th for Trend	<0.001	0.29	769	0.010	2.80	0.753		480	0.0002	479		4890	0.004		0.008	0.51	31.30	<0.00005	56	
50th Investigation Trigger	<0.001	0.02	160	0.009	2.70	0.092		455	0.0002	445		4350	0.003		0.002	0.20	19.00	<0.00005	54	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D11 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	204	11.66	0.001	440		0.262			0.003	6.4	0.002	1969		3850	<0.01	25.4		912.0	0.050
Max	260	16.00	0.001	600		0.380			0.014	7.2	0.002	2800		5100	<0.01	26.0		912.9	0.080
Min	77	0.26	<0.001	230		0.037			0.001	5.9	<0.002	42		1300	<0.01	24.5		911.4	0.025
Post-90th for Trend	259	16.00	0.001	549		0.357			0.006	7.1	0.002	2790		5070	<0.01	25.9		912.4	0.065
50th Investigation Trigger	240	15.00	0.001	480		0.290			0.001	6.2	0.002	2550		4450	<0.01	25.5		912.0	0.051
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

5. Lamberts North Groundwater Bores MPGM4/D15, D16, D17 and D18

Continued..... MPGM4/D15 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)

	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	0.001	50.58	37	0.083	0.27	0.391		197	0.0038	74		2150	0.271	<0.001	0.319	0.1	3.66	0.00147	43	
Max	<0.005	110.00	88	0.190	0.39	0.920		230	0.0083	120		2600	2.000	<0.001	0.700	<10	22.00	0.00370	63	
Min	<0.001	0.73	25	0.002	0.21	0.018		150	0.0008	55		1600	0.002	<0.001	0.012	0.1	0.01	<0.00005	25	
90th Baseline	0.001	101.00	69	0.182	0.32	0.812		230	0.0071	87		2330	0.480	<0.001	0.691	0.2	9.85	0.00343	58	
Pre-50th for Trend	0.001	49.50	25	0.040	0.25	0.370		200	0.0032	69		2200	0.080	<0.001	0.251	0.1	0.31	0.00089	42	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued..... MPGM4/D15 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)

	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	89	1.60	0.026	274		0.81			0.516	4.4	0.025	1145		1760		26.2		914.7	2.96
Max	110	1.80	0.050	390		1.10			1.300	6.3	0.066	1300		2200		27.0		915.8	4.70
Min	69	1.30	<0.010	220		0.33			0.011	3.8	0.001	820		1300		25.0		913.8	1.30
90th Baseline	110	1.71	0.042	300		1.10			1.003	6.1	0.053	1300		1930		26.9		915.4	4.43
Pre-50th for Trend	88	1.60	0.025	270		0.78			0.439	4.0	0.0185	1200		1800		26.2		914.6	2.60
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 - 8.0	0.005	1000(1170)		2000					0.908

MPGM4/D15 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																				
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
23/11/2012	<0.001	100	61	0.04	0.39	0.8		220	0.0047	120		2600	0.065		0.44	<10	0.005	0.0026	63	
21/12/2012	<0.001	10	<25	0.009	0.25	0.11		170	0.0016	83		2300	<0.001		0.062	<0.1	0.09	0.00017	34	
25/01/2013	<0.001	5	25	0.007	0.24	0.043		170	0.0015	79		2200	0.003		0.029	0.1	0.56	0.00014	30	
27/02/2013	<0.001	0.73	88	0.002	0.22	0.035		150	0.0008	55		1600	2		0.018	0.3	0.28	<0.00005	25	
21/03/2013	<0.001	2.6	25	0.003	0.23	0.03		170	0.001	69		2200	0.003		0.035	0.1	0.25	<0.00005	30	
26/04/2013	<0.005	110	25	0.18	0.31	0.92		230	0.0083	67		2100	0.097		0.7	0.1	0.06	0.0037	57	
13/05/2013	0.001	94	25	0.15	0.25	0.66		210	0.007	69		2200	0.08		0.55	0.1	0.34	0.0028	56	
26/06/2013	0.001	93	25	0.17	0.28	0.63		230	0.005	62		2100	0.09	<0.01	0.65	0.1	4.5	0.0016	53	
25/07/2013	0.001	89	25	0.19	0.31	0.66		230	0.0068	65		2000	0.1	<0.01	0.69	<0.1	8.5	0.0034	50	
29/08/2013	<0.001	1.5	<25	<0.001	0.21	0.018		190	0.0013	72		2200	0.002		0.012	<0.2	22	0.00014	28	
19/09/2013	<0.001	1.7	<25	0.001	0.21	0.011		190	0.0015	70		2200	0.002		0.013	<0.2	17	<0.00005	26	
17/10/2013	0.001	46	25	0.08	0.29	0.32		200	0.0027	71		2300	0.04		0.25	0.2	2.6	0.0011	39	
21/11/2013	<0.001	6.3	25	0.018	0.21	0.052		190	0.0017	76		2200	0.43	<0.01	0.067	0.2	12	0.00029	30	
20/12/2013	<0.001	8.5	25	0.018	0.21	0.071		180	0.0014	96		2300	0.083		0.062	0.2	1.8	0.0003	28	
30/01/2014	<0.001	16	25	0.043	0.22	0.13		190	0.0019	90		2500	0.11	<0.01	0.17	0.2	2.9	0.00044	30	
27/02/2014	<0.001	8.3	25	0.032	0.21	0.12		200	0.0018	92		2000	0.21	<0.01	0.095	0.2	10	0.0004	34	
21/03/2014	<0.001	7.4	25	0.025	0.17	0.071		180	0.0016	90		2700	0.09	<0.01	0.074	0.2	5.6	0.00023	29	
17/04/2014	<0.001	2.4	25	0.005	0.2	0.042		190	0.0012	90		2300	0.083	<0.01	0.023	0.2	8.3	<0.00005	29	
22/05/2014	<0.001	2	25	0.003	0.22	0.021		190	0.0013	96		2700	0.092	<0.01	0.021	0.2	17	<0.00005	28	
26/06/2014	<0.001	1.5	25	0.002	0.2	0.015		220	0.0011	83		2700	0.03		0.029	0.2	20	<0.00005	32	
24/07/2014	<0.001	2.2	25	0.004	0.21	0.019		200	0.0012	96		2300	0.009		0.017	<5	19	<0.00005	28	
31/08/2014	<0.001	1.6	<25	0.004	0.21	0.021		200	0.0012	94		2300	0.062	<0.01	0.013	<0.2	21	<0.00005	29	

Continued..... MPGM4/D15 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																		
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
23/11/2012	110	1.8	0.02	390		0.33			0.79	6.1	0.033	1300		2200		25		915.8	2.30
21/12/2012	73	1.6	<0.01	290		0.8			0.088	3.9	0.004	1300		1800		27		913.8	2.90
25/01/2013	77	1.5	0.01	270		0.75			0.048	3.9	0.002	1030		1800		26		914.8	2.30
27/02/2013	69	1.3	0.01	220		0.38			0.011	6.3	0.001	820		1400		25.5		915.3	1.30
21/03/2013	75	1.5	0.01	250		0.74			0.032	3.9	0.001	1100		1700		25.4		915.4	2.20
26/04/2013	100	1.7	0.039	270		1.1			1.3	4	0.066	1200		1300		26.2		914.6	4.70
13/05/2013	90	1.6	0.03	270		1.1			0.95	4	0.05	1200		1900		26.8		914.0	4.40
26/06/2013	100	1.7	0.05	240		1.1			0.95	3.9	0.038	1100		1900		26.2		914.6	3.90
25/07/2013	110	1.7	0.039	270		1.1			0.97	4.2	0.051	1200		1900		26.0		914.8	4.00
29/08/2013	86	1.6	<0.01	270		0.65			0.022	3.8	0.001	1200		1700		26.9		913.9	1.60
19/09/2013	84	1.7	<0.01	250		0.77			0.023	3.9	0.001	1200		1800		26.5		914.3	1.60
17/10/2013	87	1.7	0.02	250		0.91			0.34	3.9	0.021	1300		1700		26.9		913.9	2.60
21/11/2013	83	1.8	0.017	260		0.99			0.073	3.8	0.005	1300		2200		26.3		914.5	2.20
20/12/2013	82	2	0.007	270		0.82			0.073	4.5	0.005	1300		2000		26.0		914.8	1.90
30/01/2014	84	1.8	0.012	260		1.1			0.14	3.9	0.009	1300		2300		26.4		914.4	2.50
27/02/2014	90	2	0.014	280		1			0.093	4	0.008	1300		2100		26.0		914.8	2.20
21/03/2014	80	1.8	0.007	250		0.9			0.069	3.8	0.004	1300		2100	0.02	25.8		915.0	2.20
17/04/2014	85	1.9	0.004	260		0.83			0.022	3.9	0.001	1300		2100		26.0		914.8	1.70
22/05/2014	84	2.1	0.004	260		0.92			0.017	4.2	0.001	1300		2100		26.2		914.6	2.20
26/06/2014	95	2	0.001	290		0.94			0.013	4.5	0.001	1200		2100		26.1		914.7	2.50
24/07/2014	86	2	<0.001	260		0.93			0.016	4.4	0.001	1300		2200		26.0	26.4	914.8	1.90
31/08/2014	88	2	0.002	280		0.93			0.02	4.7	<0.002	1400		2100	<0.01	26.0	26.2	914.8	2.40

MPGM4/D15 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND mS/m	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	8.66	25	0.020	0.21	0.074		194	0.0016	87		2375	0.103	<0.001	0.070	0.20	11.43	0.00026	30	
Max	0.001	46.00	25	0.080	0.29	0.320		220	0.0027	96		2700	0.430	<0.001	0.250	<5	21.00	0.00110	39	
Min	<0.001	1.50	<25	0.001	0.17	0.011		180	0.0011	70		2000	0.002	<0.001	0.013	<0.20	1.80	<0.00005	26	
Post-90th for Trend	0.001	15.25	25	0.042	0.22	0.129		200	0.0019	96		2700	0.200	<0.001	0.163	0.20	19.90	0.00044	34	
50th Investigation Trigger	<0.001	4.35	25	0.012	0.21	0.047		190	0.0015	90		2300	0.083	<0.001	0.046	0.20	11.00	0.00014	29	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued..... MPGM4/D15 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																			
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	86	1.90	0.009	264		0.92			0.075	4.1	0.005	1292		2067	0.015	26.2	26.3	914.6	2.158
Max	95	2.10	0.020	290		1.10			0.340	4.7	0.021	1400		2300	0.020	26.9	26.4	915.0	2.600
Min	80	1.70	<0.001	250		0.77			0.013	3.8	<0.002	1200		1700	<0.01	25.8	26.2	913.9	1.600
Post-90th for Trend	85	2.00	0.017	280		1.00			0.135	4.5	0.009	1300		2200	0.019	26.5	26.4	914.8	2.500
50th Investigation Trigger	90	1.95	0.007	260		0.93			0.046	4.0	0.004	1300		2100	0.015	26.1	26.3	914.8	2.200
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D16 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.38	312	0.009	0.032	0.176		160	0.0002	28.8		1090	0.001		0.005	0.38	0.061	<0.00005	21.6	
Max	<0.001	1.70	320	0.020	0.040	1.100		180	0.0002	110		1100	0.002		0.009	0.60	0.240	0.00014	25.0	
Min	<0.001	0.01	310	0.002	0.020	0.018		150	<0.0002	17		1000	0.001		0.001	0.10	0.005	<0.00005	19.0	
90th Baseline	<0.001	0.96	316	0.019	0.040	0.479		162	0.0002	29.9		1100	0.002		0.009	0.51	0.096	<0.00005	23.2	
Pre-50th for Trend	<0.001	0.14	310	0.008	0.033	0.027		160	0.0002	20		1100	0.001		0.004	0.40	0.045	<0.00005	22.0	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued…… MPGM4/D16 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	57	0.068	0.004	21.6		0.011			0.003	7.0	0.002	304		786		12.0		909.9	0.043
Max	64	0.098	0.005	24.0		0.050			0.014	7.4	0.002	330		880		12.5		910.1	0.100
Min	51	0.034	<0.001	18.0		0.001			<0.001	6.5	<0.002	280		700		11.7		909.3	0.014
90th Baseline	60	0.097	0.005	24.0		0.023			0.007	7.3	0.002	330		871		12.2		910.1	0.082
Pre-50th for Trend	57	0.075	0.005	21.5		0.005			0.001	7.0	0.002	309.5		790		11.9		909.9	0.030
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D16 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																				
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
23/11/2012	<0.001	0.25		0.019	0.02	0.024		150	<0.0002	20		1100	<0.001		0.001	0.3	0.04	<0.00005	20	
21/12/2012	<0.001	1.7		0.02	0.02	1.1		150	0.0002	21		1100	0.001		0.008	0.5	0.005	<0.00005	22	
25/01/2013	<0.001	0.64		0.014	0.04	0.41		160	0.0002	110		1100	0.002		0.005	0.5	0.02	<0.00005	22	
27/02/2013	<0.001	0.34		0.01	0.04	0.078		160	0.0002	20		1000	0.001		0.003	0.6	0.05	<0.00005	23	
21/03/2013	<0.001	0.03		0.008	0.04	0.027		160	0.0002	21		1100	0.001		0.002	0.3	0.08	<0.00005	25	
26/04/2013	<0.001	0.02	310	0.006	0.025	0.023		160	0.0002	19		1100	0.001		0.009	0.4	0.05	<0.00005	20	
13/05/2013	<0.001	0.02	310	0.007	0.025	0.027		160	0.0002	20		1100	0.001		0.004	0.2	0.03	<0.00005	22	
26/06/2013	<0.001	<0.05	310	0.004	0.04	0.018		160	0.0002	17		1100	<0.001		<0.001	0.4	0.04	<0.00005	19	
25/07/2013	<0.001	0.01	310	0.004	0.04	0.022		180	0.0002	19		1100	0.002		0.009	0.5	0.05	<0.00005	21	
29/08/2013	<0.001	<0.01	320	0.002	0.025	0.029		160	<0.0002	21		1100	0.002		0.003	0.1	0.24	0.00014	22	
19/09/2013	<0.001	0.07	310	0.002	0.025	0.027		160	<0.0002	21		1100	0.002		0.003	0.3	0.02	<0.00005	22	
17/10/2013	<0.001	0.1	310	0.003	0.06	0.023		160	0.0002	20		1200	0.005		0.001	0.4	0.05	<0.00005	20	
21/11/2013	<0.001	0.03	300	0.003	0.025	0.016		160	0.0002	20		1000	0.002		<0.001	0.4	0.005	<0.00005	20	
20/12/2013	<0.001	0.03	300	0.002	0.025	0.014		150	0.0002	20		1100	0.01		0.001	0.4	0.005	<0.00005	18	
30/01/2014	<0.001	0.14	290	0.002	0.025	0.044		150	0.0002	20		1100	0.011		0.001	0.4	2.1	<0.00005	18	
27/02/2014	<0.001	0.06	290	0.001	0.025	0.11		160	0.0002	20		990	0.088		0.003	0.3	0.005	<0.00005	22	
20/03/2014	<0.001	0.01	300	0.0005	0.025	0.018		140	0.0002	20		1100	0.005		0.001	0.3	0.02	<0.00005	19	
17/04/2014	<0.001	0.43	300	0.002	0.025	0.15		160	0.0002	21		1100	0.013		0.001	0.3	0.03	<0.00005	21	
22/05/2014	<0.001	0.44	300	0.002	0.05	0.081		160	0.0002	19		1200	0.008		0.001	0.3	0.005	<0.00005	20	
26/06/2014	<0.001	<0.01	280	0.001	0.025	0.016		160	0.0002	19		1200	0.001		0.001	0.3	0.01	<0.00005	21	
24/07/2014	<0.001	1.2	290	0.001	0.025	0.11		160	0.0002	20		1100	0.001		0.001	0.3	0.02	<0.00005	21	
31/08/2014	<0.001	0.1	290	0.001	<0.05	0.036		160	<0.0002	22		1100	<0.001		<0.001	0.3	0.02	<0.00005	21	

Continued..... MPGM4/D16 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																			
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
23/11/2012	51	0.034	0.005	20		0.005			<0.001	7	<0.002	280		700		12.2		909.6	0.03
21/12/2012	53	0.098	0.005	22		0.05			0.014	7.3	0.002	290		710		12		909.8	0.07
25/01/2013	55	0.097	0.005	23		0.02			0.004	6.5	0.002	309		780		12.5		909.3	0.05
27/02/2013	57	0.078	0.005	24		0.005			0.002	7	0.002	290		790		11.7		910.1	0.08
21/03/2013	56	0.079	0.005	24		0.005			0.001	7.1	0.002	280		840		11.8		910.0	0.03
26/04/2013	58	0.039	0.005	19		0.005			0.001	7	0.002	310		710		11.9		909.9	0.023
13/05/2013	57	0.072	0.005	21		0.005			0.001	7	0.002	330		880		11.8		910.0	0.017
26/06/2013	59	0.043	<0.001	18		0.0005			0.001	7	0.002	310		870		11.7		910.1	0.014
25/07/2013	64	0.058	0.001	21		0.002			0.001	7.4	0.002	330		790		11.7		910.1	0.015
29/08/2013	57	0.084	0.001	24		0.008			<0.001	7.1	<0.002	310		790		12		909.8	0.1
19/09/2013	59	0.082	0.001	23		0.008			<0.001	7.2	<0.002	300		780		12.1		909.7	0.1
17/10/2013	57	0.041	<0.001	20		0.004			0.001	6.9	0.002	340		750		12		909.8	0.019
21/11/2013	56	0.037	0.001	19		0.002			0.001	6.9	0.002	350		910		12.1		909.7	0.021
20/12/2013	54	0.034	0.001	18		0.006			0.001	6.9	0.002	330		800		12.1		909.7	0.018
30/01/2014	54	0.034	0.001	18		0.008			0.001	6.9	0.002	300		880		12.1		909.7	0.024
27/02/2014	57	0.035	0.004	19		0.056			0.001	7.2	0.002	330		870		12.2		909.6	0.022
20/03/2014	50	0.037	0.001	17		0.004			<0.001	6.8	0.002	320		820		11.6		910.2	0.025
17/04/2014	58	0.032	0.001	19		0.01			0.001	7.1	0.002	350		870		11.3		910.5	0.023
22/05/2014	55	0.033	0.001	18		0.006			<0.001	6.8	0.002	300		760		11.5		910.3	0.023
26/06/2014	59	0.034	0.001	19		0.0005			0.001	7	0.002	300		770		11.9		909.9	0.023
24/07/2014	56	0.033	0.001	19		0.005			0.002	7	0.002	320		810		11.9	11.8	909.9	0.026
31/08/2014	58	0.033	<0.001	20		0.002			<0.001	7.1	<0.002	350		810	<0.01	11.4	11.4	910.4	0.02

MPGM4/D16 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	0.24	297	0.002	0.030	0.054		157	0.0002	20		1108	0.013		0.001	0.33	0.19	<0.00005	20	
Max	<0.001	1.20	310	0.003	0.060	0.150		160	0.0002	22		1200	0.088		0.003	0.40	2.10	<0.00005	22	
Min	<0.001	0.01	280	0.001	0.025	0.014		140	<0.0002	19		990	0.001		0.001	0.30	0.01	<0.00005	18	
Post-90th for Trend	<0.001	0.44	309	0.003	0.050	0.110		160	0.0002	21		1200	0.013		0.003	0.40	0.05	<0.00005	22	
50th Investigation Trigger	<0.001	0.10	300	0.002	0.025	0.032		160	0.0002	20		1100	0.005		0.001	0.30	0.02	<0.00005	21	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued..... MPGM4/D16 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	56	0.039	0.001	19		0.009			0.001	7.0	0.002	324		819	<0.01	11.9	11.6	910.0	0.029
Max	59	0.082	0.004	23		0.056			0.002	7.2	0.002	350		910	<0.01	12.2	11.8	910.5	0.100
Min	50	0.032	<0.001	17		0.001			<0.001	6.8	<0.002	300		750	<0.01	11.3	11.4	909.6	0.018
Post-90th for Trend	59	0.041	0.001	20		0.010			0.001	7.2	0.002	350		879	<0.01	12.1	11.8	910.4	0.026
50th Investigation Trigger	57	0.034	0.001	19		0.006			0.001	7.0	0.002	325		810	<0.01	12.0	11.6	909.9	0.023
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D17 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.75	131	0.008	0.033	0.063		177	0.0002	37		1380	0.004		0.009	0.36	5.74	<0.00005	14.8	
Max	<0.001	2.90	150	0.019	0.060	0.110		190	0.0002	40		1400	0.016		0.033	0.60	22.00	0.00006	16.0	
Min	<0.001	0.03	110	0.003	0.020	0.042		160	0.0002	32		1300	0.001		0.004	0.05	0.01	<0.00005	13.0	
90th Baseline	<0.001	1.94	150	0.012	0.051	0.075		190	0.0002	40		1400	0.010		0.0162	0.51	18.40	<0.00005	16.0	
Pre-50th for Trend	<0.001	0.50	130	0.006	0.025	0.062		175	0.0002	37		1400	0.002		0.0055	0.35	2.85	<0.00005	15.0	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D17 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																		
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	82	1.21	0.005	53		0.009			0.010	6.4	0.002	645		1120		26.4		910.1	0.112
Max	89	1.40	0.005	60		0.042			0.041	6.8	0.002	670		1300		27.0		911.3	0.460
Min	76	1.10	0.004	41		0.002			0.001	6.1	0.002	594		1000		25.2		909.5	0.016
90th Baseline	85	1.40	0.005	58		0.013			0.022	6.8	0.002	670		1210		27.0		910.5	0.172
Pre-50th for Trend	82.5	1.15	0.005	54		0.005			0.005	6.5	0.002	645		1100		26.5		910.0	0.080
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D17 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																				
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
23/11/2012	<0.001	0.61	120	0.0055	0.02	0.065		190	<0.0002	32		1400	0.0016		0.0044	0.6	0.19	<0.00005	15	
21/12/2012	<0.001	1.7	120	0.011	0.02	0.071		170	0.0002	33		1400	<0.001		0.009	0.4	0.005	<0.00005	16	
25/01/2013	<0.001	0.5	140	0.009	0.04	0.064		180	0.0002	40		1400	0.002		0.007	0.5	3	<0.00005	15	
27/02/2013	<0.001	0.29	150	0.004	0.04	0.059		190	0.0002	37		1300	<0.001		0.005	0.5	3.1	<0.00005	15	
21/03/2013	<0.001	0.03	150	0.003	0.05	0.051		180	0.0002	36		1400	0.001		0.005	0.3	0.91	<0.00005	16	
26/04/2013	<0.001	0.06	150	0.007	0.025	0.056		160	0.0002	38		1400	<0.001		<0.001	0.3	0.11	<0.00005	14	
13/05/2013	<0.001	0.56	130	0.008	0.025	0.068		170	0.0002	39		1400	0.002		0.006	0.2	2.7	<0.00005	15	
26/06/2013	<0.001	<0.05	110	0.005	0.02	0.043		170	0.0002	35		1400	0.006		0.004	0.05	18	<0.00005	13	
25/07/2013	<0.001	2.9	110	0.019	0.06	0.11		190	0.0002	40		1400	0.016		0.033	0.4	7.4	0.00006	16	
29/08/2013	<0.001	0.11	130	0.004	0.025	0.042		170	<0.0002	37		1300	0.002		<0.001	0.3	22	<0.00005	13	
19/09/2013	<0.001	0.09	120	0.004	0.025	0.042		190	<0.0002	37		1400	0.002		<0.001	0.3	10	<0.00005	14	
17/10/2013	<0.001	0.07	130	0.003	0.025	0.04		170	0.0002	38		1400	0.002		0.001	0.3	7.7	<0.00005	13	
21/11/2013	<0.001	0.34	78	0.004	0.025	0.033		180	0.0002	32		1300	0.006		0.002	0.1	11	<0.00005	13	
20/12/2013	<0.001	0.56	96	0.003	0.025	0.04		180	0.0002	32		1500	0.012		0.002	0.1	1.6	<0.00005	15	
24/01/2014	<0.001	0.95	73	0.006	0.025	0.052		190	0.0002	32		1500	0.014		0.006	0.1	9.1	<0.00005	17	
26/02/2014	<0.001	0.32	83	0.004	0.025	0.049		200	0.0002	30		1400	0.014		0.005	0.1	11	<0.00005	16	
21/03/2014	<0.001	0.5	81	0.003	0.025	0.053		200	0.0002	27		1800	0.024		0.002	0.1	14	<0.00005	14	
17/04/2014	<0.001	0.38	62	0.004	0.025	0.045		240	0.0002	27		1800	0.029		0.002	0.1	19	<0.00005	16	
22/05/2014	<0.001	0.4	81	0.003	0.025	0.039		210	0.0002	26		1800	0.01		0.001	0.1	24	<0.00005	15	
26/06/2014	<0.001	0.18	41	0.002	0.025	0.036		210	0.0002	25		1800	0.005		0.003	0.1	26	<0.00005	15	
23/07/2014	<0.001	0.04	85	0.003	0.025	0.033		230	0.0002	26		1600	0.001		0.003	0.1	33	<0.00005	15	
31/08/2014	<0.001	<0.01	62	0.003	0.05	0.042		240	<0.0002	110		2100	<0.001		0.001	<0.2	44	<0.00005	16	

Continued……. MPGM4/D17 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																			
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
23/11/2012	83	1.4	0.005	51		0.005			0.0037	6.4	<0.002	670		1100		27		909.5	0.08
21/12/2012	76	1.3	0.005	55		0.01			0.009	6.8	0.002	640		1000		26.5		910	0.13
25/01/2013	79	1.1	0.005	55		0.005			0.005	6.1	0.002	594		1100		27		909.5	0.11
27/02/2013	84	1.1	0.005	60		0.005			0.002	6.5	0.002	630		1200		25.2		911.3	0.08
21/03/2013	81	1.1	0.005	58		0.005			<0.001	6.8	0.002	640		1200		26		910.5	0.04
26/04/2013	76	1.1	0.005	53		0.005			0.001	6.5	0.002	620		1000		26.5		910	0.041
13/05/2013	82	1.1	0.005	53		0.005			0.009	6.3	0.002	670		1300		26.5		910	0.14
26/06/2013	84	1.4	<0.001	41		0.004			<0.001	6.3	0.002	650		1200		26.1		910.4	0.016
25/07/2013	89	1.3	0.004	57		0.042			0.041	6.5	0.002	670		1100		26.1		910.4	0.46
29/08/2013	83	1.2	<0.001	50		0.002			<0.001	6.2	<0.002	670		1000		26.6		909.9	0.021
19/09/2013	91	1.2	<0.001	53		0.002			<0.001	6.2	<0.002	660		1100		26.8		909.7	0.023
17/10/2013	80	1.1	0.001	49		0.003			0.001	6.3	0.002	670		1100		26.7		909.8	0.026
21/11/2013	91	1.7	0.001	45		0.006			0.003	6	0.002	870		1300		26.9		909.6	0.055
20/12/2013	95	1.7	0.001	48		0.009			0.003	6.2	0.002	820		1300		26.9		909.6	0.048
24/01/2014	94	1.6	0.001	46		0.014			0.009	6.3	0.002	760		1300		26.8		909.7	0.061
26/02/2014	100	2.1	0.001	48		0.011			0.004	6.2	0.002	880		1500		26.7		909.8	0.051
21/03/2014	98	2.2	<0.001	44		0.016			0.002	5.9	0.002	980		1500		26		910.5	0.054
17/04/2014	120	2.9	0.001	53		0.022			0.002	5.9	0.002	1100		1800		26		910.5	0.065
22/05/2014	110	2.8	<0.001	49		0.012			0.001	6	0.002	970		1500		26.2		910.3	0.073
26/06/2014	110	2.7	0.001	52		0.008			0.001	6.7	0.002	850		1500		26.5		910	0.077
23/07/2014	120	3	0.001	56		0.007			0.001	6.1	0.002	990		1600		26.5	26.5	910	0.077
31/08/2014	140	5.5	<0.001	160		0.079			<0.001	6.1	<0.002	1400		2200	<0.01	26.1	26.1	910.4	0.24

MPGM4/D17 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	0.35	83	0.004	0.027	0.042		203	0.0002	37		1617	0.011		0.003	0.14	17.53	<0.00005	14.9	
Max	<0.001	0.95	130	0.006	0.050	0.053		240	0.0002	110		2100	0.021		0.006	0.30	44.00	<0.00005	17.0	
Min	<0.001	0.04	41	0.002	0.025	0.033		170	0.0002	25		1300	0.001		0.001	0.10	1.60	<0.00005	13.0	
Post-90th for Trend	<0.001	0.56	118	0.004	0.025	0.052		239	0.0002	38		1800	0.024		0.005	0.30	32.30	<0.00005	16.0	
50th Investigation Trigger	<0.001	0.34	81	0.003	0.025	0.041		200	0.0002	31		1550	0.010		0.002	0.10	12.50	<0.00005	15.0	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued…… MPGM4/D17 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	104	2.38	0.001	59		0.016			0.003	6.2	0.002	913		1475	<0.01	26.5	26.3	910.0	0.071
Max	140	5.50	0.001	160		0.079			0.009	6.7	0.002	1400		2200	<0.01	26.9	26.5	910.5	0.240
Min	80	1.10	0.001	44		0.002			0.001	5.9	0.002	660		1100	<0.01	26.0	26.1	909.6	0.023
Post-90th for Trend	120	2.99	0.001	56		0.021			0.005	6.3	0.002	1089		1780	<0.01	26.9	26.5	910.5	0.077
50th Investigation Trigger	99	2.15	0.001	49		0.010			0.002	6.2	0.002	875		1500	<0.01	26.6	26.3	909.9	0.058
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D18 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	AL K	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.31	341	0.021	0.13	0.367		91.8	0.0002	11.80		706	0.007		0.012	0.68	0.28	<0.00005	20	
Max	<0.001	1.00	360	0.031	0.19	0.430		98	0.0002	17		780	0.020		0.046	0.90	2.60	<0.00005	22	
Min	<0.001	0.01	320	0.011	0.10	0.320		88	0.0002	10		660	0.001		0.002	0.40	0.01	<0.00005	17	
90th Baseline	<0.001	0.57	351	0.029	0.15	0.412		96.2	0.0002	12.5		726	0.016		0.024	0.81	0.29	<0.00005	21	
Pre-50th for Trend	<0.001	0.28	340	0.020	0.13	0.355		91	0.0002	11.5		700	0.002		0.008	0.70	0.02	<0.00005	20	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued…… MPGM4/D18 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																		
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	34	0.16	0.006	20		0.007			0.005	7.3	0.001	34		419		20.97		911.82	0.082
Max	40	0.29	0.020	30		0.025			0.010	7.6	0.001	73		480		21.5		911.99	0.250
Min	31	0.11	0.001	16		0.002			0.002	6.7	0.001	5		360		20.8		911.29	0.020
90th Baseline	36	0.18	0.011	23		0.013			0.009	7.6	0.001	48		471		21.23		911.99	0.142
Pre-50th for Trend	34	0.14	0.005	20		0.005			0.005	7.3	0.001	32		410		20.9		911.89	0.065
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D18 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																				
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
23/11/2012	<0.001	0.52	320	0.031	0.13	0.32		88	<0.0002	12		720	0.0011		0.0076	0.7	0.005	<0.00005	20	
21/12/2012	<0.001	1	340	0.023	0.14	0.43		90	0.0002	12		720	<0.001		0.009	0.5	0.005	<0.00005	20	
25/01/2013	<0.001	0.21	340	0.027	0.12	0.34		89	0.0002	12		700	<0.001		0.004	0.9	0.02	<0.00005	19	
27/02/2013	<0.001	0.35	340	0.019	0.14	0.34		96	0.0002	12		690	0.002		0.012	0.8	0.03	<0.00005	21	
21/03/2013	<0.001	0.02	340	0.016	0.13	0.33		94	0.0002	11		710	<0.001		<0.001	0.8	0.01	<0.00005	22	
26/04/2013	<0.001	0.03	340	0.02	0.12	0.4		89	0.0002	11		700	<0.001		0.006	0.4	0.01	<0.00005	19	
13/05/2013	<0.001	0.41	340	0.029	0.11	0.41		91	0.0002	11		700	0.002		0.019	0.7	0.02	<0.00005	21	
26/06/2013	<0.001	0.025	360	0.012	0.1	0.35		91	0.0002	10		680	0.02		0.005	0.7	0.02	<0.00005	18	
25/07/2013	<0.001	0.51	340	0.02	0.19	0.36		98	0.0002	17		780	0.012		0.046	0.7	0.03	<0.00005	20	
29/08/2013	<0.001	0.005	350	0.011	0.1	0.39		92	<0.0002	10		660	0.002		0.002	0.6	2.6	<0.00005	17	
19/09/2013	<0.001	0.07	350	0.015	0.1	0.39		94	<0.0002	10		680	0.002		0.002	0.6	0.02	<0.00005	17	
17/10/2013	<0.001	0.27	360	0.016	0.11	0.38		93	0.0002	10		680	0.003		0.004	0.6	0.06	<0.00005	18	
21/11/2013	<0.001	0.32	314	0.01	0.5	0.43		110	0.0002	61		1100	0.003		0.003	0.8	0.01	<0.00005	27	
20/12/2013	<0.001	0.12	340	0.007	0.14	0.49		87	0.0002	18		780	0.002		0.002	0.7	0.005	<0.00005	17	
30/01/2014	<0.001	3.2	330	0.033	0.08	0.63		90	0.0002	8		680	0.13		0.029	0.6	0.005	0.00006	17	
27/02/2014	<0.001	4.4	330	0.038	0.07	0.74		94	0.0002	8		620	0.039		0.03	0.5	0.005	0.00009	20	
21/03/2014	<0.001	6.8	360	0.056	0.06	0.94		93	0.0002	9		700	0.37		0.064	0.6	0.02	0.00014	19	
17/04/2014	<0.001	0.05	340	0.02	0.06	0.51		84	0.0002	9		650	0.003		<0.001	0.6	0.03	<0.00005	16	
23/05/2014	<0.001	0.21	340	0.022	0.06	0.53		82	0.0002	8		680	0.001		0.001	0.6	0.01	<0.00005	16	
27/06/2014	<0.001	0.07	320	0.017	0.06	0.52		86	0.0002	7		690	<0.001		<0.001	0.5	0.02	<0.00005	17	
24/07/2014	<0.001	0.49	330	0.025	0.07	0.52		82	0.0002	8		630	0.001		0.001	0.6	0.02	<0.00005	17	
31/08/2014	<0.001	0.09	330	0.013	0.05	0.47		82	<0.0002	8		620	0.001		<0.001	0.5	0.01	<0.00005	16	Magnesium (Mg)

Continued……. MPGM4/D18 Water conditioned ash data November, 2012 – August, 2014 (mg/L)																			
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
23/11/2012	31	0.13	0.02	22		0.005			0.0033	7.3	<0.002	45		390		20.8		911.3	0.07
21/12/2012	32	0.14	0.01	20		0.005			0.007	7.6	0.001	40		360		21.5		911.9	0.09
25/01/2013	32	0.14	0.005	18		0.005			0.002	6.7	0.001	5		400		20.9		912.0	0.06
27/02/2013	34	0.17	0.005	22		0.005			0.006	7.3	0.001	40		420		20.8		911.6	0.25
21/03/2013	35	0.15	0.005	19		0.005			<0.001	7.5	0.001	32		470		21.2		911.9	0.02
26/04/2013	33	0.14	0.005	18		0.005			<0.001	7.3	0.001	27		360		20.9		912.0	0.031
13/05/2013	34	0.15	0.005	20		0.005			0.01	7.3	0.001	31		480		20.8		911.9	0.13
26/06/2013	34	0.14	0.002	16		0.012			<0.001	7.3	0.001	23		450		20.9		911.8	0.043
25/07/2013	40	0.29	0.002	30		0.025			0.004	7.6	0.001	73		470		21.0		911.9	0.1
29/08/2013	34	0.11	0.001	17		0.002			<0.001	7.1	<0.002	24		390		20.9		912.0	0.027
19/09/2013	34	0.13	0.001	18		0.002			<0.001	7.2	<0.002	23		380		20.8		912.0	0.031
17/10/2013	34	0.15	0.001	18		0.005			0.002	7.1	0.001	26		340		20.8		911.6	0.043
21/11/2013	55	1	0.002	110		0.078			0.002	7.2	0.001	340*		940		21.2		911.8	0.16
20/12/2013	35	0.28	0.002	29		0.021			0.001	7.2	0.001	75		460		21.0		911.8	0.061
30/01/2014	35	0.13	0.011	14		0.1			0.028	7.1	0.001	17		410		21.0		911.1	0.12
27/02/2014	36	0.12	0.01	14		0.045			0.037	7.4	0.001	19		440		21.7		910.5	0.13
21/03/2014	36	0.17	0.024	13		0.27			0.071	6.9	0.003	23		370	0.07	22.3		910.7	0.22
17/04/2014	31	0.1	0.006	14		0.008			<0.001	7.2	0.001	18		410		22.1		911.0	0.031
23/05/2014	30	0.11	0.005	13		0.004			<0.001	6.9	0.001	15		340		21.8		910.9	0.032
27/06/2014	33	0.1	0.004	14		0.003			<0.001	8.3	0.001	12		330		21.9	33.2	910.4	0.034
24/07/2014	31	0.11	0.009	14		0.013			0.001	7.2	<0.002	18		350		22.4	36.2	910.5	0.05
31/08/2014	30	0.12	0.005	14		0.006			0.001	7.2	<0.002	25		350	<0.01	22.3	35.1	910.5	0.048

MPGM4/D18 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																				
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe-filtered	Hg	K	Li
Ave	<0.001	1.34	337	0.023	0.113	0.546		90	0.0002	14		709			0.015	0.60	0.02	<0.00005	18.1	
Max	<0.001	6.80	360	0.056	0.500	0.940		110	0.0002	61		1100			0.064	0.80	0.06	<0.00005	27.0	
Min	<0.001	0.05	314	0.007	0.050	0.380		82	0.0002	7		620			0.001	0.50	0.01	<0.00005	16.0	
Post-90th for Trend	<0.001	4.28	359	0.038	0.137	0.729		94	0.0002	17		772			0.037	0.69	0.03	<0.00005	19.9	
50th Investigation Trigger	<0.001	0.24	335	0.019	0.070	0.515		89	0.0002	9		680			0.003	0.60	0.02	<0.00005	17.0	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D18 – Post-water conditioned ash Summary September, 2013 – August, 2014 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	35	0.21	0.007	24		0.046			0.018	7.2	0.001	25		434	0.07	21.6		911.1	0.080
Max	55	1.00	0.024	110		0.270			0.071	8.3	0.003	75		940	0.07	22.4		912.0	0.220
Min	30	0.10	0.001	13		0.002			0.001	6.9	0.001	12		330	0.07	20.8		910.4	0.031
Post-90th for Trend	36	0.27	0.011	28		0.098			0.047	7.4	0.001	31		460	0.07	22.3		911.8	0.157
50th Investigation Trigger	34	0.13	0.005	14		0.011			0.002	7.2	0.001	19		380	0.07	21.8		910.9	0.049
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D19 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																				
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.55	25.0	0.001	1.35	0.021		226	0.0006	186		2836	0.003		0.009	0.06	0.07	<0.00005	31	
Max	<0.001	2.70	25.0	0.002	1.60	0.030		250	0.0009	214		3000	0.004		0.017	0.10	0.63	<0.00005	35	
Min	<0.001	0.06	<25	<0.001	1.20	0.016		210	0.0003	160		2600	0.002		0.002	0.05	0.01	<0.00005	27	
90th Baseline	<0.001	0.74	25.0	0.002	1.50	0.027		250	0.0007	200		2900	0.004		0.015	0.06	0.03	<0.00005	34	
Pre-50th for Trend	<0.001	0.31	25.0	0.001	1.30	0.020		230	0.0006	190		2800	0.002		0.009	0.05	0.01	<0.00005	30	
ANZECC	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D19 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	159	0.54	0.004	306		0.23			0.005	6.1	0.002	1513		2445		7.6		910.0	0.58
Max	170	1.30	0.005	340		0.33			0.012	6.3	0.002	1600		2800		8.2		910.5	0.94
Min	140	0.11	0.0005	260		0.14			0.003	5.7	<0.002	1400		2100		7.1		909.4	0.35
90th Baseline	170	0.9	0.005	320		0.3			0.008	6.3	0.002	1600		2700		8.0		910.3	0.733
Pre-50th for Trend	159	0.54	0.004	306		0.23			0.005	6.1	0.002	1513		2445		7.6		910.0	0.58
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D19 Water conditioned ash data October, 2012 – August, 2014 (mg/L)																				
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
31/10/2012	<0.001	2.7	<20	0.002	1.3	0.03		210	0.0007	160		2800	0.004		0.011	<0.1	0.02	<0.00005	29	
23/11/2012	<0.001	0.32	<25	0.001	1.5	0.016		230	0.00069	170		2900	<0.001		0.0053	0.05	0.005	<0.00005	30	
21/12/2012	<0.001	0.1	25	<0.001	1.5	0.016		230	0.0005	190		3000	<0.001		0.005	0.05	0.005	<0.00005	32	
25/01/2013	<0.001	0.11	25	0.001	1.5	0.02		250	0.0007	214		2900	<0.001		0.01	0.05	0.03	<0.00005	35	
27/02/2013	<0.001	0.74	25	0.001	1.6	0.024		250	0.0009	190		2600	0.002		0.017	0.05	0.005	<0.00005	34	
27/03/2013	<0.001	0.22	25	0.001	1.4	0.02		220	0.0006	180		2900	<0.001		0.015	0.05	0.005	<0.00005	32	
26/04/2013	<0.001	0.06	25	0.001	1.2	0.019		210	0.0005	170		2800	0.002		0.009	0.05	0.005	<0.00005	30	
13/05/2013	<0.001	0.18	25	0.001	1.2	0.02		210	0.0003	190		2800	0.002		0.002	0.05	0.005	<0.00005	32	
26/06/2013	<0.001	0.31	25	0.001	1.2	0.018		220	0.0004	190		2800	0.004		0.002	0.05	0.005	<0.00005	29	
25/07/2013	<0.001	0.69	25	0.002	1.3	0.027		230	0.0006	190		2900	0.004		0.012	0.05	0.005	<0.00005	29	
29/08/2013	<0.001	0.58	25	<0.001	1.2	0.024		230	0.0004	200		2800	0.002		0.007	0.1	0.63	<0.00005	27	
19/09/2013	<0.001	0.76	25	0.002	1.4	0.027		250	0.0004	220		3000	0.003		0.01	0.1	0.005	<0.00005	29	
17/10/2013	<0.001	0.06	25	<0.001	0.93	0.01		160	0.0004	140		2200	0.002		0.004	0.1	0.02	<0.00005	19	
21/11/2013	<0.001	0.34	25	0.001	1.4	0.018		240	0.0004	250		2600	0.003		0.003	0.1	0.005	<0.00005	33	
20/12/2013	<0.001	0.7	25	0.004	1.5	0.036		260	0.0004	260		3300	0.004		0.008	0.1	0.005	<0.00005	37	
24/01/2014	<0.001	0.09	25	0.001	1.5	0.018		260	0.0006	270		3600	0.003		0.003	0.1	0.005	<0.00005	37	
26/02/2014	<0.001	1	25	0.002	1.6	0.027		290	0.0007	290		3100	0.003		0.008	0.1	2.9	<0.00005	43	
20/03/2014	<0.001	1.5	25	0.006	1.3	0.069		260	0.0007	270		4100	0.006		0.014	0.1	0.03	<0.00005	37	
16/04/2014	<0.001	0.66	25	0.002	1.6	0.031		260	0.0005	270		3400	0.06		0.011	0.1	0.02	<0.00005	38	
14/05/2014	<0.001	0.75	25	0.001	1.5	0.021		250	0.0004	240		3800	0.002		0.004	0.1	0.06	<0.00005	38	
25/06/2014	<0.001	0.28	25	0.001	1.2	0.016		240	0.0002	210		3700	0.001		0.003	0.25	0.005	<0.00005	35	
24/07/2014	<0.001	0.53	25	0.001	1.4	0.019		240	0.0002	230		3000	0.002		0.004	0.1	0.005	<0.00005	34	
31/08/2014	<0.001	0.13	<25	<0.001	1.3	0.015		240	0.0003	250		2900	<0.001		0.002	<0.2	<0.01	<0.00005	33	

Continued……. MPGM4/D19 Water conditioned ash data October, 2012 – August, 2014 (mg/L)																			
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
31/10/2012	140	0.9	<0.01	260		0.30			0.012	5.7	<0.002	1400		2200		7.8		909.8	
23/11/2012	150	0.46	0.005	310		0.23			0.0037	6.1	0.002	1500		2300		7.5		910.1	0.64
21/12/2012	160	0.48	0.005	300		0.25			0.004	6.3	0.002	1500		2400		8		909.6	0.71
25/01/2013	170	0.62	0.005	320		0.27			0.004	5.8	0.002	1540		2600		8.2		909.4	0.68
27/02/2013	170	1.3	0.005	340		0.33			0.008	5.9	0.002	1500		2600		7.3		910.3	0.94
27/03/2013	150	0.61	0.005	310		0.24			0.004	6.1	0.002	1500		2400		7.5		910.1	0.67
26/04/2013	150	0.38	0.005	300		0.19			0.003	6	0.002	1500		2100		7.4		910.2	0.44
13/05/2013	160	0.12	0.005	310		0.14			0.004	6.3	0.002	1600		2500		7.3		910.3	0.35
26/06/2013	160	0.11	0.0005	290		0.17			0.003	6.3	0.002	1500		2700		7.1		910.5	0.36
25/07/2013	170	0.54	0.0005	310		0.26			0.007	6.3	0.002	1500		2300		7.6		910.0	0.66
29/08/2013	170	0.37	0.0005	320		0.14			0.005	6	<0.002	1600		2800		7.6		910.0	0.37
19/09/2013	180	0.28	0.0005	360		0.16			0.006	6.1	<0.002	1700		2900		7.5		910.1	0.34
17/10/2013	110	0.32	0.0005	220		0.16			0.0005	6.1	0.002	1100		1700		7.5		910.1	0.49
21/11/2013	170	0.28	0.0005	380		0.18			0.002	6.3	0.002	2000		3400		7.6		910.0	0.38
20/12/2013	190	0.4	0.0005	420		0.24			0.012	6.3	0.002	1900		3000		7.6		910.0	0.5
24/01/2014	190	0.7	0.0005	420		0.29			0.003	6.3	0.002	1900		3200		7.5		910.1	0.61
26/02/2014	210	0.89	0.0005	460		0.33			0.01	6	0.002	2000		3400		7.6		910.0	0.52
20/03/2014	180	0.83	0.002	400		0.32			0.018	5.9	0.002	2000		3400		7.1		910.5	0.61
16/04/2014	180	0.51	0.003	410		0.28			0.006	6.1	0.002	2000		3400		7.0		910.6	0.47
14/05/2014	180	0.71	0.0005	400		0.26			0.004	6	0.002	1800		3200		7.1		910.5	0.45
25/06/2014	170	0.15	0.0005	400		0.15			0.002	7.2	0.002	1600		3000		7.3		910.3	0.32
24/07/2014	170	0.25	0.0005	420		0.17			0.003	6.4	0.002	1700		3200		7.3		910.3	0.3
31/08/2014	170	0.16	<0.001	410		0.14			0.002	6.6	<0.002	1900		3100	<0.01	7.2		910.4	0.36

MPGM4/D19 – Post-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.57	25	0.002	1.39	0.026		246	0.0004	242		3225	0.008		0.006	0.11	0.28	<0.00005	34	
Max	<0.001	1.50	25	0.006	1.60	0.069		290	0.0007	290		4100	0.060		0.014	0.25	2.90	<0.00005	43	
Min	<0.001	0.06	<25	<0.001	0.93	0.010		160	0.0002	140		2200	0.001		0.002	0.10	0.01	<0.00005	19	
90th Baseline	<0.001	0.98	25	0.004	1.59	0.036		260	0.0007	270		3790	0.006		0.011	0.10	0.06	<0.00005	38	
Pre-50th for Trend	<0.001	0.60	25	0.002	1.40	0.020		250	0.0004	250		3200	0.003		0.004	0.10	0.01	<0.00005	36	
ANZECC	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D19 – Post-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	175	0.46	0.001	392		0.223			0.006	6.3	0.002	1800		3075	<0.01	7.4		910.3	0.446
Max	210	0.89	0.003	460		0.330			0.018	7.2	0.002	2000		3400	<0.01	7.6		910.6	0.610
Min	110	0.15	0.001	220		0.140			0.001	5.9	<0.002	1100		1700	<0.01	7.0		910.0	0.300
90th Baseline	190	0.82	0.002	420		0.317			0.012	6.6	0.002	2000		3400	<0.01	7.6		910.5	0.601
Pre-50th for Trend	180	0.36	0.001	405		0.210			0.004	6.2	0.002	1900		3200	<0.01	7.4		910.2	0.460
ANZECC 2000		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

6. Lamberts North Water Conditioned Ash Runoff Pond LN Pond 1 and LN Pond 2 Water Quality 2012 to 2014

Lamberts North Pond 1							
Date	pH	Conductivity (uS/cm)	TDS (mg/L)	Temperature °C	TSS	Chloride	Sulphate
2/09/2013	7.6	330	300		12	9	100
3/11/2013	7.2	600	360		860	15	240
5/02/2014	7.4	1800	1500		800	54	900
10/04/2014	8	1000	680		14	30	140
30/04/2014	7.9	1300	880		4	37	480
18/07/2014	8.2	2000	1600		7	92	920
30/07/2014	7.4	2400	2100		4	82	1000
Average	7.7	1347	1060		243	46	540
Lamberts North Pond 2							
Date	pH	Conductivity (uS/cm)	TDS (mg/L)	Temperature °C	TSS	Chloride	Sulphate
2/09/2013	7	2800	2300		2	130	140
3/11/2013	8.4	2000	1700		16	110	1100
5/02/2014	8.1	2700	2300		2	130	1300
10/04/2014	7.7	810	560		43	29	310
30/04/2014	8.1	1300	900		26	45	460
18/07/2014	8.1	2000	1500		36	88	890
Average	7.9	1935	1543		21	89	700

Customer Analytical Services
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Final - Report Number: 1211489
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To**: 0150139749
Representative: Clive Stacey

Sample Number	AW044094
Date Sampled	18-Jul-2014
Date Received	24-Jul-2014
Date Completed	7-Aug-2014
Date Authorised	7-Aug-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN GW Collection 1

Water

Cations - Metals	Test Method	Filtered	Total
Chromium Hexavalent (Cr)	External		<0.01 mg/L
Aluminium (Al)	*CA14106		0.1 mg/L
Antimony (Sb)	External		<0.001 mg/L
Arsenic (As)	External		0.001 mg/L
Barium (Ba)	*CA14106		0.04 mg/L
Boron (B)	*CA14106		1 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		120 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.14 mg/L
Lead (Pb)	*CA14106		<0.01 mg/L
Magnesium (Mg)	*CA14106		79 mg/L
Manganese (Mn)	*CA14106		0.25 mg/L
Mercury (Hg)	External		<0.00005 mg/L
Nickel (Ni)	*CA14106		0.07 mg/L
Potassium (K)	*CA14106		35 mg/L
Selenium (Se)	External		0.008 mg/L
Silver (Ag)	External		<0.001 mg/L
Sodium (Na)	*CA14106		240 mg/L
Zinc (Zn)	*CA14106		0.08 mg/L

Anions Test Method: *CA15000	Filtered
Fluoride (F)	1 mg/L
Chloride (Cl)	92 mg/L
Bromide (Br)	<1 mg/L
Sulfate (SO4)	920 mg/L
Nitrate (N)	1.9 mg/L
Nitrite (N)	<0.3 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN GW Collection 1

Alkalinity	**Test Method: *CA12121**	**Total**
Total Alkalinity (CaCO3)		100 mg/L
Phenolphthalein Alkalinity (CaCO3)		<25 mg/L
Bicarbonate (CaCO3)		100 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121	2000 µS/cm
pH @ 25°C	*CA12121	8.2 pH Units
Total Suspended Solids @ 105°C	*CA12119	7 mg/L
Total Dissolved Solids @ 180°C	*CA12120	1600 mg/L

External Analysis Performed By: Australian Laboratory Services. NATA Accreditation no. 825. Report Number: ES1417084. Report Date: 7-Aug-2014
Chromium, Hexavalent (Cr)

External Analysis Performed By: National Measurement Institute. NATA Accreditation no. 198. Report Number: RN1031365. Report Date: 4-Aug-2014
Total ICP

Customer Analytical Services
Gate 5 / 3 Anderson Street Botany NSW 2019
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Final - Report Number: 1211489
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To**: 0150139749
Representative: Clive Stacey

Sample Number	AW044095
Date Sampled	18-Jul-2014
Date Received	24-Jul-2014
Date Completed	7-Aug-2014
Date Authorised	7-Aug-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Big Pond

Water

Cations - Metals	Test Method	Filtered	Total
Chromium Hexavalent (Cr)	External		<0.01 mg/L
Aluminium (Al)	*CA14106		0.2 mg/L
Antimony (Sb)	External		<0.001 mg/L
Arsenic (As)	External		0.001 mg/L
Barium (Ba)	*CA14106		0.04 mg/L
Boron (B)	*CA14106		1 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		120 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		<0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.32 mg/L
Lead (Pb)	*CA14106		<0.01 mg/L
Magnesium (Mg)	*CA14106		74 mg/L
Manganese (Mn)	*CA14106		0.08 mg/L
Mercury (Hg)	External		<0.00005 mg/L
Nickel (Ni)	*CA14106		0.04 mg/L
Potassium (K)	*CA14106		35 mg/L
Selenium (Se)	External		0.006 mg/L
Silver (Ag)	External		<0.001 mg/L
Sodium (Na)	*CA14106		240 mg/L
Zinc (Zn)	*CA14106		0.03 mg/L

Anions Test Method: *CA15000	Filtered
Fluoride (F)	1 mg/L
Chloride (Cl)	88 mg/L
Bromide (Br)	<1 mg/L
Sulfate (SO4)	890 mg/L
Nitrate (N)	2.0 mg/L
Nitrite (N)	<0.3 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Big Pond

Alkalinity **Test Method: *CA12121**	**Total**
Total Alkalinity (CaCO3)	100 mg/L
Phenolphthalein Alkalinity (CaCO3)	<25 mg/L
Bicarbonate (CaCO3)	100 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121	2000 µS/cm
pH @ 25°C	*CA12121	8.1 pH Units
Total Suspended Solids @ 105°C	*CA12119	36 mg/L
Total Dissolved Solids @ 180°C	*CA12120	1500 mg/L

External Analysis Performed By: Australian Laboratory Services. NATA Accreditation no. 825. Report Number: ES1417084. Report Date: 7-Aug-2014
Chromium, Hexavalent (Cr)

External Analysis Performed By: National Measurement Institute. NATA Accreditation no. 198. Report Number: RN1031365. Report Date: 4-Aug-2014
Total ICP

Customer Analytical Services
Gate 5 / 3 Anderson Street Botany NSW 2019
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Final - Report Number: 1211489
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To**: 0150139749
Representative: Clive Stacey

Sample Number	AW044096
Date Sampled	18-Jul-2014
Date Received	24-Jul-2014
Date Completed	7-Aug-2014
Date Authorised	7-Aug-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Seepage Inflow

Water

Cations - Metals	Test Method	Filtered	Total
Chromium Hexavalent (Cr)	External		<0.01 mg/L
Aluminium (Al)	*CA14106		<0.1 mg/L
Antimony (Sb)	External		<0.001 mg/L
Arsenic (As)	External		0.002 mg/L
Barium (Ba)	*CA14106		0.01 mg/L
Boron (B)	*CA14106		2 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		130 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		<0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.04 mg/L
Lead (Pb)	*CA14106		<0.01 mg/L
Magnesium (Mg)	*CA14106		75 mg/L
Manganese (Mn)	*CA14106		0.57 mg/L
Mercury (Hg)	External		<0.00005 mg/L
Nickel (Ni)	*CA14106		0.13 mg/L
Potassium (K)	*CA14106		47 mg/L
Selenium (Se)	External		0.010 mg/L
Silver (Ag)	External		<0.001 mg/L
Sodium (Na)	*CA14106		310 mg/L
Zinc (Zn)	*CA14106		0.13 mg/L

Anions Test Method: *CA15000	Filtered
Fluoride (F)	2 mg/L
Chloride (Cl)	110 mg/L
Bromide (Br)	<1 mg/L
Sulfate (SO4)	1100 mg/L
Nitrate (N)	2.8 mg/L
Nitrite (N)	<0.3 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Seepage Inflow

Alkalinity **Test Method: *CA12121**	**Total**
Total Alkalinity (CaCO3)	120 mg/L
Phenolphthalein Alkalinity (CaCO3)	<25 mg/L
Bicarbonate (CaCO3)	120 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121	2400 µS/cm
pH @ 25°C	*CA12121	7.8 pH Units
Total Suspended Solids @ 105°C	*CA12119	5 mg/L
Total Dissolved Solids @ 180°C	*CA12120	1800 mg/L

External Analysis Performed By: Australian Laboratory Services. NATA Accreditation no. 825. Report Number: ES1417084. Report Date: 7-Aug-2014
Chromium, Hexavalent (Cr)

External Analysis Performed By: National Measurement Institute. NATA Accreditation no. 198. Report Number: RN1031365. Report Date: 4-Aug-2014
Total ICP

Customer Analytical Services
Gate 5 / 3 Anderson Street Botany NSW 2019
Phone: (612) 9392 3708 Fax: (612) 9392 3722 Email: customeranalyticalservices@nalco.com

Final - Report Number: 1242035
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To:** 0150139749
Representative: Clive Stacey

Sample Number	AW045000
Date Sampled	30-Jul-2014
Date Received	22-Aug-2014
Date Completed	15-Sep-2014
Date Authorised	18-Sep-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: MPiper - Ramberts Nth Seepage Collection Drain

Water

Cations - Metals	Test Method	Filtered	Total
Mercury (Hg)	*CA14500		<0.00005 mg/L
Aluminium (Al)	*CA14106		<0.1 mg/L
Barium (Ba)	*CA14106		0.03 mg/L
Beryllium (Be)	*CA14106		<0.01 mg/L
Boron (B)	*CA14106		<1 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		200 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		<0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.06 mg/L
Lead (Pb)	*CA14106		<0.1 mg/L
Magnesium (Mg)	*CA14106		230 mg/L
Manganese (Mn)	*CA14106		0.06 mg/L
Molybdenum (Mo)	*CA14106		<0.1 mg/L
Nickel (Ni)	*CA14106		<0.01 mg/L
Potassium (K)	*CA14106		18 mg/L
Sodium (Na)	*CA14106		140 mg/L
Strontium (Sr)	*CA14106		0.65 mg/L
Titanium (Ti)	*CA14106		<0.01 mg/L
Vanadium (V)	*CA14106		<0.01 mg/L
Zinc (Zn)	*CA14106		<0.01 mg/L
Antimony (Sb)	*CA14503		0.001 mg/L
Arsenic (As)	*CA14503		<0.001 mg/L
Cadmium (Cd)	*CA14503		<0.0002 mg/L
Lead (Pb)	*CA14503		<0.001 mg/L
Selenium (Se)	*CA14503		0.009 mg/L
Silver (Ag)	*CA14503		<0.001 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: MPiper - Ramberts Nth Seepage Collection Drain

Anions **Test Method: *CA15000**	**Filtered**
Chloride (Cl)	82 mg/L
Sulfate (SO4)	1000 mg/L

Alkalinity **Test Method: *CA12121 (CA11113)**	**Total**
Total Alkalinity (CaCO3)	500 mg/L
Phenolphthalein Alkalinity (CaCO3)	<25 mg/L
Bicarbonate (CaCO3)	500 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121 (CA11116)	2400 µS/cm
pH @ 25°C	*CA12121 (A-4.4)	7.4 pH Units
Total Suspended Solids @ 105°C	*CA12119	4 mg/L
Total Dissolved Solids @ 180°C	*CA12120	2100 mg/L

Regulatory Comments

CA14106 according to APHA 3030 E, F & 3120 B

Titanium by CA14106 - NATA Accreditation does not cover the performance of this service.

CA12120 according to APHA 2540 C

Attachment 2

Lithgow Rainfall Data from January, 2000 to August, 2014 (mm/month) from Bureau of Meteorology

Year(s)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
2000	57	22.2	271.4	50.6	53	32.2	37.4	51.2	43	75	119.2	59	871.6
2001	105.4	90.6	89.6	84.4	29	9	63.2	30.8	46.4	58.8	80	26.6	713.6
2002	87.8	187	69.4	40.2	68	22.6	16.8	17	21.2	3	22	47.2	601.8
2003	3.6	135	41.8	38.4	54	43.2	20.6	0	18.6	82.4	121	68.8	627.4
2004	35	98.2	22.4	10.4	35	16.2	30.2	50.8	34.8	118	113.8	88.6	654
2005	102.8	105	55.8	28.6	14	117	59.2	24.6	87.6	117	159.4	48.4	918.9
2006	146.6	32.6	6.4	6.8	6.8	6.8	54.2	5.8	59.2	3.2	32.2	72.7	433.3
2007	92.6	141	72.1	44.6	57	223	24.9	65.4	9	37.8	134.7	67	969.1
2008	102	84.6	47.6	59.8	11	60.9	37.1	43.6	88.2	66.2	83.3	113.2	797.5
2009	25.2	166	28	74.5	81	44.5	35.9	48.8	63	69	23.6	81.5	740.7
2010	76.4	119	85.1	35.8	54	40.9	73.5	73.5	52.4	70.9	122.8	164.6	969.5
2011	114	57.2	77.2	41.2	51.2	72.4	24.6	58.7	78.4	46.2	168	96	885.1
2012	57.1	152.6	189.8	44.4	30.6	81.8	49.8	21.2	48.6	20.8	30.9	64.1	791.7
2013	64.1	113.2	184.2	66.2	28.1	29	24.4	23.2	36.8	21.8	95.2	34.2	720.4
2014	13.6	74	143.8	63	14	43.2	24.2	24.2					400.0
												Average	767.2

Attachment 3

Mt Piper Power Station and Lamberts North Groundwater Bore Collar and Pipe Height Survey results for:

a) December, 2011 with Bores MPGM4/D9 and D19 Levels in 2012

b) Groundwater Level Survey 20th March, 2014 including water level of SW3 Pond and underground coal mine water seepage point into Huon Gully

a) Groundwater Bore Survey results December, 2011					
Bore Name	**Easting**	**Northing**	**Ground level RLm**	**Top of pipe RLm**	**Pipe Height m**
MPGM4/D1	225603.983	6305355.123	911.973	912.603	0.63
MPGM4/D3	225168.952	6305718.268	919.834	920.014	0.18
MPGM4/D4	224609.58	6305939.21	919.38	919.64	0.26
MPGM4/D5	224727.822	6305772.088	925.347	925.787	0.44
MPGM4/D8	226000.54	6305241.889	905.899	906.449	0.55
MPGM4/D9*	225686.68	6305313.55	909.566	909.664	0.098
MPGM4/D11	225312.635	6305090.199	937.344	937.48	0.15
MPGM4/D10	225241.559	6304897.926	925.932	926.087	0.14
MPGM4/D19**			916.947	917.607	0.66

January 2012

**from CDM Smith (2012) and Delta Electricity May 2013.

b) Groundwater Level Survey 20th March, 2014

MT PIPER POWER STATION WATER MONITORING

Survey Date 20/03/14

Notes			
Vertical Datum is 'Australian Hieght Datum' (AHD)			
Horizontal Datum is Map Grid Australia (MGA)			
Origin for Survey PM 69965	MGA East 224266.86	MGA North 6306197.29	AHD Height 934.946

D 10	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225241.71	6304897.87	925.95
TOP OF CONDUIT	225241.69	6304897.87	926.06

	MGA EAST	MGA NORTH	AHD HEIGHT	Comments
MINE WATER SEEPAGE POINT INTO HUON GULLY	225242.29	6304874.82	923.16	Ground wet but little seepage
	225248.59	6304873.18	920.02	Seepage flowing
POND WATER LEVEL	225279.48	6304894.09	915.34	

D 11	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225312.69	6305090.30	937.30
TOP OF CONDUIT	225312.67	6305090.30	937.37

D 15	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225027.57	6304669.51	940.18
TOP OF CONDUIT	225027.46	6304669.58	940.83

D 16	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225090.33	6304252.03	921.11
TOP OF CONDUIT	225090.35	6304251.90	921.82

D 17	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225454.95	6304437.14	935.69
TOP OF CONDUIT	225454.86	6304437.13	936.50

D 18	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225278.06	6304710.02	932.18
TOP OF CONDUIT	225278.00	6304709.93	932.79

POND SW3	MGA EAST	MGA NORTH	AHD HEIGHT
WATER LEVEL	225142.93	6304987.14	932.53

Attachment 4

Department of Planning and Infrastructure Approval on 16th February, 2012 for the Mt Piper Power Station Ash Placement Project with ash placement at Lamberts North

Project Approval

Section 75J of the *Environmental Planning & Assessment Act 1979*

As delegate of the Minister for Planning and Infrastructure under delegation from the Minister enforced from 1 October 2011, I approve the project application referred to in Schedule 1, subject to the conditions in Schedule 2.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

Richard Pearson
Deputy Director-General
Development Assessment and Systems Performance

Sydney 16 February 2012

SCHEDULE 1

Application No.:	09_0186
Proponent:	Delta Electricity
Approval Authority:	Minister for Planning and Infrastructure
Land:	The project site is located in the central-west of NSW, at 350 Boulder Road, Portland and located within Lot 9 DP804929, Lot 15 DP804929, Lot 501 DP 825541, Lot 13 DP 751651, Lot 357 DP751651.
Project:	The construction and operation of new ash placement areas at the Lamberts South and Lamberts North sites to cater for the ash generated from the existing Mt Piper Power Station and the proposed Mt Piper Power Station Extension.

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DEFINITIONS

Act, the	Environmental Planning and Assessment Act 1979
Ancillary Facility	Temporary facility for construction. Examples may include an office and amenities compound, construction compound, batch plant, materials storage compound and stockpile areas.
Conditions of Approval	The Minister's Conditions of Approval for the project.
Construction	Includes all work in respect of the project other than survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities, or other activities determined by the Environmental Representative to have minimal environmental impact (e.g. minor adjustments to utilities).
Department, the	NSW Department of Planning and Infrastructure
Director-General, the	Director-General of the NSW Department of Planning and Infrastructure (or delegate)
Director-General's Approval	A written approval from the Director-General (or delegate). Where the Director-General's approval is required by a condition, the Director-General will endeavour to provide a response within one month of receiving an approval request. The Director-General may ask for additional information if the approval request is considered incomplete. When further information is requested the time taken for the Proponent to respond in writing will be added to the one month period.
DPI	Department of Primary Industries
EA	Environmental Assessment
EPA	Environment Protection Authority
Environment Protection Licence	An Environment Protection Licence issued by the NSW Environment Protection Authority pursuant to the Protection of the Environment Operations Act 1997.
Environmental Incident	Any incident with actual or potential significant impacts on the biophysical environment and/or off-site impacts on people.
Minister, the	Minister for Planning and Infrastructure
NOW	NSW Office of Water
OEH	The Office of Environment and Heritage

Operation	Means the Operation of the Project, including ash haulage, ash truck movements, ash placement and management, operation of on-site water management systems, landscaping and revegetation/rehabilitation of the site but does not include commissioning trials of equipment or temporary use of parts of the project during construction.
Project	The project that is the subject of Major Project Application 09_0186.
Project Area	Lamberts North and Lamberts South ash disposal areas as identified in the Proponent's Environmental Assessment, August 2010.
Proponent	Delta Electricity
Publicly Available	Available for inspection by a member of the general public (for example, available on an internet site)
Reasonable and Feasible	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits, cost of mitigation versus benefits provided, community views, and nature and extent of potential improvements.
SCA	Sydney Catchment Authority
Sensitive Receiver	Residence, educational institution (e.g. school, TAFE college), health care facility (e.g. nursing home, hospital), religious facility (e.g. church), or child care facility.
Waste	For the purpose of this project, ash and brine are not considered waste.

SCHEDULE 2
PART A - ADMINISTRATIVE CONDITIONS

Terms of Approval

A1. The Proponent shall carry out the project generally in accordance with the:
   (a) Major Project Application 09_0186;
   (b) Mt Piper Ash Placement (two volumes) – Environmental Assessment (EA), prepared by Sinclair Knight Merz, August 2010;
   (c) Mt Piper Ash Placement – Submissions Report, prepared by Sinclair Knight Merz, March 2011;
   (d) Delta's Letter to the Department – Submissions Report Response to the Department and Agency Issues (dated 22 June 2011); and
   (e) the conditions of this approval.

A2. In the event of an inconsistency between:
   (a) the conditions of this approval and any document listed from condition A1a) to A1(d) inclusive, the conditions of this approval shall prevail to the extent of the inconsistency; and
   (b) any of the documents listed from conditions A1a) to A1(d) inclusive, the most recent document shall prevail to the extent of inconsistency.

A3. The Proponent shall comply with the reasonable requirements of the Director-General arising from the Department's assessment of:
   (a) any reports, plans or correspondence that are submitted in accordance with this approval; and
   (b) the implementation of any actions or measures contained in these reports, plans or correspondence.

A4. The Proponent shall meet the requirements of the Director-General in respect of the implementation of any measure necessary to ensure compliance with the conditions of this approval, and general consistency with the documents listed under condition A1 of this approval.

Limits of Approval

A5. This approval shall lapse five years after the date on which it is granted, unless the works that are the subject of this approval are physically commenced on or before that time.

Statutory Requirements

A6. The Proponent shall ensure that all licences, permits and approvals are updated and/or obtained as required by law and maintained as required with respect to the project. No condition of this approval removes the obligation for the Proponent to obtain, renew or comply with such licences, permits or approvals.

Staging

A7. Where the Proponent intends to construct and operate the project in discrete stages (i.e Lamberts North and Lamberts South) it may comply with the requirements in conditions B4, B5, D2, D3 and D4 separately for each stage.

PART B – PRIOR TO CONSTRUCTION

Environmental Representative

B1. Prior to the commencement of any construction activities, or as otherwise agreed by the Director-General, the Proponent shall nominate for the approval of the Director-General a suitably qualified and experienced Environmental Representative(s). The Proponent shall engage the Environmental Representative(s) during any construction activities, and throughout the life of the project, or as otherwise agreed by the Director-General. The Environmental Representative(s) shall:

(a) oversee the implementation of all environmental management plans and monitoring programs required under this approval, and advise the Proponent upon the achievement of these plans/programs;

(b) consider and advise the Proponent on its compliance obligations against all matters specified in the conditions of this approval and the Statement of Commitments; and

(c) have the authority and independence to recommend to the Proponent reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts and, failing the effectiveness of such steps, to recommend to the Proponent that relevant activities are to be ceased as soon as reasonably practicable if there is a significant risk that an adverse impact on the environment will be likely to occur.

Groundwater Modelling

B2. The Proponent shall undertake groundwater modelling by either adapting the existing UTS (2007) groundwater model to Lamberts North or developing a new groundwater model for Lamberts North. The updated model should be calibrated to site-specific data. In either case, the model shall incorporate the findings of groundwater monitoring of the existing ash placement areas. The Proponent shall consult with the SCA in the preparation of the groundwater model and the model shall be provided to the SCA within five months of project approval, unless otherwise agreed by the Director-General. The model shall address but not necessarily be limited to the following:

(a) the findings of the groundwater monitoring of existing ash placement areas and be based on average groundwater quality data;

(b) updated predictions of the long term behaviour, fate and impacts of ash placement, in particular for water quality parameters such as sulphates, chlorides, boron, manganese, nickel, zinc, molybdenum copper, arsenic and barium;

(c) updated risk assessment for ground and surface water quality impacts under a range of rainfall events of differing duration and intensities (including up to a 100 year ARI event);

(d) calibration to site-specific data; and

(e) identification of appropriate surface and groundwater management measures required in order to achieve a neutral or beneficial effect on water quality.

Prior to construction of Lamberts South, the Lamberts North groundwater model is to be updated as set out above in items (a) - (e) in consultation with the SCA, to apply to Lamberts South.

Groundwater Monitoring

B3. Baseline groundwater monitoring data, including groundwater quality, location of groundwater monitoring wells, depth and flow of groundwater in the project area should be obtained for a minimum of two sampling events prior to construction and a minimum of two sampling events after construction and prior to ash placement commencing. The baseline monitoring data along with the modelling predictions in B2 should be used in the consideration of the design of the ash placement facilities. The location of groundwater monitoring wells and parameters to be monitored should be undertaken in consultation with the SCA.

Prior to construction of Lamberts South the Proponent shall conduct baseline groundwater data collection as set out above, and use the results and the modelling predictions in B2 in the consideration of the design of the ash placement facilities.

Construction Environmental Management Plan

B4. The Proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) to outline environmental management practices and procedures to be followed during construction of the project. The Plan shall be prepared in consultation with Lithgow City Council and relevant government agencies, and be consistent with the Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004 or its latest revision) and shall include, but not necessarily be limited to:

(a) a description of all relevant activities to be undertaken on the site during construction including an indication of stages of construction, where relevant;
(b) identification of the potential for cumulative impacts with other construction activities occurring in the vicinity and how such impacts would be managed;
(c) details of any site compounds and mitigation, monitoring, management and rehabilitation measures specific to the site compound(s) that would be implemented;
(d) statutory and other obligations that the Proponent is required to fulfil during construction including all relevant approvals, consultations and agreements required from authorities and other stakeholders, and key legislation and policies;
(e) evidence of consultation with relevant government agencies required under this condition and how issues raised by the agencies have been addressed in the plan;
(f) a description of the roles and responsibilities for all relevant employees involved in the construction of the project including relevant training and induction provisions for ensuring that all employees, contractors and sub-contractors are aware of their environmental and compliance obligations under these conditions of approval;
(g) details of how the environmental performance of construction will be managed and monitored, and what actions will be taken to address identified potential adverse environmental impacts;
(h) specific consideration of relevant measures to address any requirements identified in the documents referred to under conditions A1(b) and A1(d);
(i) a complaints handling procedure during construction;
(j) emergency management measures including measures to control bushfires;
(k) details of waste management including reuse and/or recycling of waste material, to minimise the need for treatment or disposal of those materials outside the site; and
(l) the additional requirements of this approval.

The CEMP for the project (or any stage of the project) shall be submitted to the Director-General for approval at least four weeks prior to the commencement of any construction work associated with the project (or stage as relevant), unless otherwise agreed by the Director-General. Construction shall not commence until written approval has been received from the Director-General.

B5. As part of the CEMP for the project, the Proponent shall prepare and implement the following plans:

a) a **Construction Noise Management Plan** to detail how construction noise impacts would be minimised and managed. The Plan shall be developed in consultation with the EPA and shall include, but not necessarily be limited to:
   i) details of construction activities and an indicative schedule for construction works;

ii) identification of construction activities that have the potential to generate noise impacts on sensitive receivers;
iii) identification of noise criteria and procedures for assessing noise levels at sensitive receivers;
iv) details of reasonable and feasible actions and measures to be implemented to minimise noise impacts;
v) details of noise monitoring and if any noise exceedance is detected, how any non-compliance would be rectified; and
vi) procedures for notifying sensitive receivers of construction activities that are likely to affect their noise amenity.

b) a **Groundwater Management Plan** to detail measures to manage groundwater impacts. The Plan shall be prepared in consultation with the NOW and the SCA and include, but not necessarily be limited to:
i) identification of the construction activities that could affect groundwater at the site, including groundwater interference and impacts to groundwater users and dependent species;
ii) a description of the management controls to minimise impacts to groundwater during construction;
iii) methods for monitoring groundwater during construction including a program to monitor groundwater flows and groundwater quality in the project area;
iv) a response program to address indentified exceedances of existing groundwater quality criteria approved for Area 1 (the existing ash placement area); and
v) provisions for periodic reporting of results to the SCA during construction.

c) a **Soil and Surface Water Management Plan** to outline measures that will be employed to manage water on the site, to minimise soil erosion and the discharge of sediments and other pollutants to lands and/or waters throughout the construction period. The Plan shall be based on best environmental practice and shall be prepared in consultation with the SCA and the NOW and any other relevant government agency. The Plan shall include, but not necessarily be limited to:
i) baseline data on the water quality and available flow data in Huons Creek, Lamberts Gully Creek and Neubecks Creek;
ii) water quality objectives and impact assessment criteria for Huons Creek, Lamberts Gully Creek and Neubecks Creek;
iii) a geomorphic assessment of the capacity of Lamberts Gully Creek to accommodate additional flow under a range of rainfall events and duration, prior to commencement of construction works;
iv) identification of the construction activities that could cause soil erosion or discharge sediment or water pollutants from the site;
v) description of stockpile locations and disposal methods;
vi) a description of the management methods to minimise soil erosion or discharge of sediment or water pollutants from the site, including a strategy to minimise the area of bare surfaces, stabilise disturbed areas, and minimise bank erosion;
vii) demonstration that the proposed erosion and sediment control measures will conform with, or exceed, the relevant requirements of Managing Urban Stormwater: Soils and Construction (Landcom, 2004);
viii) a site water management strategy identifying drainage design including the separation of clean and dirty water areas for the project, details of the lining of surface water collection ponds and the associated water management measures including erosion and sediment controls and provisions for recycling/reuse of water and the procedures for decommissioning water management structures on the site and

consideration to the treatment of water prior to discharge to the environment;

ix) measures to monitor and manage soil and water impacts in consultation with NOW and DPI (Fisheries) including: control measures for works close to or involving waterway crossings (including rehabilitation measures following disturbance and monitoring measures and completion criteria to determine rehabilitation success);

x) measures to monitor and manage flood impacts in consultation with NOW and shall include, but not necessarily be limited to a flood model for predicted water levels and contingency measures for the site during potential floods;

xi) a program to monitor surface water quality, including Lamberts Gully Creek and Neubecks Creek;

xii) a protocol for the investigation of identified exceedances in the impact assessment criteria;

xiii) a response plan to address potential adverse surface water quality exceedances; and

xiv) provisions for periodic reporting of results to the DPI (Fisheries), NOW and the SCA as per condition B8.

d) a **Air Quality Management Plan**, to provide details of dust control measures to be implemented during the construction of the project. The Plan shall be prepared in consultation with the EPA and should include, but not necessarily be limited to:

i) identification of sources of dust deposition including, truck movements, regrading, backfilling, stockpiles and other exposed surfaces;

ii) identification of criteria, monitoring and mitigation measures for the above sources; and

iii) a reactive management programme detailing how and when construction operations are to be modified to minimise the potential for dust emissions, should emissions exceed the relevant criteria.

e) a **Flora and Fauna Management Plan**, to outline measures to protect and minimise loss of native vegetation and native fauna habitat as a result of construction of the project. The Plan shall be prepared in consultation with the EPA and shall include, but not necessarily be limited to:

i) plans showing terrestrial vegetation communities; important flora and fauna habitat areas; locations of threatened flora and fauna and areas to be cleared. The plans shall also identify vegetation adjoining the site where this contains important habitat areas and/or threatened species, populations or ecological communities;

ii) procedures to accurately determine the total area, type and condition of vegetation community to be cleared;

iii) methods to manage impacts on flora and fauna species and their habitat which may be directly or indirectly affected by the project, procedures for vegetation clearing or soil removal/stockpiling and procedures for identifying and re-locating hollows, installing nesting boxes and managing weeds; and

iv) a procedure to review management methods where they are found to be ineffective.

f) an **Aboriginal Heritage Plan** to monitor and manage Aboriginal heritage impacts in consultation with registered Aboriginal stakeholders and prepared in consultation with the EPA. The plan should include but not necessarily limited to:

i) an updated Cultural Heritage Management Plan to cover the protection of sites previously recorded in the 2005 Aboriginal heritage assessment;
ii) procedures for the management of unidentified objects and/or human remains, including ceasing work;
iii) Aboriginal cultural heritage induction processes for construction personnel; and
iv) procedures for ongoing Aboriginal consultation and involvement should Aboriginal heritage sites or objects be found during construction.

g) an **Ash Transportation Plan** to provide details on the preferred option for the transportation of ash from the Mt Piper Power Station to the ash placement areas. The Plan shall include but not necessarily limited to:
i) justification of the proposed option for ash transportation (either haulage access roads and/or conveyor) for ash transportation;
ii) details of the proposed option, including construction requirements, impacts and mitigation measures;
iii) plans showing the location of the chosen option; and
iv) provision of mitigation measures should the conveyor breakdown.

Biodiversity Offsets

B6. The Proponent shall develop and submit for the approval of the Director-General, a Biodiversity Offset Management Plan. The Biodiversity Offset Management Plan is to be submitted within 12 months of the project approval, unless otherwise agreed to by the Director-General. The Plan shall be developed in consultation with the EPA and shall:
a) identify the objectives and outcomes to be met by the Biodiversity Offset Management Plan;
b) describe the size and quality of the habitat/vegetation communities of the offset;
c) identify biodiversity impacts, including impacts related to the loss of impacted flora and fauna including threatened Capertee Stringybark (*Eucalyptus cannonii*), nine (9) hectares of remnant vegetation (including, Red Stringy Bark Woodland, Scribbly Gum Woodland, Ribbon Gum Woodland), habitat for microbat and woodland bird species and the 31 ha of rehabilitated vegetation to be removed;
d) describe the decision-making framework used in selecting the priority ranking of compensatory habitat options available in the region. Where possible, this should include purchase of land, development of agreements with identified land management authorities (e.g EPA, local Council) for long term management and funding of offsets and mitigation measures, and installation of identified mitigation measures;
e) include an offset for direct and indirect impacts of the proposal which maintains or improves biodiversity values;
f) identify the mechanisms for securing the biodiversity values of the offset measures in perpetuity and identify a monitoring regime, responsibilities, timeframes and performance criteria; and
g) detail contingency measures to be undertaken should monitoring against performance criteria indicate that the offset/ rehabilitation measures have not achieved performance outcomes. Rehabilitation measures are required to be implemented to ensure that the biodiversity impacts are consistent with a maintain or improve biodiversity outcome.

Ecological Monitoring Program

B7. The Proponent shall prepare and implement an **Ecological Monitoring Program** prior to construction, in consultation with the NOW and the DPI (Fisheries), to monitor and quantify the impacts on the ecology of Neubecks Creek and the

associated riparian environment. The Program shall include, but not necessarily be limited to:

a) a sampling, data collection and assessment regime to establish baseline ecological health and for ongoing monitoring of ecological health of the in-stream environment during construction and throughout the life of the project (including operation);
b) at least one in-stream sampling period prior to ash placement at Neubecks Creek and at least two (2) sampling periods following ash placement at each of Lamberts North and Lamberts South;
c) an assessment regime for monitoring the ecological health of the riparian environment for a period of at least five (5) years after final capping; and
d) management measures to address any adverse ecological impacts.

Compliance Monitoring and Tracking

B8. The Proponent shall develop and implement a Compliance Tracking Program for the project, prior to commencing construction, to track compliance with the requirements of this approval and shall include, but not necessarily be limited to:

a) provisions for periodic review of the compliance status of the project against the requirements of this approval and the Statement of Commitments detailed in the document referred to in condition A1c) of this approval;
b) provisions for periodic reporting of the compliance status to the Director-General;
c) a program for independent environmental auditing in accordance with AS/NZ ISO 19011:2003 - Guidelines for Quality and/or Environmental Management Systems Auditing;
d) procedures for rectifying any non-compliance identified during environmental auditing or review of compliance;
e) mechanisms for recording environmental incidents and actions taken in response to those incidents;
f) provisions for reporting environmental incidents to the Director-General during construction and operation; and
g) provisions for ensuring all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.

The Compliance Tracking Program shall be implemented prior to construction of the project with a copy submitted to the Director-General for approval at least four weeks prior to the commencement of the project, unless otherwise agreed by the Director-General.

B9. Nothing in this approval restricts the Proponent from utilising any existing compliance tracking programs administrated by the Proponent to satisfy the requirements of condition B8. In doing so, the Proponent must demonstrate to the Director-General how these systems address the requirements and/or have been amended to comply with the requirements of the condition.

Community Information and Complaints Management Provision of Information

B10. Prior to the construction of the project, the Proponent shall establish and maintain a website for the provision of electronic information associated with the project. The Proponent shall, subject to confidentiality, publish and maintain up-to-date information on this website or dedicated pages including, but not necessarily limited to:

a) the documents referred to under condition A1 of this approval;
b) this project approval, Environment Protection Licence and any other relevant environmental approval, licence or permit required and obtained in relation to the project;
c) all strategies, plans and programs required under this project approval, or details of where this information can be viewed;

d) information on construction and operational progress; and
e) the outcomes of compliance tracking in accordance with the requirements of this project approval.

Complaints and Enquiries Procedure

B11. Prior to the construction of the project, the Proponent shall ensure that the following are available for community complaints and enquiries during construction and operation:

a) a 24 hour contact number(s) on which complaints and enquiries about construction and operational activities may be registered;
b) a postal address to which written complaints and enquiries may be sent; and
c) an email address to which electronic complaints and enquiries may be transmitted.

The telephone number, postal address and email address shall be published in a newspaper circulating in the local area prior to the commencement of the project. The above details shall also be provided on the website required by condition B11 of this approval.

B12. The Proponent shall record the details of complaints received through the means listed under condition B11 of this approval in a Complaints Register. The Register shall record, but not necessarily be limited to:

a) the date and time of the complaint;
b) the means by which the complaint was made (e.g. telephone, email, mail, in person);
c) any personal details of the complainant that were provided, or if no details were provided a note to that effect;
d) the nature of the complaint;
e) the time taken to respond to the complaint;
f) any investigations and actions taken by the Proponent in relation to the complaint;
g) any follow-up contact with, and feedback from, the complainant; and
h) if no action was taken by the Proponent in relation to the complaint, the reason(s) why no action was taken.

The Complaints Register shall be made available for inspection by the Director-General upon request.

Community Information Plan

B13. Prior to the commencement of construction of the project, the Proponent shall prepare and implement a Community Information Plan which sets out the community communications and consultation processes to be undertaken during construction and operation of the project. The Plan shall include but not be limited to:

a) measures for disseminating information on the development status of the project and methods for actively engaging with surrounding landowners, including Forests NSW and affected stakeholders regarding issues that would be of interest/ concern to them during the construction and operation of the project; and
b) procedures to inform the community where work has been approved to be undertaken outside the normal Construction hours, in particular noisy activities.

A copy of the Plan shall be provided to the Director-General one month prior to the commencement of construction.

Design

B14. The ash placement areas shall be designed by a suitably qualified expert to ensure structural stability of the ash placement areas.

PART C – DURING CONSTRUCTION

Environmental Incident Reporting

C1. The Proponent shall notify the Director-General of any environmental incident within 12 hours of becoming aware of the incident. The Proponent shall provide full written details of the incident to the Director-General within seven days of the date on which the incident occurred.

C2. The Proponent shall meet the requirements of the Director-General to address the cause or impact of any environmental incident, as it relates to this approval, reported in accordance with condition C1 of this approval, within such period as the Director-General may require.

Construction Hours

C3. Construction activities associated with the project shall only be undertaken during the following hours:

a) 7:00 am to 6:00 pm, Mondays to Fridays, inclusive;
b) 8:00 am to 1:00 pm on Saturdays; and
c) at no time on Sundays or public holidays.

C4. Construction outside the hours stipulated in condition C3 of this approval is permitted in the following circumstances:

a) where construction works do not cause audible noise at any sensitive receiver; or
b) for the delivery of materials required outside these hours by the Police or other authorities for safety reasons; or
c) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

C5. The hours of construction activities specified under condition C3 of this approval may be varied with the prior written approval of the Director-General. Any request to alter the hours of construction specified under condition C3 shall be:

a) considered on a case-by-case basis;
b) accompanied by details of the nature and need for activities to be conducted during the varied construction hours; and
c) accompanied by information necessary for the Director-General to reasonably determine that activities undertaken during the varied construction hours will not adversely impact on the acoustic amenity of sensitive receivers in the vicinity of the site.

Construction Noise

C6. The construction noise objective for the project is to manage noise from construction activities (as measured by $L_{Aeq\ (15\ minute)}$ descriptor) so as not to exceed:

Location	Day ($L_{Aeq\ (15\ minute)}$) dB(A)
All private receivers within the township of Blackmans Flat	46
All other residences	43

The Proponent shall implement reasonable and feasible noise mitigation measures with the aim of achieving the construction noise objective consistent with the requirements of the Interim Construction Noise Guideline (DECC, July 2009), including noise generated by heavy vehicle haulage and other construction traffic associated with the project. Any activities that have the potential for noise emissions that exceed the objective must be identified and managed in accordance with the

Construction Noise Management Plan (as referred to under condition B5a) of this approval).

Dust Generation

C7. The Proponent shall construct the project in a manner that minimises dust emissions from the site, including wind-blown from earth works and stockpiles and traffic-generated dust. All activities on the site shall be undertaken with the objective of preventing visible emissions of dust from the site. Should such visible dust emissions occur at any time, the Proponent shall identify and implement all practicable dust mitigation measures, including cessation of relevant works, as appropriate, such that emissions of visible dust cease.

Heritage Impacts

C8. If during the course of construction the Proponent becomes aware of any previously unidentified Aboriginal object(s), all work likely to affect the object(s) shall cease immediately and the EPA (OEH) informed in accordance with the *National Parks and Wildlife Act 1974*. In addition, registered Aboriginal stakeholders shall be informed of the finds. Works shall not recommence until an appropriate strategy for managing the objects has been determined in consultation with the EPA (OEH) and the registered Aboriginal stakeholders and written authorisation from the EPA (OEH) is received by the Proponent.

C9. If during the course of construction the Proponent becomes aware of any unexpected historical relic(s), all work likely to affect the relic(s) shall cease immediately and the EPA (OEH (Heritage Branch)) notified in accordance with the *Heritage Act 1977*. Works shall not recommence until the Proponent receives written authorisation from the EPA (OEH (Heritage Branch)).

Soil and Water Quality Impacts

C10. The Proponent shall comply with section 120 of the Protection of the Environment Operations Act 1997 which prohibits the pollution of waters.

C11. Soil and water management controls shall be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities, in accordance with:

(a) Managing Urban Stormwater: Soils and Conservation (Landcom, 2004);
(b) Managing Stormwater: Urban Soils and Construction 2A Installation of Services (DECC 2008); and
(c) Managing Stormwater: Urban Soils and Construction Vol 2C Unsealed Roads (DECC 2008).

C12. During construction, the Proponent shall maintain a buffer of 50 metres from the construction work to Neubecks Creek.

C13. Surface water drainage must be appropriately engineered and stabilised to convey run off without collapse or erosion. Surface water run off collection ponds are to be lined.

Waste Generation and Management

C14. All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.

C15. The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.

C16. The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and classified in accordance with the Waste Classification Guidelines (DECC, 2008), or any future guideline that may supersede that document.

PART D – PRIOR TO OPERATION

Ash Management

D1. The Proponent shall prepare a long-term ash management strategy including a program for investigation and assessment of alternative ash management measures with a goal of 40% reuse of ash by 31 December 2020. The report shall be submitted to the Director-General six months prior to the commencement of operations. The Proponent shall report on the status and outcomes of its investigations to the Director-General every two years from the commencement of the operation of the project, unless otherwise agreed by the Director-General.

Operational Environmental Management Plan

D2. The Proponent shall prepare and implement an Operational Environmental Management Plan (OEMP) to detail an environmental management framework, practices and procedures to be followed during operation of the project. The Plan shall be prepared in consultation with Lithgow City Council and relevant government agencies, and shall be consistent with the Guideline for the Preparation of Environmental Management Plans (DIPNR 2004) and shall include, but not necessarily be limited to:

a) identification of all statutory and other obligations that the Proponent is required to fulfil in relation to operation of the project, including all approvals, licences, approvals and consultations;
b) a description of the roles and responsibilities for all relevant employees (including contractors) involved in the operation of the project;
c) overall environmental policies and principles to be applied to the operation of the project;
d) standards and performance measures to be applied to the project, and a means by which environmental performance can be periodically reviewed and improved, where appropriate;
e) management policies to ensure that environmental performance goals are met and to comply with the conditions of this approval;
f) the environmental monitoring requirements outlined under conditions E12 to E18 inclusive;
g) details of waste management including reuse and/or recycling of waste material, to minimise the need for treatment or disposal of those materials outside the site;
h) specific consideration of relevant measures to address any requirements identified in the documents referred to under conditions A1(b) and A1(d) of this approval; and
i) the additional requirements of this approval.

The Plan shall be submitted for the approval of the Director-General no later than four weeks prior to the commencement of operation of the project, unless otherwise agreed by the Director-General. Operation shall not commence until written approval has been received from the Director-General.

Nothing in this approval precludes the Proponent from incorporating the requirements of the Operational Environmental Management Plan into existing environmental management systems and plans administered by the Proponent.

D3. As part of the OEMP for the project, required under condition D2 of this approval, the Proponent shall prepare and implement the following Management Plans:

a) an **Operational Noise Management Plan** to detail measures to mitigate and manage noise during operation of the project. The Plan shall be prepared in consultation with the EPA and include, but not necessarily be limited to:
    i) identification of activities that will be carried out in relation to the project and the associated noise sources;

ii) identification of all relevant sensitive receivers and the applicable criteria at those receivers commensurate with the noise limit specified under condition E7 of this approval;
iii) noise monitoring procedures (as referred to in condition E12 of this approval) for periodic assessment of noise impacts at the relevant receivers against the noise limits specified under this approval and the predicted noise levels as detailed in the EA;
iv) details of all management methods and procedures that will be implemented to control individual and overall noise emissions from the site during operation, including the feasibility of noise reducing benching;
v) procedures to ensure that all reasonable and feasible noise mitigation measures are applied during operation of the project and procedures and corrective actions to be undertaken if non-compliance against the operational noise criteria as detailed in condition E7 is detected at the sensitive receivers; and
vi) provisions for periodic reporting of results to the EPA as per condition B8.

b) a **Groundwater Management Plan** to detail measures to mitigate and manage groundwater impacts. The Plan shall be prepared in consultation with the NOW and the SCA and include, but not necessarily be limited to:
i) consideration of the revised updated groundwater model as per condition B2;
ii) baseline data on groundwater quality (including Huons Creek), location of groundwater monitoring wells, depth and available flow of groundwater in the project area;
iii) identification of potential sources of water pollutants and management measures;
iv) groundwater assessment criteria including trigger levels for remedial measures;
v) a contingency plan for events that have the potential to pollute or contaminate groundwater sources of water. The plan shall include remediation actions and communication strategies (including notification of potentially affected nearby bore users) for the effective management of such an event to prevent discharge of these pollutants from all sources within the project area;
vi) a monitoring program as per condition E15 for groundwater connectivity, water levels, groundwater flow and water quality over the short and long term that includes upstream and downstream locations. The program shall continue for a minimum of five years following final capping and landscaping;
vii) a protocol for the investigation of identified exceedances of the groundwater impact assessment criteria; and
viii) provisions for periodic reporting of results to the SCA as per condition B8.

c) a **Soil and Surface Water Management Plan** to outline measures that will be employed to manage water on the site, to minimise soil erosion and the discharge of sediments and other pollutants to lands and/or waters throughout the life of the project. The Plan shall be based on best environmental practice and shall be prepared in consultation with the NOW and the SCA and DPI (Fisheries). The Plan shall include, but not necessarily be limited to:
i) baseline data on the surface water quality and available flow in Neubecks Creek and Lamberts Gully Creek;
ii) water quality objectives and impact assessment criteria for Neubecks Creek and Lamberts Gully Creek;

iii) identification of the operation activities that could cause soil erosion or discharge sediment or water pollutants from the site;
iv) a description of the management controls to minimise soil erosion or discharge of sediment or water pollutants from the site, including a strategy to minimise the area of bare surfaces, stabilise disturbed areas and minimise bank erosion;
v) demonstration that the proposed erosion and sediment control measures will conform with, or exceed, the relevant requirements of Managing Urban Stormwater: Soils and Construction (Landcom, 2004);
vi) details of the water management system including separation of clean and contaminated/polluted water flows, provisions for the treatment, recycling/reuse and/or discharge of flows;
vii) site water balance including water usage for ash placement, sources of water and quantity of run-off generated;
viii) details of the lining for the surface water collection ponds;
ix) measures to minimise potential surface water infiltration;;
x) a flow and water quality monitoring program for Neubecks Creek and Lamberts Gully Creek that includes discharge points, upstream and downstream locations as per condition E16 and limits for identified pollutants;
xi) specified remedial actions and contingency plans to mitigate any water quality exceedances on receiving waters including identified trigger levels for remedial measures or the activation of contingency plans; and
xii) provisions for periodic reporting of results to the DPI (Fisheries) and the SCA as per condition B8.

d) a **Air Quality Management Plan** to outline measures to minimise impacts from the project on local air quality. The Plan shall be prepared in consultation with NSW Health and the EPA and include, but not necessarily be limited to:
i) baseline data on dust deposition levels;
ii) air quality objectives and impact assessment criteria;
iii) an assessment of alternative methods of ash placement to minimise the exposure of active placement areas to prevailing winds;
iv) mitigation measures to be incorporated during ash placement activities, haulage, etc;
v) an operating protocol for the ash placement irrigation system including activation rates, application rates and area of coverage and means of dealing with water shortages;
vi) detail how ash placement moisture levels will be maintained;
vii) a contingency plan to deal with high winds and dust suppression;
viii) a protocol for the investigation of visible emissions from the ash placement area;
ix) a response plan to address exceedances in visible emissions including $PM_{10,}$ TSP and deposited dust from the ash placement areas; and
x) an air quality monitoring program as referred to in condition E18 of this approval including identified air quality monitoring locations (including monitoring at sensitive receivers) and meteorological monitoring to predict high wind speed events;
xi) provisions for periodic reporting of results to the EPA as per condition B8; and
xii) a protocol for suppressing dust emissions within licence limits under normal and adverse weather conditions at all stages of the ash placement process.

e) a **Landscape/Revegetation Plan** to outline measures to minimise the visual impacts of the ash placement areas and ensure the long-term stabilisation of

the site and compatibility with the surrounding landscape and land use. The Plan shall include, but not necessarily be limited to:

i) identification of design objectives and standards based on local environmental values, vistas, and land uses;
ii) identification of the timing and progressive implementation of revegetation works for ash placement areas as they are completed, including short-term and long term goals including landscape plans;
iii) a schedule of species to be used in revegetation, including the use of local native species in revegetation works selected by a qualified expert to ensure the rehabilitation works do not compromise the long term integrity of the capping; and
iv) procedures and methods to monitor and maintain revegetated areas during the establishment phase and long-term.

f) a **Site Rehabilitation Management Plan** to outline measures to stabilise and rehabilitate the site following project completion. The Plan shall be prepared in consultation with the SCA. The Plan shall include, but not necessarily be limited to:

i) reinstatement of geomorphologic stable drainage lines on the rehabilitated areas and a timeframe for rehabilitation;
ii) restoration, rehabilitation and revegetation of the project's site;
iii) measures to control water pollutants from rehabilitated areas; and
iv) a program and timeframe for monitoring rehabilitated areas.

Groundwater Quality and Geotechnical Impacts

D4. Prior to commencement of operation the Proponent shall submit a geotechnical report prepared by a suitably qualified expert that demonstrates the site has been engineered as being suitable for ash placement. The report must also provide an evaluation of groundwater levels once re-profiling has been completed.

PART E – DURING OPERATIONS

Operational Hours

E1. Operational activities associated with the project shall only be undertaken from 6.00 am to 8.00 pm Monday to Friday and 6.00am to 5.00pm Saturday and Sunday.

E2. Operations outside the hours stipulated in condition E1 of this approval are only permitted in the following emergency situations:

a) where it is required to avoid the loss of lives, property and/or to prevent environmental harm; or

b) breakdown of plant and/or equipment at the ash placement areas or the Mt Piper Power Station and the proposed Mt Piper Power Station Extension project with the effect of limiting or preventing ash storage at the power station outside the operating hours defined in condition E1; or

c) a breakdown of an ash haulage truck(s) or the conveyor preventing haulage during the operating hours stipulated in condition E1 combined with insufficient storage capacity at the Mt Piper Power Station including the proposed Mt Piper Power Station Extension to store ash outside of the project operating hours; or

d) in the event that the Australian Energy Market Operator (AEMO), or a person authorised by AEMO, directs the Proponent (as a licensee) under the National Electricity Rules to maintain, increase or be available to increase power generation for system security and there is insufficient ash storage capacity at the Mt Piper Power Station to allow for the ash to be stored.

In the event of conditions E2b) or E2c) arising, the Proponent is to take all reasonable and feasible measures to repair the breakdown in the shortest time possible.

E3. In the event that an emergency situation as referred to under condition E2b) or E2c) occurs more than once in any two month period, the Proponent shall prepare and submit to the Director-General for approval a report including, but not limited to:

a) the dates and a description of the emergency situations;

b) an assessment of all reasonable and feasible mitigation measures to avoid recurrence of the emergency situations;

c) identification of a preferred mitigation measure(s); and

d) timing and responsibility for implementation of the mitigation measure(s).

The report is to be submitted to the Director-General within 60 days of the second emergency situation occurring. The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the Director-General.

E4. The Proponent shall notify the EPA prior to undertaking any emergency ash haulage or placement operations outside of the hours of operation stipulated in condition E1 of this approval and keep a log of such operations.

E5. The Proponent shall notify the Director-General in writing within seven days of undertaking any emergency ash haulage or placement operations outside of the hours of operation stipulated in condition E1 of this approval.

E6. The Proponent shall notify nearby sensitive receivers (as defined in the Operational Noise Management Plan required under condition D3(a) of this approval) prior to 8.00 pm where it is known that emergency ash haulage or placement operations will be required outside of the hours of operation stipulated in condition E1 of this approval.

Operational Noise

E7. The cumulative operational noise from the ash placement area and ash haulage activity shall not exceed the following $L_{Aeq(15\ minute)}$ dB(A):

Location	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
All private sensitive receivers within the township of Blackmans Flat	42	38	35
All other sensitive receivers	42	38	35

This noise criteria set out above applies under all meteorological conditions except for any of the following:

(a) wind speed greater than 3 metres/second at 10 metres above ground level;
(b) stability category F temperature inversion conditions and wind speed greater than 2 metres/second at 10 metres above ground level; and
(c) stability category G temperature inversion conditions.

This criteria does not apply where the Proponent and an affected landowner have reached a negotiated agreement in regard to noise, and a copy of the agreement has been forwarded to the Director-General and the EPA.

E8. To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, the noise monitoring equipment must be located at the most affected point:

a) within 30 metres of a dwelling façade where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises; or
b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises.

E9. For the purposes of monitoring noise from the premises to determine compliance with the noise limits:

a) Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1-2004 and ASIEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing, must be used;
b) the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment;
c) the meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station at the premises; and
d) stability category temperature inversion conditions are to be determined by the sigmatheta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.

E10. The Proponent shall implement measures to ensure noise attenuation of trucks. These measures may include, but are not necessarily limited to, installation of residential class mufflers, engine shrouds, body dampening, speed limiting, fitting of rubber stoppers to tail gates, limiting the use of compression braking, and ensuring trucks operate in a one-way system at the ash placement areas where feasible.

Operational Noise Review

E11. Within 60 days of the commencement of operation of the project, unless otherwise agreed to by the Director-General, the Proponent shall submit to the Director-

General an **Operational Noise Review** to confirm the operational noise impacts of the project. The Operational Noise Review shall be prepared in consultation with the EPA. The Review shall:

a) identify the appropriate operational noise objectives and levels for sensitive receivers;
b) describe the methodologies for noise monitoring, including the frequency of measurements and location of monitoring sites;
c) document the operational noise levels at sensitive receivers as ascertained by the noise monitoring program;
d) assess the noise performance of the project against the noise criteria specified in condition E7 of this approval and the predicted noise levels as detailed in the report referred to under condition A1(b) of this approval; and
e) provide details of any entries in the Complaints Register relating to noise impacts.

Where monitoring indicates noise levels in excess of the operational noise criteria specified in condition E7 of this approval, the Proponent shall prepare a report as required by condition E13 of this approval.

Ongoing Operational Noise Monitoring

E12. The Proponent shall prepare and implement an **Operational Noise Monitoring Program** to assess compliance against the operational noise criteria stipulated in condition E7 of this approval, throughout the life of the project. The noise monitoring program shall be prepared in consultation with the EPA and must include the proposed frequency of monitoring and as a minimum must include monitoring when there are any significant changes in work locations or processes.

The noise monitoring program shall be prepared in accordance with the requirements of the *New South Wales Industrial Noise Policy* (EPA, 2000) and shall include, but not be limited to:

a) monitoring at Lamberts North, Lamberts South and Blackmans Flat during ash placement activities; and
b) monitoring of the effectiveness of any noise mitigation measures implemented under condition D3(a) of this approval, against the noise criteria specified in condition E7 of this approval.

The Proponent shall forward to the EPA and the Director-General a report containing the results of any non-compliance within 14 days of conducting a noise assessment. The monitoring program shall form part of the Operational Noise Management Plan referred to in condition D3 (a) of this approval.

E13. Where noise monitoring including as required by condition E11 and E12 of this approval identifies any non-compliance with the operational noise criteria specified under condition E7 of this approval the Proponent shall prepare and submit to the Director-General a report including, but not limited to:

a) an assessment of all reasonable and feasible physical and other mitigation measures for reducing noise at the source;
b) identification of the preferred measure(s) for reducing noise at the source;
c) feedback from directly affected property owners and the EPA on the proposed noise mitigation measures; and
d) location, type, timing and responsibility for implementation of the noise mitigation measure(s).

The report is to be submitted to the Director-General within 60 days of undertaking the noise monitoring which has identified exceedances of the operational noise criteria specified under condition E7, unless otherwise agreed to by the Director-

General. The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the Director-General.

E14. If after the implementation of all reasonable and feasible source controls, as identified in the report required by condition E13, the noise generated by the project continues to exceed the criteria stipulated in condition E7 the Proponent shall implement at the receiver reasonable and feasible noise mitigation measures, such as double glazing, insulation, air conditioning and or other building acoustic treatments, in consultation with and with the agreement of the affected landowner.

Groundwater Monitoring

E15. The Proponent shall prepare and implement a **Groundwater Monitoring Program** to monitor the impacts of ash placement activities on local groundwater quality and hydrology. The Program shall be developed in consultation with the SCA, and shall describe the location, frequency, rationale and procedures and protocols for collecting groundwater samples as well as the parameters analysed and methods of analysis. The monitoring program shall be ongoing for the operation of the project and for a minimum of 5 years following project completion and include, but not be limited to:

a) monitoring at established bore sites (or replacement bore sites in the event that existing sites are damaged or lost) as described in the Groundwater Management Plan as per condition D3(b); and
b) a schedule for periodic monitoring of groundwater quality, depth and flow at all monitoring sites, at an initial frequency of no less than once every month for the first 12 months of operation.

The monitoring program shall form part of the Groundwater Management Plan referred to in condition D3(b) of this approval.

Surface Water Quality Monitoring

E16. The Proponent shall prepare and implement a surface water quality monitoring program to monitor the impacts of the ash placement activities on Neubecks Creek and Lamberts Gully. The Program shall be developed in consultation with the DPI (Fisheries) and the SCA, and shall describe the location, frequency, rationale and the procedures and protocols for collecting water samples as well as the parameters analysed and methods of analysis. The program shall include, but not necessarily be limited to:

a) monitoring at the existing water quality monitoring sites as described in the document referred to under condition A1b);
b) monitoring at surface water discharge points from Lamberts Gully Creek;
c) monitoring at surface water discharge points into Neubecks Creek;
d) wet weather monitoring with a minimum of two events recorded within the first 12 months operation of the project; and
e) a schedule for periodic monitoring of surface quality at all sites throughout the life of the project, at an initial frequency of no less than once every month for the first 12 months and must include, but not be limited to, monitoring of dissolved oxygen, turbidity, sulphates, salinity, boron, manganese, iron chloride, total phosphorus and total nitrogen.

Hydrological Monitoring Program

E17. A Hydrological Monitoring Program to assess and quantify the impacts and effectiveness of the transformed section of Huons Creek into a sub-surface drainage line in consultation with the DPI (Fisheries). Monitoring is to be undertaken for a period of five (5) years upon completion of the creek transformation. The program must include sampling for identified pollutants before and after the transformation works and include a sampling site downstream of the sub-surface section of Huons Creek. In the first 12 months following completion of the transformation, monitoring

is to be undertaken at least every three (3) months upon completion of the creek transformation and after any heavy wet weather event.

The monitoring program shall form part of the Soil and Surface Water Management Plan referred to in condition D3(c) of this approval.

Air Quality Monitoring

E18. The Proponent shall prepare an Air Quality Monitoring Program, in consultation with the EPA and NSW Health. The Program shall include, but not necessarily be limited to, monitoring for dust. Monitoring sites shall be identified as per condition D3 (d). The air quality monitoring program shall be ongoing for the life of the project, and during final rehabilitation and stabilisation of the site.

The monitoring program shall form part of the Air Quality Management Plan referred to in condition D3(d) of this approval.

Environmental Incident Reporting

E19. The Proponent shall notify the Director-General of any environmental incident within 12 hours of becoming aware of the incident. The Proponent shall provide full written details of the incident to the Director-General within seven days of the date on which the incident occurred.

E20. The Proponent shall meet the requirements of the Director-General to address the cause or impact of any environmental incident, as it relates to this approval, reported in accordance with condition E19 of this approval, within such period as the Director-General may require.

Annual Performance Reporting

E21. The Proponent shall, throughout the life of the project, prepare and submit to the Director-General, an Annual Environmental Management Report (AEMR). The AEMR shall review the performance of the project against the Operation Environmental Management Plan (refer to condition D2 of this approval) and the conditions of this approval. The AEMR shall include, but not necessarily be limited to:

a) details of compliance with the conditions of this approval;
b) a copy of the Complaints Register (refer to condition B11 of this approval) for the preceding twelve-month period (exclusive of personal details), and details of how these complaints were addressed and resolved;
c) identification of any circumstances in which the environmental impacts and performance of the project during the twelve month period have not been generally consistent with the environmental impacts and performance predicted in the documents listed under condition A1 of this approval, with details of additional mitigation measures applied to the project to address recurrence of these circumstances;
d) results of all environmental monitoring required under conditions of this approval, including interpretations and discussion by a suitably qualified person; and
e) a list of occasions in the twelve month period when environmental goals/objectives/impact assessment criteria for the project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure.

The Proponent shall submit a copy of the AEMR to the Director-General every year, with the first AEMR to be submitted no later than fourteen months after the commencement of operation of the project unless otherwise agreed by the Director-General. The Director-General may require the Proponent to address certain matters in relation to the environmental performance of the project in response to the Director-General's review of the Annual Environmental Management Report. Any action

required to be undertaken shall be completed within such period as the Director-General may require. The Proponent shall make copies of each AEMR available for public inspection on request. Copies of the AEMR shall be sent to the EPA and the SCA.

Independent Environmental Auditing

E22. Within 12 months of commencement of operation of Lamberts North and Lamberts South and then as may be directed by the Director-General, the Proponent shall commission an independent person or team to undertake an Environmental Audit of the project. The independent person or team shall be approved by the Director-General prior to the commencement of the Audit. The Audit shall:

a) be carried out in accordance with ISO 19011:2002 - Guidelines for Quality and or Environmental Management Systems Auditing;
b) assess compliance with the requirements of this approval, and other licences and approvals that apply to the project;
c) assess the environmental performance of the project against the predictions made and conclusions drawn in the documents referred to under condition A1 of this approval;
d) review the effectiveness of the environmental management of the project, including any environmental impact mitigation works; and
e) review the adequacy of the Proponent's response to any complaints made about the project identified in the Complaints Register.

The Environmental Audit Report shall be submitted to the Director-General within two months of the completion of the Audit, detailing the findings and recommendations of the Audit and including a detailed response from the Proponent to any of the recommendations contained in the Report.

Waste Generation and Management

E23. All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.

E24. The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.

E25. The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and classified in accordance with the Waste Classification Guidelines (DECC, 2008), or any future guideline that may supersede that document.

PART F – POST OPERATIONS

Project Completion Management Plan

F1. No later than one month prior to the decommissioning of the project, or as otherwise agreed by the Director-General, the Proponent is to prepare a Project Completion Management Plan, in consultation with the SCA, for the approval of the Director-General. The Plan is to include but not necessarily be limited to:

(a) identification of structures to be removed and how they will be removed;
(b) measures to reduce impacts on the environment and surrounding sensitive land uses;
(c) details of components to be recycled;
(d) details of rehabilitation and revegetation with reference to the biodiversity offset required under condition B6;
(e) groundwater assessment criteria including trigger levels for remedial measures;
(f) a groundwater monitoring program as per condition E15 for groundwater connectivity, water levels, groundwater flow and water quality over the short and long term that includes upstream and downstream locations. The program shall continue for a minimum of five years following final capping and landscaping;
(g) a contingency plan to address potential exceedances and mitigation measures in groundwater and groundwater quality impacts and if exceedances continue, implementation of further measures and groundwater monitoring to demonstrate compliance;
(h) surface water assessment criteria including trigger levels for remedial measures;
(i) available flow and water quality monitoring program for Neubecks Creek and Lamberts Gully Creek that includes discharge points, upstream and downstream locations as per condition E16 and limits for identified pollutants. The program shall continue for a minimum of five years following final capping and landscaping; and
(j) a contingency plan to address potential exceedances and mitigation measures in surface water and surface water quality impacts and if exceedances continue, implementation of further measures and surface water monitoring to demonstrate compliance.

Attachment 5

Discharge flow data for the LDP01 v-notch from October, 2012 to August, 2014

Date	kl/day
01/10/12	644
02/10/12	388
03/10/12	109
04/10/12	68
05/10/12	1
06/10/12	0
07/10/12	0
08/10/12	265
09/10/12	409
10/10/12	924
11/10/12	1710
12/10/12	2063
13/10/12	877
14/10/12	437
15/10/12	443
16/10/12	436
17/10/12	404
18/10/12	363
19/10/12	416
20/10/12	395
21/10/12	499
22/10/12	428
23/10/12	338
24/10/12	275
25/10/12	345
26/10/12	374
27/10/12	299

28/10/12	323
29/10/12	311
30/10/12	406
31/10/12	376
01/11/12	473
02/11/12	276
03/11/12	410
04/11/12	315
05/11/12	661
06/11/12	607
07/11/12	1210
08/11/12	553
09/11/12	89
10/11/12	45
11/11/12	0
12/11/12	0
13/11/12	305
14/11/12	330
15/11/12	280
16/11/12	2351
17/11/12	1850
18/11/12	625
19/11/12	422
20/11/12	385
21/11/12	289
23/11/12	276
24/11/12	257
25/11/12	321
26/11/12	892
27/11/12	907
28/11/12	5221
29/11/12	2794
30/11/12	1006
01/12/12	1227
02/12/12	598
03/12/12	439
04/12/12	403
05/12/12	332
06/12/12	218
07/12/12	311
08/12/12	294
09/12/12	373
10/12/12	468
11/12/12	393
12/12/12	285
13/12/12	250
14/12/12	272
15/12/12	348
16/12/12	321
17/12/12	329
18/12/12	268
19/12/12	298
20/12/12	306

21/12/12	333
22/12/12	9868
23/12/12	4014
24/12/12	1689
25/12/12	14193
26/12/12	3612
27/12/12	1100
28/12/12	804
29/12/12	514
30/12/12	463
31/12/12	392
01/01/13	352
02/01/13	325
03/01/13	428
04/01/13	379
05/01/13	329
06/01/13	345
07/01/13	309
08/01/13	394
09/01/13	264
10/01/13	368
11/01/13	311
12/01/13	411
13/01/13	487
14/01/13	523
15/01/13	374
16/01/13	353
17/01/13	384
18/01/13	612
19/01/13	913
20/01/13	781
21/01/13	437
22/01/13	5956
23/01/13	2256
24/01/13	711
25/01/13	488
26/01/13	418
27/01/13	16447
28/01/13	14434
29/01/13	10217
30/01/13	2018
31/01/13	1170
01/02/13	10872
02/02/13	12565
03/02/13	2257
04/02/13	1347
05/02/13	1010
06/02/13	932
07/02/13	841
08/02/13	1029
09/02/13	1160
10/02/13	8630
11/02/13	5587

12/02/13	1776
13/02/13	1255
14/02/13	982
15/02/13	702
16/02/13	171
17/02/13	107
18/02/13	599
19/02/13	774
20/02/13	924
21/02/13	555
22/02/13	196
23/02/13	9940
24/02/13	13824
25/02/13	9908
26/02/13	3882
27/02/13	2146
28/02/13	3119
01/03/13	26944
02/03/13	7995
03/03/13	3845
04/03/13	2785
05/03/13	2263
06/03/13	1995
07/03/13	2032
08/03/13	1094
09/03/13	1052
10/03/13	1857
11/03/13	1733
12/03/13	1754
13/03/13	1596
14/03/13	4374
15/03/13	3216
16/03/13	1820
17/03/13	1548
18/03/13	1536
19/03/13	1542
20/03/13	1467
21/03/13	1484
22/03/13	1533
23/03/13	1397
24/03/13	1337
25/03/13	1122
26/03/13	1194
27/03/13	1195
28/03/13	1343
29/03/13	1098
30/03/13	1046
31/03/13	1139
01/04/13	1033
02/04/13	1004
03/04/13	1076
04/04/13	1151
05/04/13	423

06/04/13	52
07/04/13	98
08/04/13	333
09/04/13	0
10/04/13	89
11/04/13	135
12/04/13	289
13/04/13	0
14/04/13	300
15/04/13	0
16/04/13	0
17/04/13	557
18/04/13	969
19/04/13	920
20/04/13	1046
21/04/13	780
22/04/13	865
23/04/13	835
24/04/13	734
25/04/13	736
26/04/13	714
27/04/13	684
28/04/13	682
29/04/13	606
30/04/13	620
01/05/13	726
02/05/13	614
03/05/13	379
04/05/13	0
05/05/13	92
06/05/13	2
07/05/13	0
08/05/13	0
09/05/13	0
10/05/13	0
11/05/13	173
12/05/13	523
13/05/13	1203
14/05/13	1167
15/05/13	822
16/05/13	914
17/05/13	718
18/05/13	604
19/05/13	525
20/05/13	573
21/05/13	0
22/05/13	1496
23/05/13	3075
24/05/13	1335
25/05/13	716
26/05/13	640
27/05/13	645
28/05/13	1174

29/05/13	937
30/05/13	676
31/05/13	642
01/06/13	1149
02/06/13	13347
03/06/13	1720
04/06/13	956
05/06/13	851
06/06/13	833
07/06/13	949
08/06/13	723
09/06/13	0
10/06/13	2444
11/06/13	1246
12/06/13	6492
13/06/13	2479
14/06/13	1570
15/06/13	899
16/06/13	723
17/06/13	806
18/06/13	672
19/06/13	657
20/06/13	630
21/06/13	441
22/06/13	540
23/06/13	731
24/06/13	1165
25/06/13	0
26/06/13	9538
27/06/13	2530
28/06/13	1697
29/06/13	2851
30/06/13	1665
01/07/13	1128
02/07/13	950
03/07/13	868
04/07/13	1031
05/07/13	844
06/07/13	733
07/07/13	728
08/07/13	768
09/07/13	857
10/07/13	741
11/07/13	600
12/07/13	724
13/07/13	637
14/07/13	774
15/07/13	1028
16/07/13	1938
17/07/13	2530
18/07/13	1196
19/07/13	3636
20/07/13	3132

21/07/13	1268
22/07/13	995
23/07/13	966
24/07/13	717
25/07/13	730
26/07/13	747
27/07/13	733
28/07/13	0
29/07/13	684
30/07/13	701
31/07/13	747
01/08/13	545
02/08/13	744
03/08/13	663
04/08/13	668
05/08/13	662
06/08/13	701
07/08/13	1096
08/08/13	3167
09/08/13	1051
10/08/13	738
11/08/13	828
12/08/13	1964
13/08/13	0
14/08/13	0
15/08/13	0
16/08/13	0
17/08/13	0
18/08/13	0
19/08/13	0
20/08/13	0
21/08/13	0
22/08/13	0
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30/08/13	0
31/08/13	0
01/09/13	0
02/09/13	0
03/09/13	0
04/09/13	0
05/09/13	0
06/09/13	1035
07/09/13	622
08/09/13	689
09/09/13	685
10/09/13	755
11/09/13	609

12/09/13	606
13/09/13	565
14/09/13	756
15/09/13	603
16/09/13	8121
17/09/13	9658
18/09/13	1900
19/09/13	206
20/09/13	198
21/09/13	130
22/09/13	70
23/09/13	1
24/09/13	0
25/09/13	0
26/09/13	0
27/09/13	0
28/09/13	0
29/09/13	0
30/09/13	0
01/10/13	348
02/10/13	765
03/10/13	0
04/10/13	618
05/10/13	624
06/10/13	635
07/10/13	540
08/10/13	597
09/10/13	566
10/10/13	598
11/10/13	448
12/10/13	479
13/10/13	569
14/10/13	0
15/10/13	486
16/10/13	0
17/10/13	601
18/10/13	465
19/10/13	1097
20/10/13	659
21/10/13	0
22/10/13	640
23/10/13	1758
24/10/13	681
25/10/13	459
26/10/13	474
27/10/13	460
28/10/13	460
29/10/13	1130
30/10/13	825
31/10/13	568
01/11/13	460
02/11/13	463
03/11/13	478

04/11/13	377
05/11/13	427
06/11/13	412
07/11/13	428
08/11/13	475
09/11/13	462
10/11/13	424
11/11/13	3410
12/11/13	1011
13/11/13	171
14/11/13	100
15/11/13	0
16/11/13	0
17/11/13	0
18/11/13	0
19/11/13	0
20/11/13	550
21/11/13	2510
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23/11/13	1400
24/11/13	608
25/11/13	623
26/11/13	461
27/11/13	0
28/11/13	363
29/11/13	520
30/11/13	426
01/12/13	347
02/12/13	290
03/12/13	295
04/12/13	360
05/12/13	2376
06/12/13	818
07/12/13	368
08/12/13	354
09/12/13	460
10/12/13	367
11/12/13	366
12/12/13	300
13/12/13	304
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15/12/13	380
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18/12/13	373
19/12/13	324
20/12/13	317
21/12/13	322
22/12/13	297
23/12/13	362
24/12/13	0
25/12/13	6906
26/12/13	0

27/12/13	634
28/12/13	395
29/12/13	364
30/12/13	301
31/12/13	300
01/01/14	328
02/01/14	335
03/01/14	436
04/01/14	247
05/01/14	247
06/01/14	275
07/01/14	355
08/01/14	441
09/01/14	429
10/01/14	461
11/01/14	404
12/01/14	405
13/01/14	390
14/01/14	395
15/01/14	343
16/01/14	380
17/01/14	374
18/01/14	347
19/01/14	0
20/01/14	0
21/01/14	0
22/01/14	0
23/01/14	0
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10/02/14	0
11/02/14	0
12/02/14	0
13/02/14	0
14/02/14	0
15/02/14	479
16/02/14	3954
17/02/14	1557

18/02/14	808
19/02/14	14434
20/02/14	4983
21/02/14	1062
22/02/14	607
23/02/14	559
24/02/14	540
25/02/14	510
26/02/14	595
27/02/14	2383
28/02/14	2297
01/03/14	10013
02/03/14	5184
03/03/14	2132
04/03/14	1219
05/03/14	1492
06/03/14	2325
07/03/14	6311
08/03/14	2843
09/03/14	1022
10/03/14	868
11/03/14	433
12/03/14	862
13/03/14	8767
14/03/14	15643
15/03/14	5171
16/03/14	7652
17/03/14	2535
18/03/14	1311
19/03/14	1282
20/03/14	1057
21/03/14	1042
22/03/14	1032
23/03/14	910
24/03/14	5810
25/03/14	2748
26/03/14	9695
27/03/14	14594
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01/04/14	1531
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05/04/14	7049
06/04/14	3683
07/04/14	2707
08/04/14	2276
09/04/14	2059
10/04/14	2223
11/04/14	8127

12/04/14	3311
13/04/14	2332
14/04/14	2073
15/04/14	1979
16/04/14	1897
17/04/14	1806
18/04/14	1747
19/04/14	1503
20/04/14	1465
21/04/14	1419
22/04/14	1502
23/04/14	1342
24/04/14	1423
25/04/14	1513
26/04/14	1529
27/04/14	1481
28/04/14	1348
29/04/14	1485
30/04/14	1631
01/05/14	1384
02/05/14	1592
03/05/14	2315
04/05/14	0
05/05/14	1256
06/05/14	1218
07/05/14	1076
08/05/14	1076
09/05/14	1076
10/05/14	1076
11/05/14	1414
12/05/14	1089
13/05/14	1047
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15/05/14	959
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18/05/14	990
19/05/14	1011
20/05/14	1093
21/05/14	940
22/05/14	940
23/05/14	1063
24/05/14	1018
25/05/14	1018
26/05/14	852
27/05/14	1226
28/05/14	1875
29/05/14	970
30/05/14	960
31/05/14	962
01/06/14	3793
02/06/14	2439
03/06/14	0

04/06/14	0
05/06/14	0
06/06/14	0
07/06/14	0
08/06/14	0
09/06/14	0
10/06/14	0
11/06/14	0
12/06/14	0
13/06/14	0
14/06/14	0
15/06/14	0
16/06/14	0
17/06/14	0
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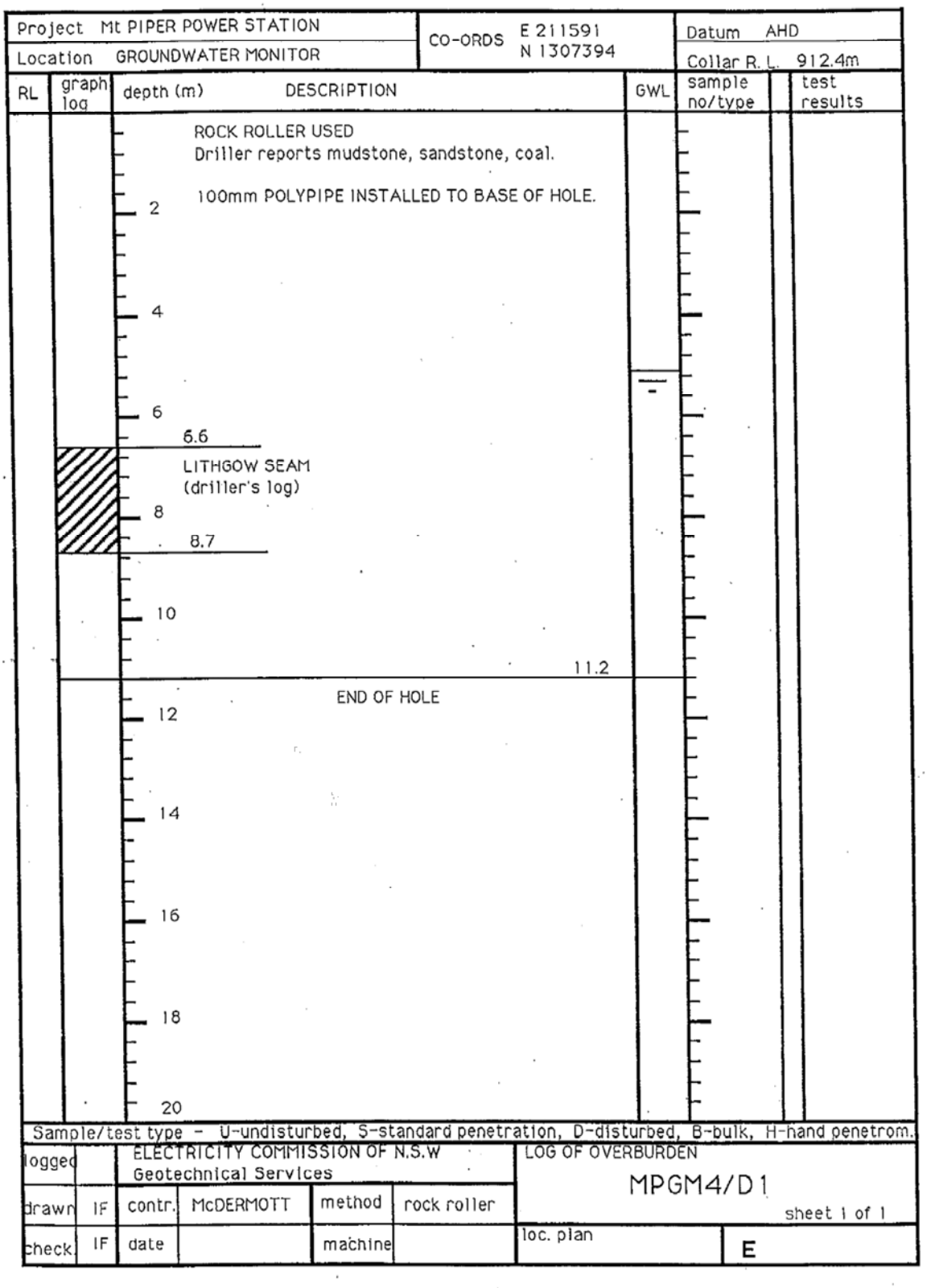
19/06/14	638
20/06/14	990
21/06/14	777
22/06/14	2341
23/06/14	1476
24/06/14	1129
25/06/14	351
26/06/14	0
27/06/14	311
28/06/14	1256
29/06/14	2639
30/06/14	1355
01/07/14	849
02/07/14	700
03/07/14	0
04/07/14	796
05/07/14	0
06/07/14	436
07/07/14	0
08/07/14	0
09/07/14	0
10/07/14	0
11/07/14	0
12/07/14	0
13/07/14	0
14/07/14	0
15/07/14	0
16/07/14	0
17/07/14	0
18/07/14	0
19/07/14	339
20/07/14	431
21/07/14	210
22/07/14	316
23/07/14	228
24/07/14	286
25/07/14	0
26/07/14	0

27/07/14	617
28/07/14	34
29/07/14	0
30/07/14	0
31/07/14	813
01/08/14	868
02/08/14	912
03/08/14	743

Attachment 6

a) Groundwater installation bore Log for MPGM4/D1

a) Groundwater installation bore Log for MPGM4/D1



b) Bore Logs for MPGM4/D15, D16, D17 and D18

See “Appendix A - Borehole Logs” in Lamberts North Ash Placement Project Groundwater Modelling Report by CDM Smith. Report to Delta Electricity dated 22 November 2012

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