



Review and Amendments Schedule – PLANIT CONSULTING PTY LTD

Date		
Author	BL	May 2014
Reviewer	AS	May 2014

Amendments

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Planit Consulting Pty Ltd declares that it does not have, nor expect to have, a beneficial interest in the subject project.

PLANIT CONSULTING PTY LTD[®]
MAY 2014

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Executive Summary & Introduction



Introduction & Context

Development consent for Ramtech Pty Ltd's (Ramtech) proposal to construct and operate a sand quarry at Lot 1 in DP 755721 & Lots 1 & 2 in DP 780199 Pottsville Mooball Road, Mooball was granted by the Minister for Planning on 24th November 2008. Schedule 3 of the development consent requires that individual management plans for the key environmental issues be prepared and that environmental management and monitoring conditions be fulfilled. To this end, an EMP was approved by the Department of Planning which integrates the prescribed environmental monitoring programs in accordance with Condition 2 of Schedule 5 into a planning and operations framework.

Construction commenced on a general trial basis in September 2010 with formal commencement occurring in October of 2010. Operations are at a basic level with estimated annual production in the order of 20,000 tonnes per annum only at this stage.

Within Schedule 5 of the consent, Condition No.5 requires that within twelve (12) months of the date of the approval and annually thereafter, Ramtech is to submit an Annual Environmental Management Report (AEMR). This report forms a 6 monthly assessment of the operations and sampling data. It is formulated into the AEMR and is to be submitted to the Director General of the Department of Planning and other relevant agencies in accordance with the abovementioned Condition 5. This monitoring report describes works undertaken, provides a summary and analysis of any complaints and monitoring results, identifies any trends in the monitoring results and identifies any non compliance over the preceding 12 months. Also included is any proposed construction, extraction and rehabilitation activities planned for the following 12 months.

Description of Resource

Concrete Sand

The Dunloe Park sand, after washing, is suitable as a concrete sand additive. It is expected that this will be the major use of the sand. Low extraction costs will make the sand competitive within the local Pottsville markets. As sand demand increases, the Dunloe Park sand may become competitive within the Brisbane market.

Loam

Further investigation into loam resources were carried out in mid 2007 (Coffey Geosciences, 2007), the area selected for investigation being the initial mining area proposed for the sand quarry (Gilbert and Sutherland, 2007). A 200m x 200m area approximately 1.2 m deep in the alluvial soil below the topsoil (which averaged approximately 0.3m depth) equating to approximately 90,000t of loam, was sampled by auger drilling and assessed for suitability as a loam.

Fill Material

Fill material represents a portion of demand in South East Queensland and Northern NSW. The sand appears to match Rocla specifications for fill sand in NSW (Rocla, 2007). From investigations carried out by Coffey Mining, it is considered that the Dunloe Park sand can be used as "low grade" fill material which is not dissimilar to fill material supplied into the northern and central coast of NSW. Major local sources of fill include sandstone fill from Kangaroo Creek (near Grafton) which also provides road base and hard materials.

Plastering and Rendering Sand

Coffey Mining is of the opinion that the sand in the Dunloe Park Resource, when washed, will be suitable for lower grade plastering and rendering sand and this is similar to current material supplied into the northern and central NSW market. To confirm this, it is recommended that the following be completed:

- Washed material be prepared and provided to agents for trialing and feedback.
- Laboratory tests be completed for fineness modulus, clay/silt content (<3%), organics and shell content.

Other Uses

Other “specialist” products which fit closely to the grading of the Dunloe Park sands include:

- Golf course sands – colour (usually whiteness) is a major issue.
- Grout sands.
- Fine filter sands.

Sale of these sands (except for local demand) is not considered to be a major opportunity for Dunloe Park due to established marketing strategies (including bagging of filter sands and grout sands) by other manufacturers. If these products are required in the future, then blending with imported (generally coarser size ranges) will be required. This is commonplace within the sand industry.

Dunloe Park *in situ* Indicated Mineral Resources

Pit	Overburden Mm ³	Sand Mm ³	Total Mm ³
North Pit	0.14	3.70	3.84
South Pit	0.08	2.96	3.04
Total	0.22	6.66	6.88

Extraction rates are not to exceed 300,000 tonnes per annum in accordance with Condition 7 of Schedule 2 of the Development Consent. Condition 5 of Schedule 2 provides for operations being permitted until 1 January 2035.

Monitoring

Planit Consulting has been contracted by Ramtech Pty Ltd to prepare this report based on environmental monitoring undertaken upon site by the proponents.

The monitoring includes;

- Algae;
- Ground Waters; and
- Surface Waters.

This report was prepared by Planit Consulting and includes the following;

- Algae Level results for November 2013 to April 2014;
- Ground Water chemical results for November 2013 to April 2014;
- Quarterly Surface Water chemical results for December 2013 and March 2014; and
- Rainfall levels from November 2013 to April 2014.

Water samples for algae were collected monthly between November 2013 to April 2014 at the Lake site Number 1. Mixed Algae results from all water samples remained steady with less than 100cells/mL. These results are significantly less than the maximum allowable water quality objective of 50,000cells/mL.

Groundwater was sampled monthly over a 6-month period between November 2013 to April 2014. Monthly monitoring provided levels of pH, Electrical Conductivity (EC), Redox Potential and Dissolved Oxygen (DO) from locations DLP1, DLP3, DLP 5, DLP 6 and DLP 7. The pH level across the site varied however the majority of the samples maintained within the pH interim target range presented within the Environmental Management Plan. The monitoring is ongoing and samples on-site water for levels of Chloride, Calcium, Magnesium, Sodium, Potassium, Sulphate, Arsenic, Iron and Manganese. Groundwater sampling locations as approved by the DoP are contained at **Appendix B**.

Surface water samples were collected for the quarterly sampling event in December 2013 and March 2014 at sites SW3, SW4, SW9 and SW10. Surface water sampling locations as approved by the DoP are contained at **Appendix B**.

The Bureau of Meteorology (BOM) recorded rainfall within surrounding suburbs over the 6 month period from November 2013 to April 2014. The recorded rainfall averaged from three sites – Coolangatta, Murwillumbah and Byron Bay – was approximately 598.5mm over the 6 month period.

Complaints Recorded

No complaints have been registered by the proponents to date.

Chapter 1.0 Sampling Program



Sampling Program

Dunloe Sand Quarry conducts environmental monitoring in accordance to Development Consent, Condition 2 of Schedule 5 and the approved Environmental Management Plan (EMP). Ramtech undertake algae, surface water and groundwater monitoring for the project.

Groundwater sites are monitored monthly for pH, EC, Redox Potential and DO and quarterly for Chloride, Calcium, Magnesium, Sodium, Potassium, Sulphate, Arsenic, Iron and Manganese. Samples are collected from sites DLP 1, DLP 3, DLP 5, DLP 6 and DLP 7. Sites locations are shown on the **Ground Water Location Map** under **Appendix A**.

Surface water analysis includes pH, conductivity, DO, suspended solids, total phosphorus and total nitrogen is conducted quarterly at sites SW 3, SW 4, SW 9 and SW 10. Site locations are depicted within the **Surface Water Location Map** under **Appendix B**.

All of the **Sampling Raw Data** that has been used to compile this report is included in **Appendix C**.

Chapter 2.0 Monthly Monitoring Results



2.1 Groundwater Depth

Ground water boreholes (Depth) November 2013				
DLP1	DLP3	DLP5	DLP6	DLP7
0.61	0.57	0.67	0.59	0.61
Ground water boreholes (Depth) April 2014				
DLP1	DLP3	DLP5	DLP6	DLP7
0.61	0.58	0.68	0.61	0.62

As referenced in the levels above the groundwater depth has stayed quite uniform across the site with no marked difference detected.

2.2 Algae Results

The results of the algae monitoring for the period of November 2013 to April 2014 are displayed within **Table 1**. Results are presented in cells/mL.

Table 1: Dunloe Sands – Lake – Algae Results November 2013 to April 2014

	25/11 2013	12/12 2013	19/12 2013	09/01 2014	29/01 2014	24/02 2014	31/03 2014	28/04 2014
Total Algal Count (cells/mL)	-	40650	22000	-	-	<100	-	-
Total Cyanophyta (cells/mL)	-	1150	-	-	-	-	-	-
Total Cyanophyta Biovolume	-	0.02	-	-	-	-	-	-
Pseudanabaena (Cyanophyta)	-	1150	-	-	-	-	-	-
Pseudabaena Biovolume	-	0.02	-	-	-	-	-	-
Chlorophyta	-	39500	22000	123000	34000	-	-	7700
Dinophyta (Dinoflagellates)	480	-	-	-	-	-	-	-
Diatoms (Bacillariophyta)	-	-	-	-	-	-	295	45

The results gathered between November 2013 and April 2014 remains consistently low being <100 cells/mL. No potentially hazardous levels were noted.

2.3 Ground Water Results

Monthly ground water monitoring was conducted between November 2013 and April 2014. Samples monitored the pH, EC, Redox Potential and DO levels of twelve sample sites; including eleven ground water and one lake sample site. The locations of the DLP sites are illustrated within the **Ground Water Location Map - Appendix B**.

The results are displayed within four separate graphs illustrating the results of each test site over the six month monitoring period. **Figure 2** depicts the pH test results, **Figure 3** illustrates the EC, **Figure 4** shows the Redox Potential and **Figure 5** presents DO levels.

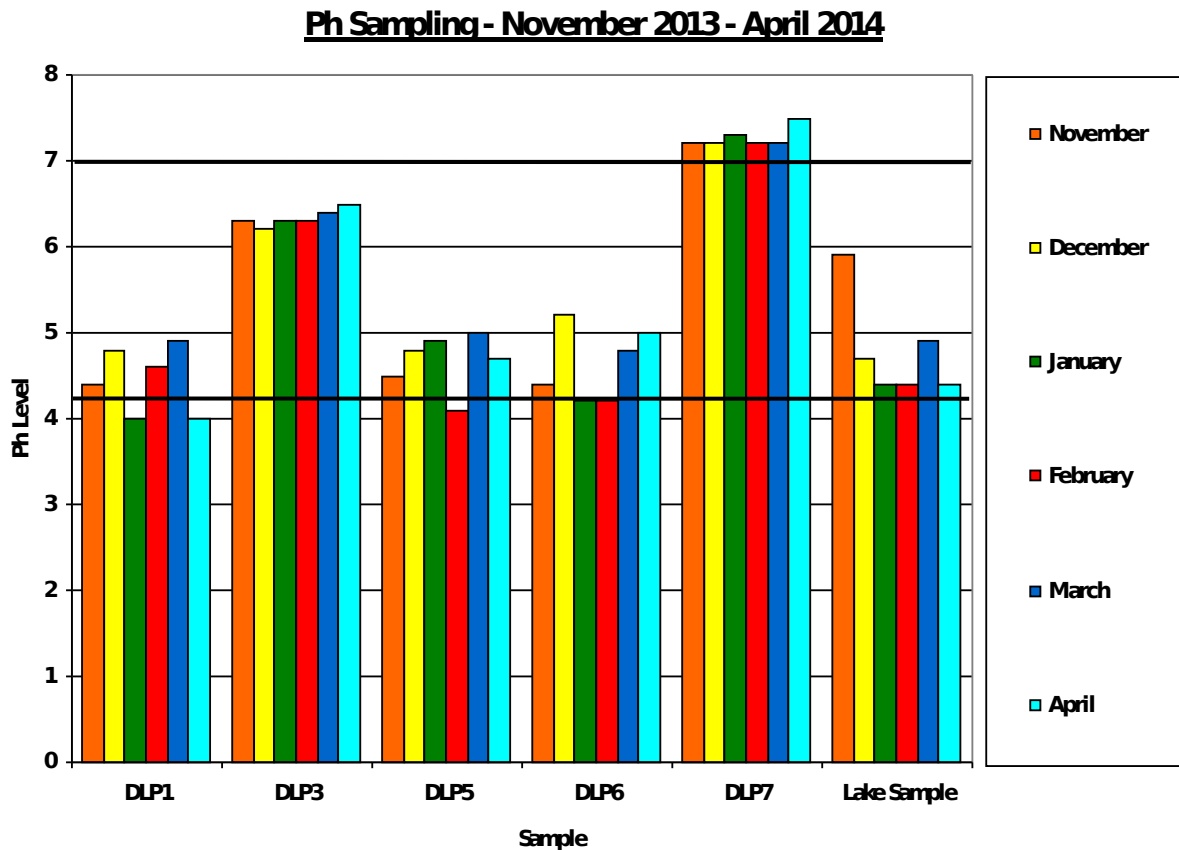


Figure 1: Dunloe Sands - Ground Water - Chemical (pH Test) Results November 2013 to April 2014

The EMP provides the interim target range regarding the pH levels of ground water sampling. The majority of the results displayed are between the minimum of 4.2pH and maximum of 7.0pH (shown as black lines).

DLP 7 demonstrates some samples outside of the maximum interim target levels by between 0.2 and 1.5pH. This presents a more alkaline pH level than the target range. These minimal exceedances of pH at DLP7 are not considered to be of any significance as small fluctuations in groundwater pH is common within regions which experience both high and low levels of rainfall and are consistent with background levels which were consistently acidic before operations commenced.

DLP 1 and DLP 5 both record samples below the 4.2pH interim target. This presents a more acidic pH level than the target range. Control of pH levels in the Lake Sample is relatively simple in so much that excessive alkaline readings are easily addressed by way of both dredging activity and chemical solution.

Groundwater Electroconductivity - November 2013 - April 2014

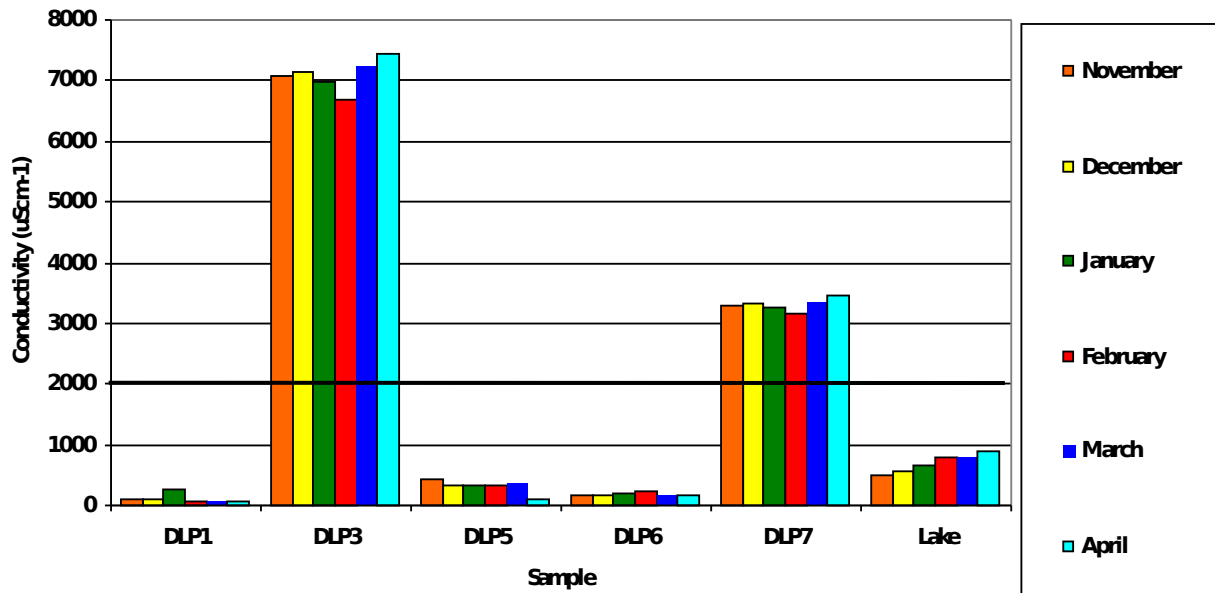


Figure 2: Dunloe Sands - Ground Water - Chemical (EC Test) Results November 2013 to April 2014

The majority of the samples taken produce considerably low EC levels when compared to the EMP maximum interim target. However, two samples sites; DLP3 and DLP7 present conductivity levels above the maximum interim target of $2,000\text{uS/cm}^{-1}$ stated within the EMP (shown as a black line). These sites also expressed similar levels of EC within background testing. This can be explained by the sampling wells being installed in the low-lying portion of the floodplain. The wells are adjacent to sections of Mooball Creek and the main agricultural drainage line which can be subject to tidal influences. It is therefore considered likely that some localised salinisation of surficial groundwater has occurred within the vicinity of monitoring locations DLP3 and DLP7. The operator of Dunloe Sands has undertaken measures to reign in the EC results at the problems sites, which is considered to be an error in analysis.

Groundwater Redox Potential - November 2013 - April 2014

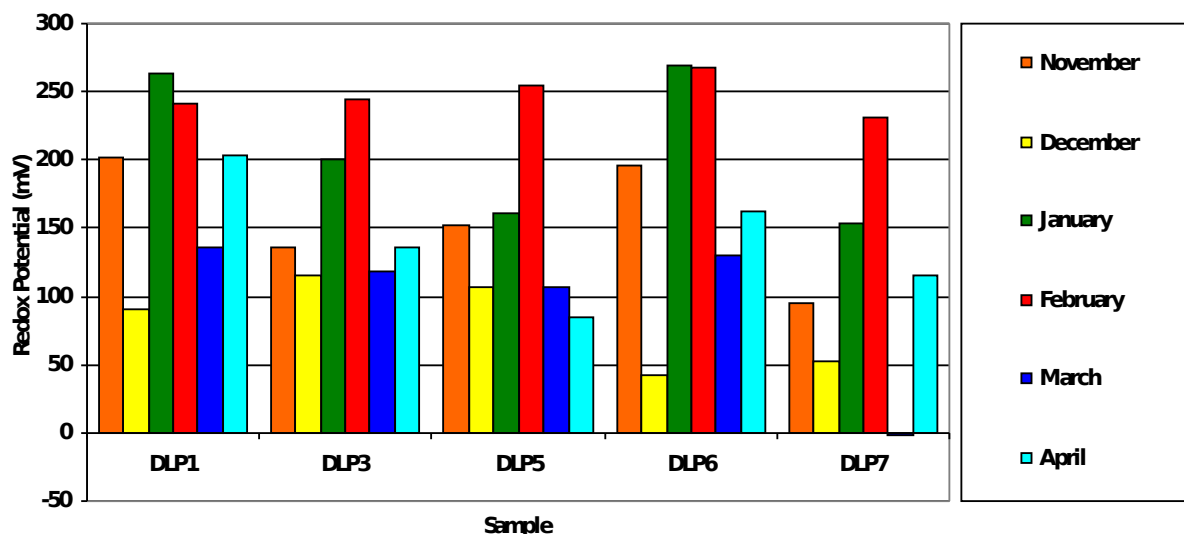


Figure 3: Dunloe Sands - Ground Water - Chemical (Redox Potential Test) Results November 2013 to April 2014

The EMP does not provide an interim target level for Redox Potential but instead states that results should be monitored for outlier samples. All samples present in a uniform manner, with no outliers present.

Groundwater Dissolved Oxygen Test Results - November 2013 - April 2014

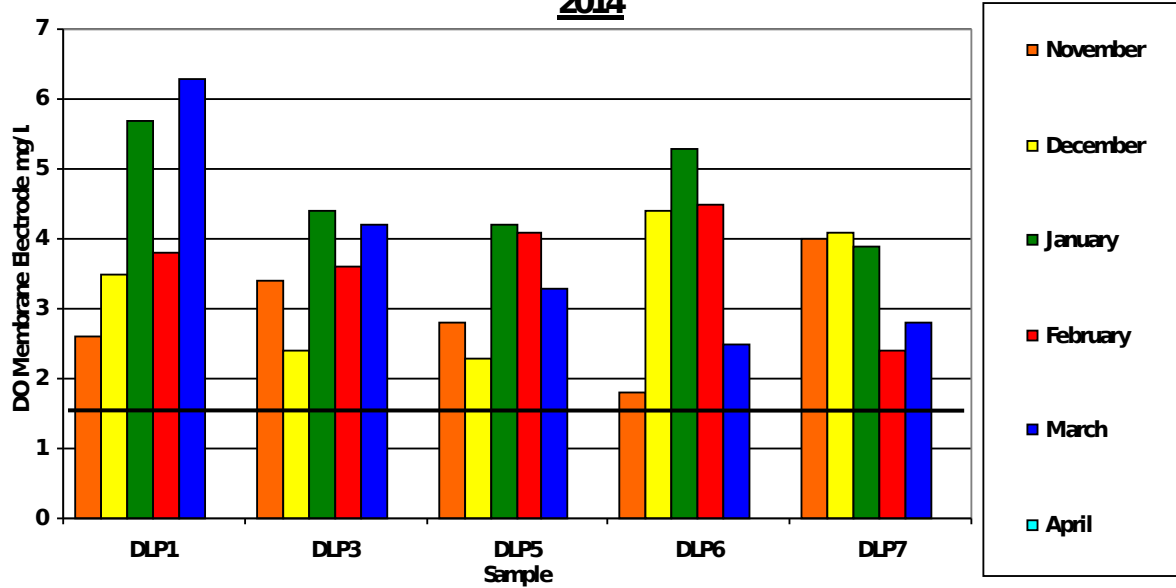


Figure 4: Dunloe Sands - Ground Water - Chemical (DO Test) Results November 2013 to April 2014

The minimum DO level provided within the EMP is 1.5mg/mL (shown as a black line). The results vary in DO levels considerably with the majority not presenting or conforming to a pattern over the six month monitoring period. All groundwater samples provide results above the minimum interim target. Compliance is achieved with the DO requirements of the EMP.

Results for tests of turbidity, suspended solids, oil and grease, total phosphorus and total nitrogen were only collected within the lake sample site. **Figures 6 and 7** present the sample levels compared to the EMP interim target levels.

Chemical Results - Lake Samples - November 2013 - April 2014

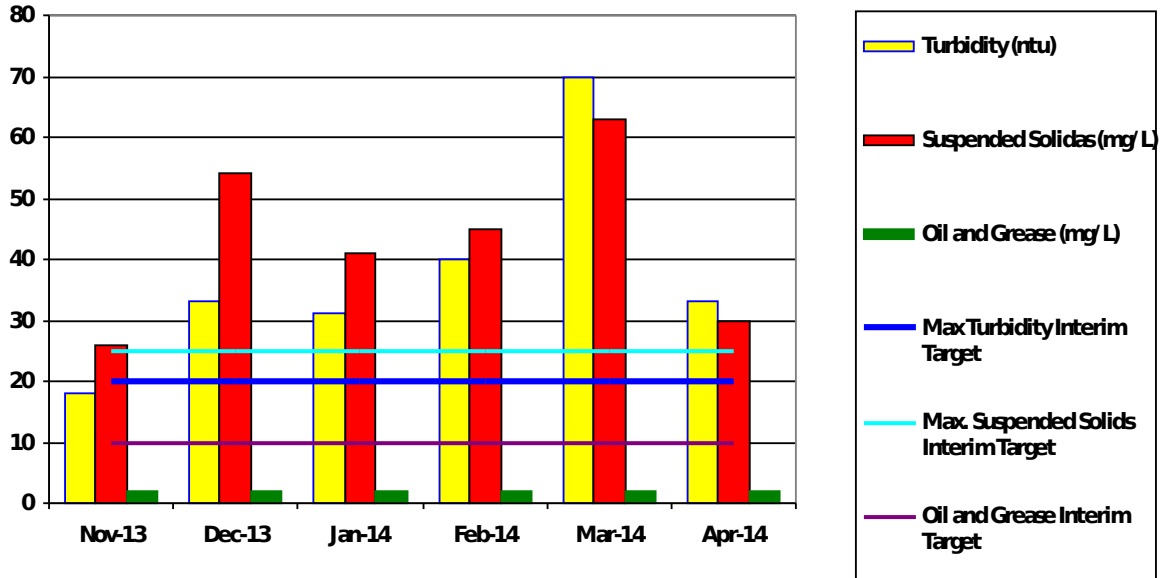


Figure 5: Dunloe Sands - Lake - Chemical Results – November 2013 to April 2014

Interim target levels for turbidity present a maximum level of 20ntu within the EMP. The levels recorded over the six month monitoring period show levels below the maximum levels during the December 2012 and March 2013 sample and exceedances for the December to April period. This can be explained by a period of extended dredging through this period and hence the results are as expected.

The maximum interim target level for the suspended solids within the EMP is 25mg/L. Results present below the maximum levels for both the December 2012 and March 2013 samples and exceedances for the December to April period. This can be explained by a period of extended dredging through this period and hence the results are as expected.

The EMP states a maximum level of 10mg/L in regard to oil and grease. Levels of oil and grease within the samples are consistent over the six month monitoring period at less than 2mg/L.

Chemical Results - Lake Sample - November 2013 - April 2014

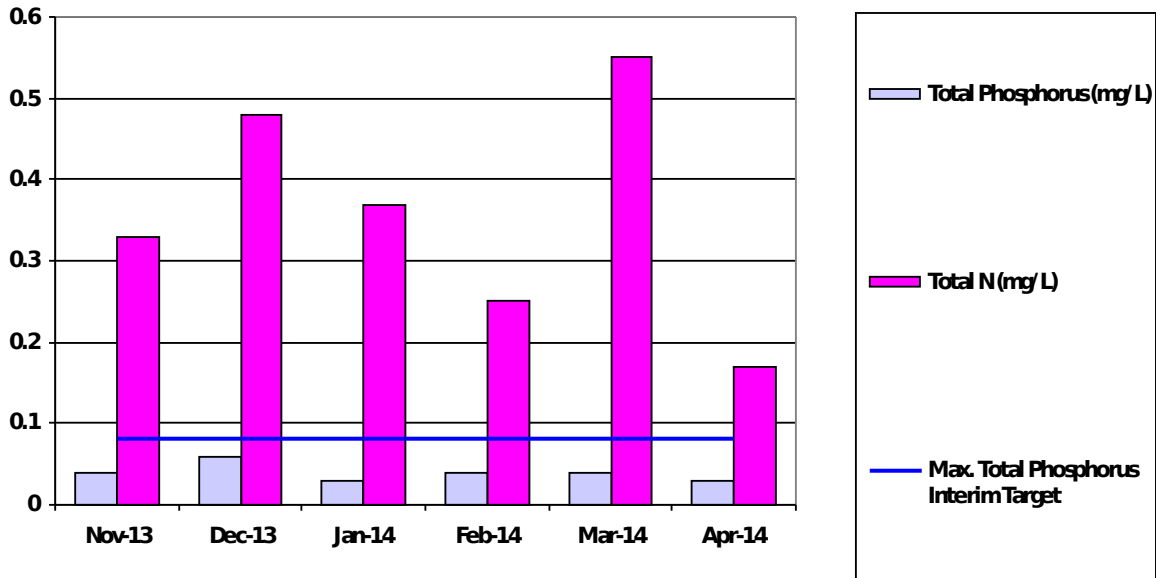


Figure 7: Dunloe Sands - Lake - Chemical Results – December 2013 and March 2014

Total phosphorus levels have a maximum interim target of 0.08mg/L. All sample data results in levels of below the maximum interim target levels contained within the EMP.

Total nitrogen levels remain consistently lower than the interim target of 20mg/L with a maximum result of 0.48 mg/L.

2.4 Recorded Rainfall

The Bureau of Meteorology (BOM) have recorded rainfall within the surrounding areas of Pottsville; including Coolangatta (24.3km from Pottsville), Murwillumbah – Bray Park (18.9km from Pottsville) and Byron Bay (28.5km from Pottsville). The results are illustrated within **Figure 8** along with the recorded rainfall average.

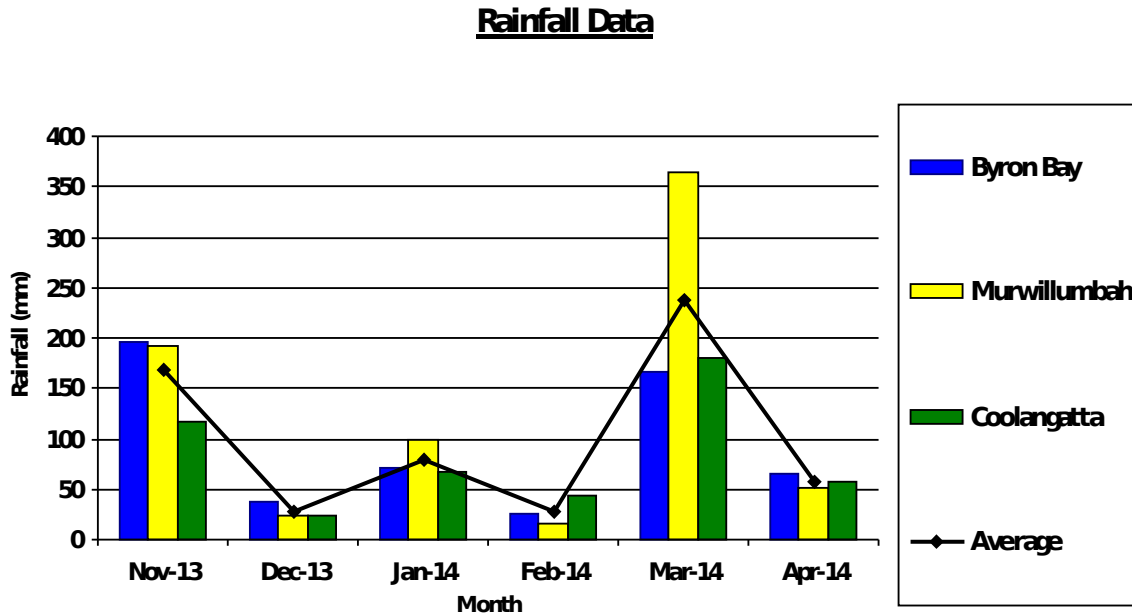


Figure 8: Recorded Rainfall November 2013 to April 2014

The recorded rainfall of the three suburbs surrounding Pottsville has been averaged to produce an approximate on-site rainfall. March 2014 presented the highest level of rainfall within the region with an average of 236.7mm of total rainfall being recorded. In total over the six month period approximately 598.5mm of rain was recorded on-site.

Chapter 3.0 Quarterly Monitoring Results



3.1 Ground Water Results

Quarterly monitoring of the ground waters on-site within locations DLP 1, DLP 3, DLP 5, DLP 6 and DLP 7 have been undertaken to determine levels of chloride (**Table 2**), calcium (**Table 3**), magnesium (**Table 4**), sodium (**Table 5**), potassium M8 (**Table 6**), sulphate (**Table 7**), arsenic (**Table 8**), iron (**Table 9**) and Manganese (**Table 10**). Samples were collected in December 2013 and March 2014. Tables present the results compared against the interim target criteria contained within the EMP.

The majority of the samples collected are consistent with the interim target criteria of the EMP. Some variants are illustrated within the results. These variants have been highlighted with bold text.

Table 2: Dunloe Sands - Ground Water - Chemical (Chloride Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample	20	2,340	89	20	750
Interim Target	285.0	285.0	285.0	285.0	285.0
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample	15	120	110	22	720
Interim Target	285.0	285.0	285.0	285.0	285.0

Comments: Two (2) samples sites (DLP3 and DLP7) presented chloride test levels above the maximum interim target of 285mg/L stated within the EMP. These sampling sites have expressed similar levels of chloride within background testing. The high chloride levels in these locations indicate a high level of saltwater intrusion at these points. This is quite easily explained as these sampling wells have been installed in the low-lying portion of the floodplain adjacent to the sections of Mooball Creek and the main agricultural drainage line that are subject to tidal influences. It is also not unexpected in the instance of DLP 7 given that it sits immediately adjacent the existing wetland which would in itself act as a 'drawer' of permanently saline conditions in order to sustain its dominant vegetative makeup (See **Appendix A – Ground Water Location Map**). It is therefore considered likely that some localised salinisation of surficial groundwater has occurred within the vicinity of DLP3 and DLP7 due to tidal influences within these nearby waterways and wetlands.

Table 3: Dunloe Sands - Ground Water - Chemical (Calcium Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	0.4	66	2.3	4.5	18
Target	55.0	55.0	55.0	55.0	55.0
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	0.6	73	2.4	5.6	19
Target	55.0	55.0	55.0	55.0	55.0

NB. Major cation

Comments: The spike associated with the DLP3 sample are consistent with background testing and consistent with the sites location proximate to the adjacent tidal waterway.

Table 4: Dunloe Sands - Ground Water - Chemical (Magnesium Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	0.2	104	7.2	1.5	38
Target	40.0	40.0	40.0	40.0	40.0
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	0.1	109	6.3	1.8	39
Target	40.0	40.0	40.0	40.0	40.0

NB. Major cation

Comments: The spike associated with DLP3 is consistent with background testing and consistent with the sites location proximate to the adjacent tidal waterway.

Table 5: Dunloe Sands - Ground Water - Chemical (Sodium Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	0.2	104	7.2	1.5	38
Target	280.0	280.0	280.0	280.0	280.0
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	0.1	109	6.3	1.8	39
Target	280.0	280.0	280.0	280.0	280.0

NB. Major cation

Comments: Two (2) samples sites (DLP3 and DLP7) presented sodium test levels above the maximum interim target of 280mg/L stated within the EMP. These sampling sites have expressed similar levels of sodium within background testing. The high sodium levels in these locations indicate a high level of saltwater intrusion at these points. This is quite easily explained as these sampling wells have been installed in the low-lying portion of the floodplain adjacent to the sections of Mooball Creek and the main agricultural drainage line that are subject to tidal influences. It is also not unexpected in the instance of DLP 7 given that it sits immediately adjacent the existing wetland which would in itself act as a 'drawer' of permanently saline conditions in order to sustain its dominant vegetative makeup (See **Appendix A – Groundwater Location Map**). It is therefore considered likely that some localised salinisation of surficial groundwater has occurred within the vicinity of DLP3 and DLP7 due to tidal influences within these nearby waterways and wetlands.

Table 6: Dunloe Sands - Ground Water - Chemical (Potassium M8 Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	< 5	43	<5	< 5	26
Target	17.5	17.5	17.5	17.5	17.5
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	< 5	43	< 5.0	< 5	26
Target	17.5	17.5	17.5	17.5	17.5

NB. Major cation

Comments: Two (2) samples sites (DLP3 and DLP7) presented potassium test levels above the maximum interim target of 17.5mg/L stated within the EMP. These sampling sites have expressed similar levels of potassium within background testing. The high potassium levels in these locations indicate a high level of saltwater intrusion at these points. This is quite easily explained as these sampling wells have been installed in the low-lying portion of the floodplain adjacent to the sections of Mooball Creek and the main agricultural drainage line that are subject to tidal influences. It is also not unexpected in the instance of DLP 7 given that it sits immediately adjacent the existing wetland which would in itself act as a 'drawer' of permanently saline conditions in order to sustain its dominant vegetative makeup (See **Appendix A – Ground Water Location Map**). It is therefore considered likely that some localised salinisation of surficial groundwater has occurred within the vicinity of DLP3 and DLP7 due to tidal influences within these nearby waterways and wetlands. Efforts to date to clear these wells have not had a noticeable impact upon readings, indicating that levels are naturally high in this regard.

Table 7: Dunloe Sands - Ground Water - Chemical (Sulphur as Sulphate Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	6.2	168	15	30	249
Target	175	175	175	175	175
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	3.5	175	12	34	253
Target	175	175	175	175	175

Comments: Minor exceedances were experienced during both sampling periods at DLP 7. This well is located near the stockpile and plant. Background testing shows that DLP 7 has previously tested with high test results.

Table 8: Dunloe Sands - Ground Water - Chemical (Arsenic Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	< 0.005	< 0.005	<0.005	< 0.005	< 0.005
Target	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample Interim	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Target	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Comments: The samples are fully compliant with the interim targets as set out by the EMP.

Table 9: Dunloe Sands - Ground Water - Chemical (Iron Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample	3.83	3.16	4.81	10	1.33
Interim Target	< 7.5	< 7.5	< 7.5	< 7.5	< 7.5
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample	2.44	2.86	3.52	10.5	1.52
Interim Target	< 7.5	< 7.5	< 7.5	< 7.5	< 7.5

Comments: Exceedance of the target iron levels is noted at DLP 6. Background testing suggests a history of DLP6 and a high reading of iron.

Table 10: Dunloe Sands - Ground Water - Chemical (Manganese Test) Results (mg/L)

December 2013	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample	0.02	0.57	0.04	0.06	0.08
Interim Target	0.15	0.15	0.15	0.15	0.15
March 2014	DLP 1	DLP 3	DLP 5	DLP 6	DLP 7
Sample	< 0.01	0.56	< 0.01	0.06	0.04
Interim Target	0.15	0.15	0.15	0.15	0.15

Comments: Manganese is typically associated brackish or slightly saline conditions and therefore the readings at DLP3 are entirely expected and consistent with background sampling.

3.2 Surface Water Results

Quarterly monitoring of the surface waters on site within locations SW 3, SW4, SW9 and SW10 sample water for levels of pH (**Table 11**), EC (**Table 12**), DO (**Table 13**), suspended solids (**Table 14**), phosphorus (**Table 15**) and nitrogen (**Table 16**). Samples were collected in December 2013 and March 2014. Tables present the results compared against the interim target criteria contained within the EMP.

The majority of the samples collected are consistent with the interim target criteria of the EMP. Some variants are illustrated within the results. These variants have been highlighted with bold text.

Table 11: Dunloe Sands - Surface Water - Chemical (pH Test) Results (pH)

December 2013	SW 3	SW 4	SW 9	SW 10
Sample	7.1	6.7	6.8	6.8
Interim Target	5 – 8.5	5 – 8.5	5 – 8.5	5 – 8.5
March 2014	SW 3	SW 4	SW 9	SW 10
Sample	3.7	3.8	4.6	4.6
Interim Target	5 – 8.5	5 – 8.5	5 – 8.5	5 – 8.5

Comments: All of the December samples taken are compliant with the interim target levels outlined within the EMP. The March pH samples are all less than the interim target level. High rainfall in March and active dredging have contributed to a spike in the March results as evidenced in more acidic levels. Additional in situ testing in future rain events is encouraged and consideration given to dosing with calcium carbonate to increase pH if it remains low.

Table 12: Dunloe Sands - Surface Water - Chemical (EC Test) Results (uS/cm⁻¹)

December 2013	SW 3	SW 4	SW 9	SW 10
Sample	25,681	17,021	10,096	15,775
Interim Target	< 5,500	< 5,500	< 5,500	< 5,500
March 2014	SW 3	SW 4	SW 9	SW 10
Sample	1,753	1,354	1,431	1,454
Interim Target	< 5,500	< 5,500	< 5,500	< 5,500

Comments: All of the December samples taken exceed the interim target levels outlined within the EMP. The March sample shows all samples back within acceptable levels. Saltwater has a high level of electroconductivity and therefore saltwater intrusion is considered the most likely explanation for the December 2013 samples. Ongoing monitoring of these sites and a review of sampling practices is to be undertaken by the proponent.

Table 13: Dunloe Sands - Surface Water - Chemical (DO Test) Results - (mg/L)

December 2013	SW 3	SW 4	SW 9	SW 10
Sample	5.8	5.5	5.2	5.0
Interim Target	> 4	> 4	> 4	> 4
March 2014	SW 3	SW 4	SW 9	SW 10
Sample	2.9	2.5	2.1	2.2
Interim Target	> 4	> 4	> 4	> 4

Comments: All of the December samples taken are compliant with the interim target levels outlined within the EMP. The March samples taken present DO levels of less than the interim target. The low dissolved oxygen results (albeit marginally low) are likely related to the low pH and high rainfalls experienced in March. This will need to be monitored.

Table 14: Dunloe Sands - Surface Water - Chemical (Suspended Solids Test) Results (mg/L)

December 2013	SW 3	SW 4	SW 9	SW 10
Sample	13	15	20	10
Interim Target	< 25	< 25	< 25	< 25
March 2014	SW 3	SW 4	SW 9	SW 10
Sample	42	41	40	40
Interim Target	< 25	< 25	< 25	< 25

Comments: All of the December samples taken are compliant with the interim target levels outlined within the EMP. The March samples taken present suspended solids levels exceeding the interim target. The increased levels in March are related to both the increased rainfall in March and active dredging through the preceding period.

Table 15: Dunloe Sands - Surface Water - Chemical (Total Phosphorus Test Results (mg/L))

December 2013	SW 3	SW 4	SW 9	SW 10
Sample	0.02	0.03	0.05	0.03
Interim Target	< 0.08	< 0.08	< 0.08	< 0.08
March 2014	SW 3	SW 4	SW 9	SW 10
Sample	0.05	0.04	0.13	0.13
Interim Target	< 0.08	< 0.08	< 0.08	< 0.08

Comments: The majority of the samples taken are compliant with the interim target levels outlined within the EMP. The March SW 9 and SW 10 samples result in a minor exceedance of the interim target and will be monitored in future testing to determine whether these results continue.

Table 16: Dunloe Sands - Surface Water - Chemical (Total Nitrogen Test) Results (mg/L)

December 2013	SW 3	SW 4	SW 9	SW 10
Sample	0.34	0.51	0.81	0.56
Interim Target	< 20	< 20	< 20	< 20
March 2014	SW 3	SW 4	SW 9	SW 10
Sample	1.54	1.43	1.64	1.63
Interim Target	< 20	< 20	< 20	< 20

Comments: All of the samples taken are compliant with the interim target levels outlined within the EMP.

Chapter 4.0 Conclusion





CONSULTING

4.1 Conclusion

This report represents the ongoing monitoring for the operation of the Dunloe Sands Quarry. It is to be utilised in respect of operational compliance and environmental characteristics on the site, as well as to be cross referenced with future monitoring reports. This will allow the identification of potential trends and areas requiring intervention and environmental amelioration.

The results within this report demonstrate that the environmental characteristics on-site remain consistent with background readings and within the acceptable limit set out within the consent and approved EMP.

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May 2014

Appendix A Ground Water Location Map



Appendix B Surface Water Location Map



Appendix C Sampling Raw Data

