



Aus 10 Rhyolite Pty Limited

ABN: 90 002 325 144



2018 Annual Review

for the

Tinda Creek Quarry



Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

March 2019

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ABN: 90 002 325 144

2018 Annual Review

for the

Tinda Creek Quarry

Period: 1 January 2018 to 31 December 2018

Prepared for:

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March 2019



R.W. CORKERY & CO. PTY. LIMITED

Table A
Title Block

Name of operation	Tinda Creek Sand Quarry
Name of operator	Aus 10 Rhyolite Pty Limited t/a Hy-Tec Concrete and Aggregates
Development consent / project approval #	SSD_4978
Name of holder of development consent / project approval	Aus 10 Rhyolite Pty Limited
Mining Lease #	No Mining Lease applicable to site under <i>Mining Act</i> (1992).
Name of holder of mining lease	N/A
Water licence #	WAL 24367 / WAL 24381
Name of holder of water licence	Aus 10 Rhyolite Pty Limited
MOP/RMP start date	N/A
MOP/RMP end date	N/A
Annual Review start date	1 January 2018
Annual Review end date	31 December 2018
<p>I, Darryl Thiedeke, certify that to the best of my knowledge this audit report is a true and accurate record of the compliance status of the Tinda Creek Quarry for the period 1 January 2018 to 31 December 2018 and that I am authorised to make this statement of behalf of Aus 10 Rhyolite Pty Limited.</p> <p><i>Note.</i></p> <p>a) <i>The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</i></p> <p>b) <i>The Crimes Act 1900 contains other offences relating to false and misleading information: Section 192G (Intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); Section 307A, 307B and 307C (false or misleading application/information/documents – maximum penalty 2 years imprisonment or \$22,000, or both).</i></p>	
Name of authorised reporting officer	Darryl Thiedeke
Title of authorised reporting officer	National Planning and Development Manager
Signature of authorised reporting officer	
Date	29.03.2019.

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LIST OF ACRONYMS

AHD	Australian Height Datum
ARI	Average Recurrence Interval
CCC	Community Consultative Committee
DPE	Department of Planning and Environment
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environment Protection Authority
EPL	Environment Protection License
PM	Particulate Matter
RWC	R.W. Corkery and Co. Pty Limited
TSP	Total Suspended Particulates
WAL	Water Access Licence



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1. STATEMENT OF COMPLIANCE

**Table 1.1
Statement of Compliance**

Were all conditions of the relevant approval(s) complied with?	Yes / No
DC # SSD_4978	No
EPL # 12007	Yes

**Table 1.2
Non-compliances**

Relevant Approval	Condition #	Condition Description (summary)	Compliance Status	Comment	Where Addressed in Annual Review
SSD 4978	2 (2)	This condition relates to operation of the Quarry in accordance with the conditions of consent	Administrative	A single non-compliance issue was identified during the reporting period as detailed in this table.	See below
SSD 4978	3 (7)	This condition relates to operation of the Quarry to satisfy prescribed air quality criteria.	Low	Monitoring of deposited dust levels indicated that levels exceeded the annual average criterion identified under Condition 3(7) of SSD_4978. A review of the data and laboratory analysis observations indicate that the elevated dust levels are unlikely to be caused by Quarry operations. Actions have since been taken by Hy-Tec to prevent the introduction of foreign matter into dust gauges by birds perching on the gauges.	Section 6.2

Compliance Status Key

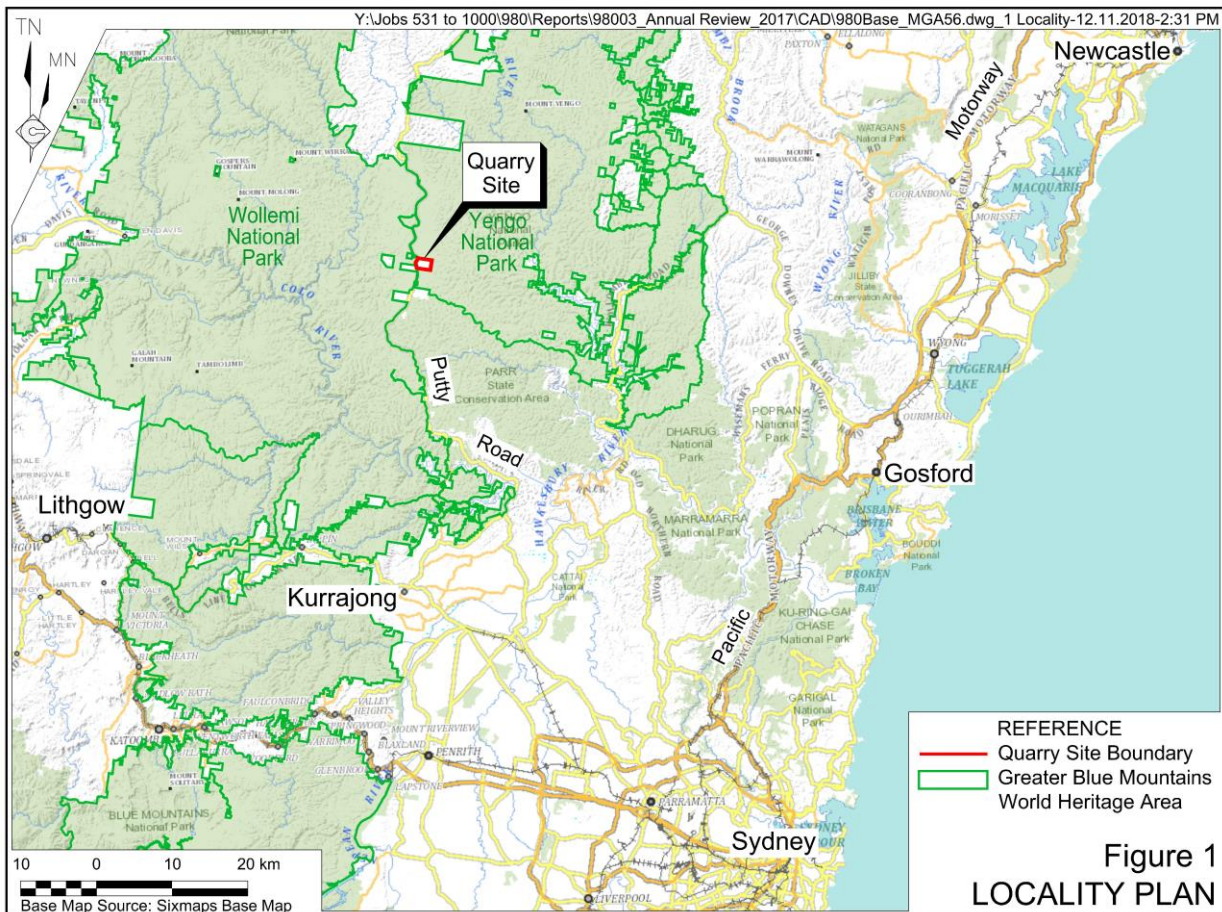
Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences but is likely to occur.
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences but is likely to occur.
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).

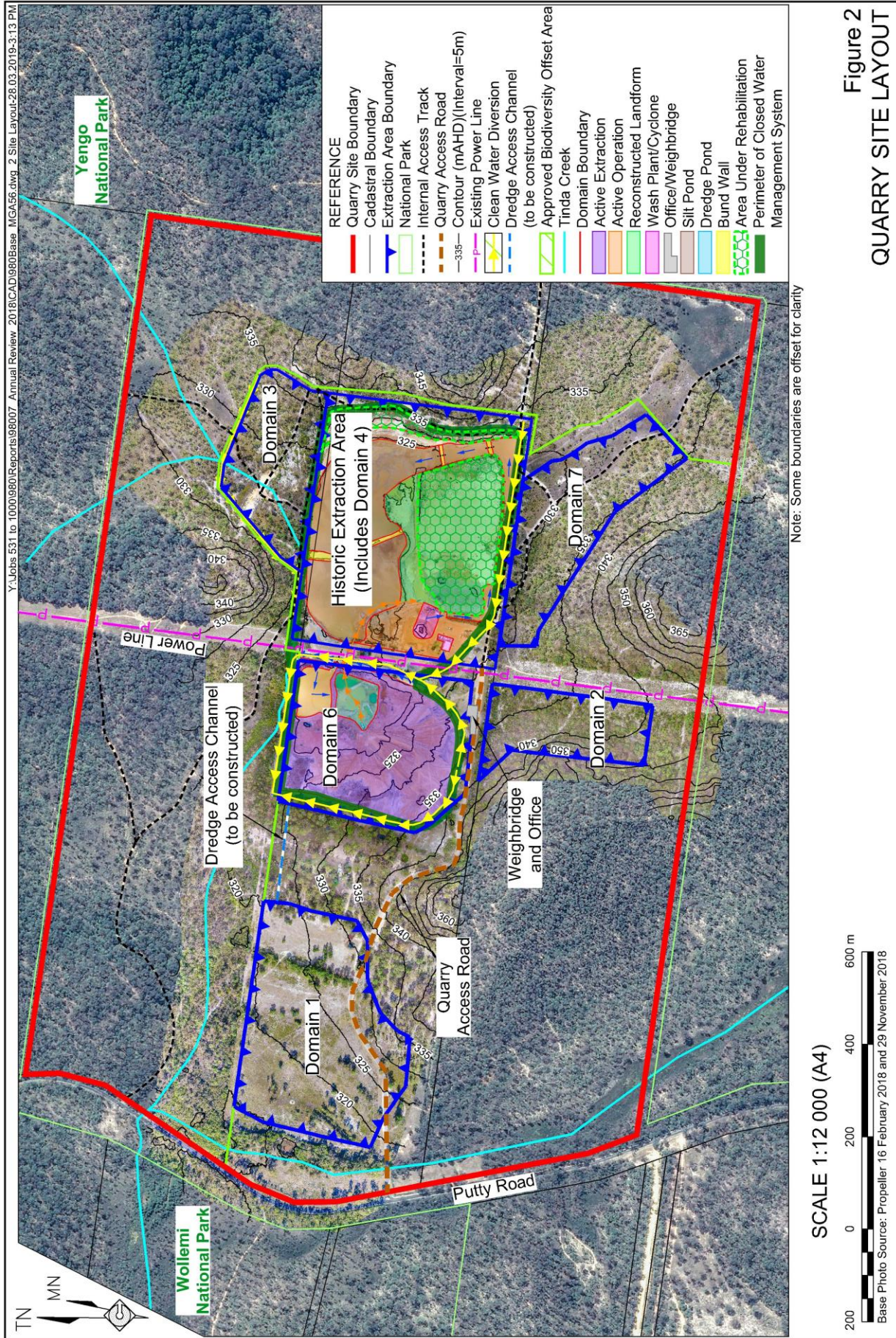
2. INTRODUCTION

2.1 SCOPE AND FORMAT

This *Annual Review* has been compiled by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Aus 10 Rhyolite Pty Limited. This report is applicable for the period 1 January 2018 to 31 December 2018 (“the reporting period”). The information presented within this *Annual Review* has been prepared based upon observations made during a site visit on Thursday 14 March 2019 and information provided by Hy-Tec.

The Tinda Creek Sand Quarry (the Quarry) is owned and operated by Aus 10 Rhyolite Pty Limited trading as Hy-Tec Concrete and Aggregates hereafter referred to as Hy-Tec. The Quarry Site is located approximately 67km north of Windsor along Putty Road, NSW (see **Figure 1**). Development Consent SSD_4978 (SSD_4978) was granted on 10 April 2015 to permit the extraction and despatch of up to 300 000 tonnes of sand from the Quarry each year for the duration of the Project. **Figure 2** displays the layout of the Quarry.





This *Annual Review* has been prepared in accordance with *Condition 5(4)* of Development Consent SSD_4978 to record the activities and environmental monitoring undertaken at the Quarry during the reporting period and to outline the activities and environmental monitoring planned throughout the next reporting period (1 January 2019 to 31 December 2019). *Condition 5(4)* requires the preparation of a report which must:

- a) *describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year (Sections 4, 8 and 11);*
- b) *include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against:*
 - *the relevant statutory requirements, limits or performance measures/criteria;*
 - *the monitoring results of previous years; and*
 - *the relevant prediction in the EIS (Sections 6, 7 and 9);*
- c) *identify any non-compliance over the last year, and describes what actions were (or are being) taken to ensure compliance (Section 10);*
- d) *identify any trends in the monitoring data over the life of the development (Section 6 and 7);*
- e) *identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (Section 6 and 7)*
- f) *describe what measures will be implemented over the current calendar year to improve the environmental performance of the development (Sections 6, 7 and 11).*

2.2 KEY PERSONNEL CONTACT DETAILS

The key personnel contact names, position and phone numbers are as follows.

Name	Position	24 Hour Contact
Michael Walton	Quarry Manager	0447 391 964

3. APPROVALS

Hy-Tec is required to operate the Tinda Creek Quarry in accordance with a development consent and three licenses, listed in **Table 3.1**.

Table 3.1
Tinda Creek Sand Quarry – Approvals and Licences

Consent/Lease/Licence	Issue Date	Expiry Date	Details / Comments
Development Consent SSD_4978	10/4/2015	31/12/2045	Issued by Department of Planning and Environment
Environment Protection Licence No 12007	11/5/2005	12 May ⁺	Issued by Environment Protection Authority
Water Access License 24381	1/9/2014	Continuing	Water Supply Works (Excavation) approval number 10WA112523 issued on 1/7/2011. Valid until 8/11/2025
Water Access License 24367	2/2/2012	Continuing	Water Supply Works (Bore) approval number 10WA112531 issued on 1/7/2011. Valid until 13/4/2025
⁺ Anniversary Date			

No modifications or variations to the development consent or licenses outlined in **Table 4** were sought within the reporting period.

SSD 4978 was granted in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by the Minister for Planning on 10 April 2015 to extract and transport no more than 300 000 tonnes of sand products from the Quarry Site each calendar year until 31 December 2045. SSD_4978 superseded DA 134/95 to allow for the expansion of extraction beyond the previously approved extraction area boundary. Sand extraction within the new approved extraction area commenced in September 2015. DA 134/95 was formally surrendered on 10 December 2015.

Hy-Tec also operates the Tinda Creek Quarry in accordance with Environment Protection Licence (EPL) 12007. This licence incorporates standard conditions for extractive industries and includes limits for noise emissions from the Quarry Site.

An internal compliance review of the conditions of SSD 4978 and EPL 12007 is presented as **Appendix 1** with the outcomes discussed in Section 1 and Section 10.

Water Access Licence (WAL) 24381 (40ML) and WAL24367 (15ML) were issued to permit extraction of water from the Sydney Basin North Groundwater Source. Water within this source is managed through the water sharing plan for the *Greater Metropolitan Region Groundwater Sources 2011*. The WALs permit extraction of groundwater in accordance with the conditions provided in the licences. Two Water Supply Works approvals were issued to Hy-Tec on 1 July 2011 by the then Department of Primary Industries (now the Department of Industry – Crown Lands and Water) to permit extraction of groundwater.

WAL 24367 relates to water sourced via a production bore from the underlying aquifer. This water, when required is used to top up the dredge pond to ensure the dredge can operate efficiently. WAL 24381 relates to water accessed from the groundwater setting through

extraction activities and principally accounts for evaporation from exposed faces. Anecdotally, Quarry personnel have observed very little seepage into operating domains, however this license accounts for the possible evaporation.

Hy-Tec applied for and received an additional 60ML allocation of groundwater from within the Sydney Basin North Groundwater Source under a controlled allocation order in October 2018. This allocation will commence upon issue of the appropriate documentation.

Hy-Tec also operates in accordance with Approval EPBC 2013/7028. This approval relates principally to operations that may impact the threatened Koala and small flower Grevillea identified within the Quarry Site. This approval also recognises the world and natural heritage values of the nearby Greater Blue Mountains Area. A compliance review of the conditions of EPBC 2013/7028 is completed annually and placed on the Hy-Tec website. During the reporting period, Hy-Tec remained compliant with the conditions of EPBC 2013/7028.

4. OPERATIONS SUMMARY

4.1 INTRODUCTION

The following subsections provide a summary of activities undertaken during the reporting period. Activities were generally consistent with those described in previous environmental management reporting. **Plates 1 to 6** display a series of photographs of the Tinda Creek Quarry taken on 14 March 2019 that are representative of existing conditions at the Quarry.

4.2 CLOSED WATER MANAGEMENT SYSTEM

Condition 12 of Schedule 3 of SSD 4978 requires that the catchment of the closed water system must not exceed 40ha at any one time. The closed water management system includes the area within the clean water diversions (**Figure 2**).

During the reporting period the closed water management system covered an area of 33.5ha.

It is anticipated that the closed water management system will be slightly expanded during the next reporting period but will remain within the 40ha limit.

4.3 EXTRACTION OPERATIONS

Extraction and processing during the reporting period occurred entirely within Domain 6 (see **Figure 2**). The total volume of sand extracted and processed was 114 269t which is within the limits specified in Condition 6 of Schedule 2 of SSD 4978. Sand was extracted using a cutter-suction dredge throughout the reporting period (refer **Plate 2**). This process involves the removal of water, sand, silt and clay in the form of a slurry which is then pumped to the processing area and stockpiled prior to transportation (refer **Plate 3**).



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Plate 1: Weighbridge Office and Weighbridge - March 2019
(Ref: E890F_114)

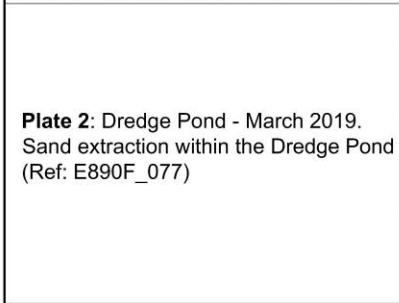


Plate 2: Dredge Pond - March 2019.
Sand extraction within the Dredge Pond
(Ref: E890F_077)



Plate 3: Sand Stockpile and Plant Infrastructure - March 2019
(Ref: E890F_120)



Plate 4: View of erosion sediment controls in the headwaters of Tinda Creek
(Ref: E890F_086)





Sand transported from site during the reporting period and forecast for the 2019 reporting period is displayed in **Table 4.1**.

Table 4.1
Sand Transportation from Site

Material	Approved annual limit (SSD_4978)	2017 reporting period	2018 reporting period	2019 reporting period (forecast)
Sand	300 000 t	190 642t	116 865t	150 000

Source: Hy-Tec

A copy of the annual return for extractive materials submitted to DRG for 2017/2018 is included within **Appendix 2**.

During the reporting period, the reported sand transported from site (116 865t) was similar to the volume of sand produced (114 269t) which is below the 300 000tpa limit approved within the development consent. Sand processing and transport decreased between the 2017 and 2018 reporting periods, largely due to operational constraints caused by drier than usual conditions.

During the reporting period (and for all historic operations) extraction operations did not exceed the limit of 15m below the natural ground surface described in *Condition 2(6)* of SSD 4978.

Hy-Tec has established a site-based standard procedure for survey and confirmation of the depth of extraction. The surveys are undertaken on a monthly basis.

It is expected that sand processing and transportation from site will increase slightly in 2019.

4.4 HOURS OF OPERATION

The permissible operating hours as set out in *Condition 3(3)* of SSD_4978 were adhered to throughout the reporting period. Extended hours for major supply contracts were not required during the reporting period.

4.5 TRANSPORT LEVELS

SSD_4978 specifies that haulage activities at Tinda Creek Quarry should not exceed 34 trucks per day, averaged over a calendar month. A total of 3 284 laden loads were despatched from the Quarry during the reporting period. A summary of the vehicle movements at Tinda Creek Quarry is provided from the Hy-Tec website and are summarised in **Table 4.2**. There were no recorded exceedances of average daily vehicle movements (based on a calendar month averaging period) within the reporting period.

Table 4.2
Monthly Laden Truck Movements at Tinda Creek Quarry

Month	Laden Truck Loads	Mean Daily Laden Truck Loads ¹
January	293	10
February	333	12
March	101	4
April	207	7
May	505	17
June	354	12
July	413	14
August	461	15
September	111	4
October	88	4
November	213	8
December	205	7
Annual Total	3 284	-
Annual Daily Average	9	-
Annual Maximum	27	-
Note 1: Daily despatch averaged over the calendar month is presented, consistent with the requirements of Condition 7 of Schedule 2 of SSD 4978.		
Source: Hy-Tec		

4.6 CONSTRUCTION ACTIVITIES

No construction activities were conducted during the reporting period.

4.7 WASTE MANAGEMENT

Waste management practices continued in accordance with the provisions of the *Protection of the Environment Operations (Waste) Regulation 2014* throughout the reporting period. Hy-Tec has engaged licensed waste contractors to recycle and dispose of waste throughout the reporting period. A review of waste management practices was undertaken during the reporting period.

4.8 NEXT REPORTING PERIOD

Sand extraction and processing from Domain 6 will continue throughout the 2019 reporting period with extraction unlikely to proceed into Domains 1, 2, 3 or 7.

Processing activities will continue, consistent with historic processing activities. Average daily laden truck levels will remain within approved limits.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Feedback on the *2017 Annual Review* was provided on 2 July 2018 which confirmed that the report generally satisfied the requirements of SSD_4978.

The feedback requested that future Annual Reviews include a comparison of the monitoring results and complaint records against the relevant predictions in the EIS.

This information is presented throughout Sections 6 and 7.

6. ENVIRONMENTAL PERFORMANCE

6.1 METEOROLOGICAL MONITORING

Hy-Tec installed a meteorological station in July 2016 in accordance with the requirements of *Condition 3(10)* of SSD_4978. The meteorological station complies with the requirements in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* guideline. The location of the meteorological station is shown on **Figure 3**.

6.1.1 Rainfall

A summary of the rainfall data for the reporting period is provided in **Table 6.1**. A total of 340.8mm of rain was recorded from 1 January 2018 to 31 December 2018. Total rainfall during 2018 was significantly lower than each of the preceding 10 years, however, rainfall varied between individual months. It is noted that rainfall in 2018 was approximately 43% of the average annual rainfall from previous recorded years (790mm) demonstrating that 2018 was one of the driest years in recent times.

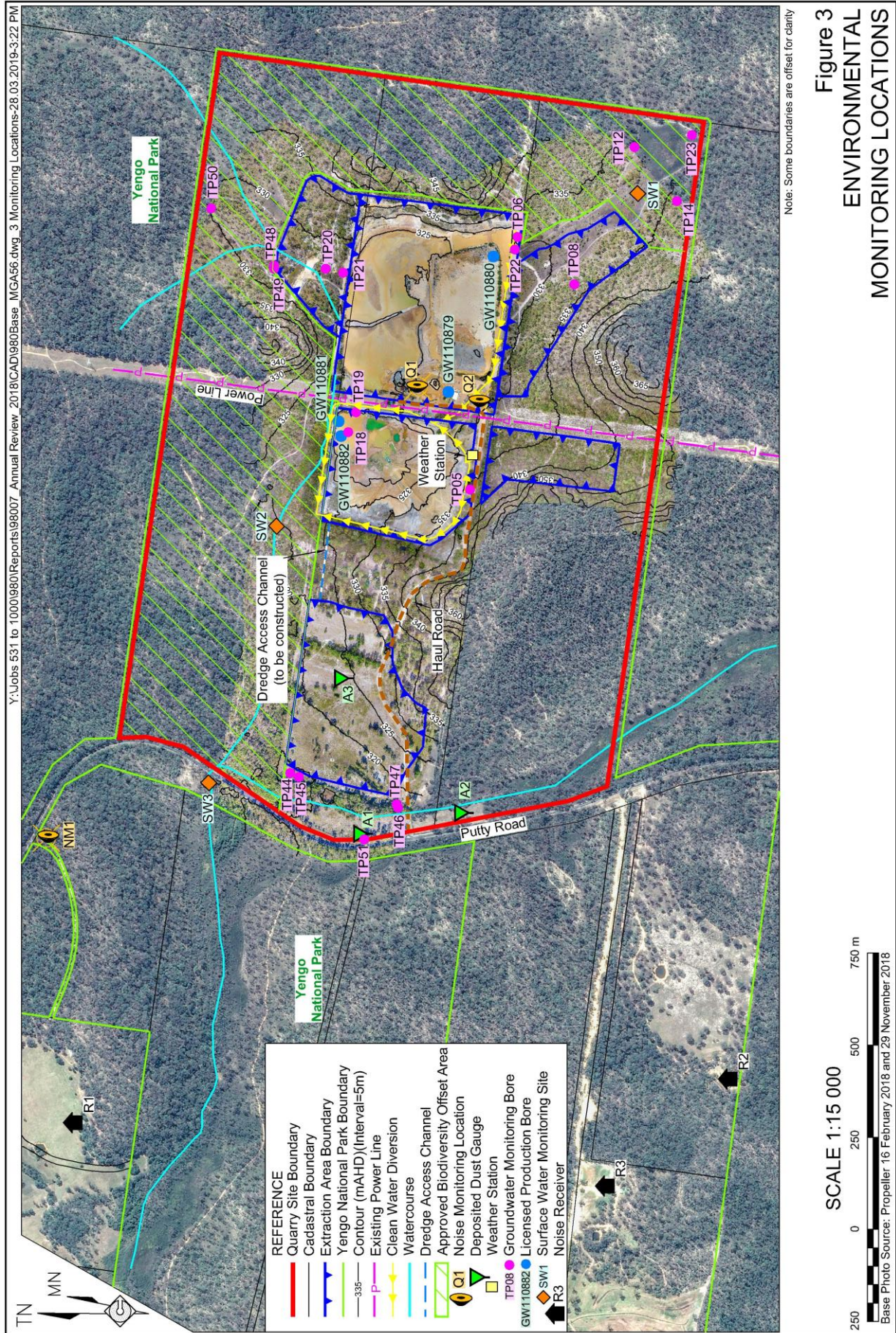


Figure 3
ENVIRONMENTAL
MONITORING LOCATIONS

Table 6.1
Summary of Rainfall Records Since 2007

Month	Year											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
January	50.5	95.5	29.0	48.5	66.5	133.0	138.0	8.0	163.0	272.0	36.2*	25.6
February	152.0	146.5	137.5	119.5	47.0	179.0	202.0	64.0	46.5	0.0	34.2*	58.4
March	80.5	43.0	30.0	85.5	97.0	145.0	103.0	135.2	96.5	0.0	208.0	64.4
April	61.5	81.5	117.0	26.0	60.0	64.0	63.5	60.5	285.5	0.0	22.4^	13.4
May	29.0	10.5	56.5	59.5	96.0	-	31.0	0.0	56.5	0.0	16.6	6.2
June	210.0	94.0	39.5	43.0	85.5	29.0	84.5	29.0	20.5	126.0	54.0	33.0
July	13.0	24.5	17.5	38.5	25.5	27.0	18.5	13.0	34.0	55.0	2.6	5.0
August	107.0	40.5	4.0	13.5	90.0	4.0	11.0	74.5	26.5	36.5	11.6	10.0
September	18.5	58.5	21.0	18.0	69.0	27.5	31.5	29.0	26.5	45.5	0.0	20.0
October	22.0	93.5	85.5	85.0	65.5	17.5	26.5	48.0	34.0	40.4	61.6	88.8
November	157.5	75.0	31.5	127.5	159.0	70.5	106.5	16.5	141.0	72.2	35.8	13.2
December	76.0	71.0	103.5	120.5	72.5	18.5	27.0	150	116.0	69.0	65.0	2.8
Totals (mm)	977.5	834.0	672.5	785.0	933.5	715.0	843.0	627.7	1046.5	716.6	548.0	340.8

* Estimated from Putty Tea RMS as Quarry weather station out of service.
^ Data downloaded between 31/3/2017 – 9/4/2017 due to weather station fault

6.2 AIR QUALITY

6.2.1 Introduction

Air quality monitoring is required to be undertaken in accordance with the approved *Air Quality Management Plan*.

6.2.2 Air Quality Criteria

The air quality criteria for the Quarry are provided in *Condition 3(7)* of SSD_4978 and are summarised in **Table 6.2**. Deposited dust is currently the only air quality parameter that is required to be monitored as specified in the approved *Air Quality Management Plan*. The level of monitoring is considered appropriate as all extraction and processing is essentially a ‘wet’ process and generates limited dust. Deposited dust levels are used as an indicator of the overall air quality performance of operations.

Table 6.2
Air Quality Criteria

Pollutant	Criterion	Averaging Period
Total suspended particulates (TSP)	90µg/m ³	Annual mean
Particulate matter <10µm (PM ₁₀) <10µm (PM ₁₀)	30µg/m ³	Annual mean
Particulate matter <10µm (PM ₁₀)	50µg/m ³	24-hour average
Deposited dust	4 g/m ² /month*	Annual mean

* or 2g/m²/month above the annual background level

6.2.3 Air Quality Monitoring Results

Monthly deposited dust monitoring was undertaken throughout the reporting period. The location of dust monitoring gauges DG1, DG2 and DG3 are shown on **Figure 3**. **Table 6.3** presents the results of the deposited dust monitoring program over the reporting period.

Table 6.3
Measured Performance – Deposited Dust

Date	Deposited Dust Level ¹			Criterion
	DG1	DG2	DG3	
January	1.9	2.2	2.3	-
February	4.7	4.6	4.2	-
March	4.5	2.0	6.2	-
April	8.7	7.7	2.6	-
May	1.6	14.2	3.7	-
June	2.0	2.6	6.4	-
July	1.8	1.1	12.6	-
August	3.7	3.1	5.8	-
September	7.0	4.4	Nil	-
October	12.0	4.3	3.1	-
November	14.7	2.2	7.6	-
December	10.6	4.4	5.7	-
Annual Average	6.1	4.4	5.5	4.0
Note 1: Units – g/m ² /month Red text indicates elevated results				
Note 2: All results are considered contaminated by insects and other organic matter				

6.2.4 Analysis of Results

Deposited dust levels were generally above the trigger value at each dust gauge throughout the reporting period and increased compared to 2017 deposited dust levels (**Figure 4**). As a result of the high records, the annual average level is higher than the criteria level for the reporting period.

It is noted that observations made by ALS during monthly deposited dust monitoring recorded consistently high levels of insects, organic matter and bird droppings in samples. **Appendix 3** presents a summary of analysis observations for the reporting period. Representative dust samples collected in March and April were also sent for further analysis at a laboratory operated by UQ Materials Performance. Samples were examined by stereo and scanning electron microscopy in order to ascertain the composition of the materials present in the samples. High levels of polysaccharide slime and fungi, insect debris and plant debris were typical in all samples accounting for between 20% to 35% of total particle types. It is, therefore, appropriate to consider that samples showing high deposited dust levels do not accurately reflect quarry-generated dust.

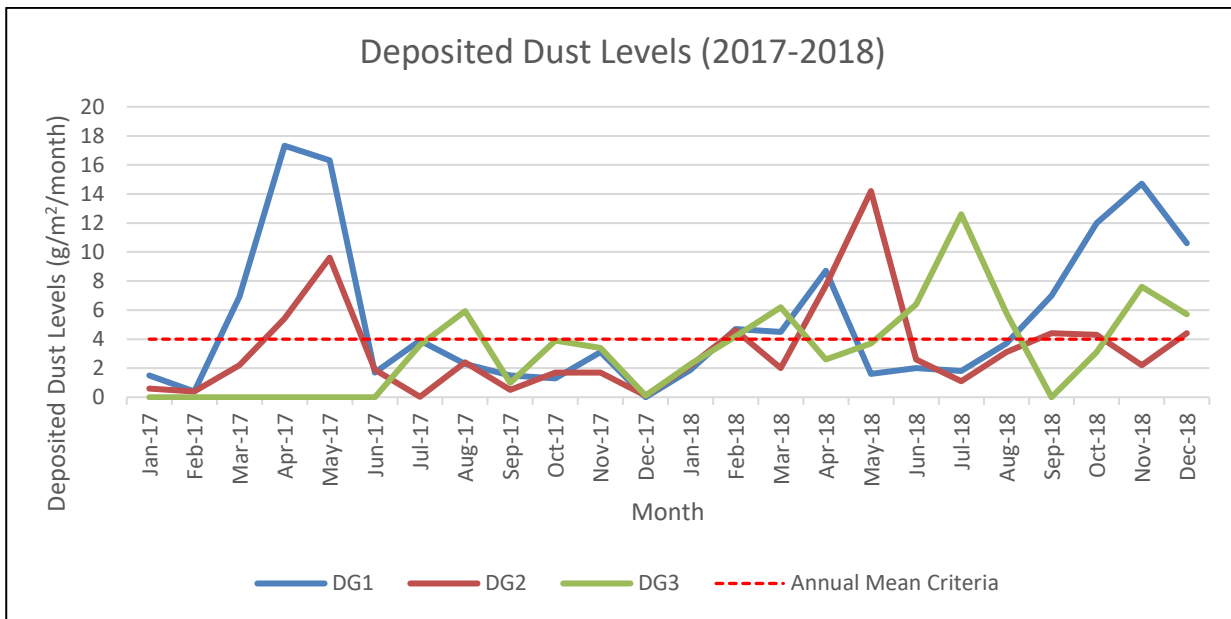


Figure 4 Deposited Dust Levels for 2017 and 2018

It is further noted that Hy-Tec installed bird deterrence collars on all dust gauges on 4 January 2019 in an effort deter birds from landing on the gauges and introducing matter into the gauge when perching on the edge. **Plate 6** displays a dust gauge with the installed bird control. It is considered that the bird controls do not influence air flow in the vicinity of the gauges and that the gauges remain consistent with the *Approved methods for the sampling as analysis of air pollutants* (DEC, 2007) The installation of the bird deterrence has resulted in a significant drop in deposited dust levels with results of <math><0.1\text{g/m}^2</math> (DG1), 1.1g/m^2 (DG2) and <math><0.01\text{g/m}^2</math> (DG3) recorded in January 2019. It is appropriate to conclude that the bird spikes have contributed to the reduction in deposited dust since their installation. As these results are more in line with expectations presented in the EIS it is considered that birds were in fact contributing to the dust recorded each month. Hy-Tec will continue to monitor the deposited dust levels during the next reporting period to confirm the ongoing effectiveness of the bird controls.

It is noted that the EIS does not include a quantitative assessment of potential air quality impacts as the operation is essentially a ‘wet’ process and significant air quality impacts were not anticipated.

6.3 OPERATIONAL NOISE

6.3.1 Introduction

Noise monitoring is required to be undertaken in accordance with the conditions listed in the development consent, EPL and approved *Noise Management Plan*. The following subsections provide a brief summary of noise criteria that apply at the Quarry, the results of noise monitoring activities and a discussion of the results recorded during the reporting period.

Following discussions with the DPE in January 2017, it was agreed that additional monitoring would be undertaken to provide an estimate of the contribution of the Quarry to noise levels at residential locations. The results of this monitoring for 2018 are presented in Section 6.3.5 and in **Appendix 4**.

6.3.2 Noise Criteria

Condition 3(4) of SSD_4978 is relevant to noise compliance assessment and sets the criteria for noise generated by the development at any residence on privately-owned land as outlined in **Table 6.4**.

Table 6.4
Noise Monitoring Criteria SSD_4978 (db(A))

Receiver	Day / Evening	Night	
	LAeq (15 min)	LAeq (15min)	LA1 (max)
All receivers	35	35	45

Condition L3 of EPL 12007 is relevant to the noise compliance assessment and stipulates the noise criteria at any monitoring point established under the EPL as outlined in **Table 6.5**.

Table 6.5
Noise Monitoring Criteria EPL 12007 (db(A))

Time Period	Measurement Parameter	Noise level dB(A)
All hours	LAeq (15 minute)	35
All receivers	Lmax OR LA1, 1min	45

6.3.3 Noise Monitoring Results

Attended noise monitoring was undertaken by Muller Acoustic Consulting Pty Ltd (MAC) on 18 April 2018 in accordance with the approved *Noise Management Plan*. A report prepared by MAC is included as **Appendix 4**.

A summary of the attended noise monitoring results at NM1 is provided in **Table 6.6**.

Table 6.6
Summary of Attended Noise Monitoring at Receiver NM1

Time (hrs)	Measure (dBA re 20µPa)			Descriptor and Noise Contribution (dBA)
	L _{Amax}	L _{Aeq}	L _{A90}	
Morning Shoulder (5:43am)	65	45	24	Traffic 38-65 Birds 26-28 Quarry 18-21
Morning Shoulder (5:58am)	63	44	25	Traffic 34-63 Quarry 20-22 Wildlife 40-46 Birds 31-54
Morning Shoulder (6:13am)	63	42	25	Traffic 32-63 Quarry 19-21 Wildlife 32-46 Birds 25-40
Morning Shoulder (6:29am)	65	46	21	Traffic 33-65 Quarry 19-22 Birds 25-30
Day (9:57am)	66	47	24	Birds 27-32 Quarry 20-22 Traffic 35-66 Aircraft 33-38
Day (10:13am)	63	45	26	Traffic 50-64 Birds 32-54 Leaves 29-34 Aircraft 34-38 Quarry 18-20
Day (10:28am)	62	45	24	Traffic 55-62 Aircraft 36-47 Quarry 22-24
Day (10:44am)	64	44	23	Traffic 50-64 Birds 36-38 Aircraft 32-34 Quarry 20-24

6.3.4 Attended Noise Measurement Compliance Assessment

The compliance assessment summary for R1 is presented in **Table 6.7** for day and morning shoulder assessment periods and compares operational contributions against the relevant criteria.

Table 6.7
Day and Morning Shoulder Noise Compliance Assessment at R1

Period	Quarry Noise Contribution L_{Aeq}(15min)	Quarry Noise Criteria L_{Aeq}(15min)	Compliant
Day	20	35	Yes
Morning Shoulder	20	35	Yes

The overall contribution of the Quarry to ambient noise was found to be approximately 20dB(A) at the time of the monitoring which is well within the limits set by both SSD_4978 and EPL 12007. These results indicate that the Quarry is complying with all relevant noise assessment criteria.

The results of the noise monitoring program are also comparable with historic noise monitoring data from Tinda Creek Quarry. Attended noise monitoring conducted in 2016 and 2017 estimated Quarry noise contribution to be less than 25dB(A) and 20db(A) respectively. This indicates that current noise mitigation measures are effective in restricting noise to an acceptable level.

6.3.5 Quarry Noise Predictions at Residences

On 20 January 2017, DPE requested that Hy-Tec undertake additional noise monitoring to record existing noise levels (sound power levels) that were being produced at the Quarry and undertake an assessment to predict the noise impact of the Quarry at nearby privately-owned residences.

Sound power levels were measured at locations Q1 and Q2 on 18 April 2018 (see **Figure 3**) with the results of this assessment presented in **Appendix 4**. In summary, it was concluded that Quarry noise at the relevant residences was likely to vary between 21dB(A) and 22dB(A), which is consistent with previous monitoring results that estimated the Quarry contribution to total noise at no more than 22dB(A) and well below the criteria nominated in SSD 4978. It is noted that the noise levels are also well below the predicted noise levels modelled during the preparation of the EIS which ranged from <30db(A) to 35db(A) at the nearest receivers.

6.4 ABORIGINAL HERITAGE

No actions or impacts related to Aboriginal heritage occurred during the reporting period.

6.5 NON-ABORIGINAL HERITAGE

No actions or impacts related to non-Aboriginal heritage occurred during the reporting period.

7. WATER MANAGEMENT

7.1 GROUNDWATER

7.1.1 Groundwater Quality Monitoring

Groundwater quality monitoring was conducted by Hy-Tec generally in accordance with the approved *Water Management Plan*. Groundwater quality monitoring was undertaken at six-month intervals over the reporting period at the locations shown on **Figure 3**. The groundwater quality assessment trigger values recorded in the approved *Water Management Plan* are presented in **Table 7.1**.

Table 7.1
Groundwater Quality Trigger Criteria

Analyte	Historic Minimum Monitored Value	Historic Maximum Monitored Value	Lower Trigger Value	Upper Trigger Value
pH	4.5	6.7	<4.5	>7.0
Conductivity (µS/cm)	45.0	1320.0	N/A	900.0
Nitrate (mg/L)	<0.1	9.3	N/A	7.5
Ammonia (mg/L)	<0.1	0.4	N/A	0.2
TPH (C6-C9) (µg/L)	<10.0	<50.0	N/A	25.0
TPH (C10-C14) (µg/L)	<50.0	<50.0	N/A	25.0
TPH (C15-C28) (µg/L)	<100.0	650.0	N/A	100.0
TPH (C29-C36) (µg/L)	<50.0	320.0	N/A	100.0

The results of the groundwater quality monitoring data are outlined in **Tables 7.2** and **7.3**.

Table 7.2
Water Monitoring Results – 26 July 2018

Bore Hole	pH	EC (µS/cm)	Nitrate (mg/L)	Ammonia (mg/L)
TP05	5.1	85	<0.10	0.02
TP06	5.7	80	<0.10	0.05
TP08	5.2	60	<0.10	0.04
TP12	5.2	50	0.18	0.06
TP14	5.4	85	<0.10	<0.10
TP20	5.3	80	1.90	0.04
TP21	5.3	60	4.90	0.04
TP23	5.1	50	0.89	0.05
TP44	5.5	200	0.09	<0.10
TP45	5.7	230	0.13	0.01
TP46	5.7	100	5.50	0.01
TP47	5.7	110	12.00	0.03
TP48	6.2	280	0.49	0.02
TP49	5.3	260	0.35	0.01
TP50	5.1	380	0.14	<0.10
TP51	6.3	100	0.31	0.02

Table 7.3
Water Monitoring Results – 27 November 2018

Bore Hole	pH	EC (μ S/cm)	Nitrate (mg/L)	Ammonia (mg/L)
TP05	5.3	90	<0.10	<0.1
TP06	5.9	110	<0.10	<0.1
TP08	5.4	100	<0.10	<0.1
TP12	5.4	60	<0.10	<0.1
TP14	5.4	80	<0.10	<0.1
TP20	5.4	75	0.80	<0.1
TP21	5.6	60	10.00	<0.1
TP23	5.3	50	1.20	<0.1
TP44	5.5	200	<0.10	<0.1
TP45	5.6	230	0.18	<0.1
TP46	5.6	130	16.00	2.2
TP47	5.0	130	25.00	1.8
TP48	6.2	240	<0.10	<0.1
TP49	5.3	250	0.27	<0.1
TP50	5.2	410	<0.10	<0.1
TP51	6.0	95	0.35	<0.1

7.1.2 Analysis of Groundwater Quality Results

General observations from the groundwater quality monitoring data are as follows.

- Bore TP 47 returned elevated nitrate results in the sample collected on 26 July 2018 and both bores TP46 and TP47 returned samples with elevated nitrate and ammonia on 27 November 2019. These bores are located on the western boundary of the Quarry and are approximately 750m from the closest point of disturbance. As only three records are available from these bores, monitoring will continue to record background data for review once operations commence in Domain 1. It is possible that the elevated nitrate is a result of past agricultural practices (fertiliser application) and elevated ammonia the result of decaying plant matter.
- The slightly acidic pH is consistent with historic data and likely to represent the breakdown of plant material.
- It is highly unlikely that quarrying activities are impacting groundwater quality.
- pH, conductivity, nitrate and ammonia results are consistent with groundwater monitoring data obtained during previous monitoring campaigns. No distinct temporal trends are evident within the measured parameters.

The EIS noted that the groundwater tended to be slightly acidic due to the generation of organic acid from the breakdown of plant material (min pH = 4.6, max pH = 6.7). The EIS further noted that conductivity was generally very low (min $\mu\text{S}/\text{cm}$ = 45, max $\mu\text{S}/\text{cm}$ = 1 320). The groundwater quality results are generally consistent with those presented in the EIS and it is unlikely that extractive operations are impacting on the quality of the groundwater.

It is noted that bores TP18 and TP19 have been removed as a part of the development of Domain 6. Additional monitoring bores TP44, 45, 46, 47, 48, 49, 50 and 51 were installed in 2017 generally in accordance with the approved *Water Management Plan* recommendations. Samples were not taken at bore TP22 due to damage to the standpipe. It is considered that bore TP06 provides a suitable substitute for bore TP22 due to the close proximity of these bores.

7.1.3 Groundwater Level Monitoring

Groundwater levels at the monitoring bores were monitored monthly in accordance with the approved *Water Management Plan*. Groundwater levels in the monitoring bores are used to assess the impacts of Quarry operations on the surrounding aquifers. This analysis involves assessing the risk of Quarry operations impacting on the Greater Blue Mountains Heritage Area. No significant impacts were anticipated to groundwater flow as a result of quarrying activities.

Section 5.3 of the approved *Water Management Plan* identifies the locations and performance criteria to be used in assessing the impacts of Quarry operations on groundwater levels. **Table 7.4** summarises these criteria.

Table 7.4
Groundwater Investigation Trigger Levels

Bore Hole	Depth to Water (mbgs)
TP22	5.85
TP06	7.33
TP12	7.73
TP23	7.63
TP14	9.81
TP08	7.45
TP05	8.55
TP18	4.62
TP19	5.43
TP20	6.95
TP21	7.22

Groundwater level monitoring has been undertaken at 11 groundwater bores since October 2010 (bores TP05, TP06, TP08, TP12, TP14, TP18, TP19, TP20, TP21, TP22, TP23). In March 2018, monitoring also commenced at a further five bores located to the west of the Quarry (TP44, TP45, TP46, TP47, and TP51) and three bores in the vicinity of Domain 3 (TP49, TP48 and TP50). The locations of the monitoring bores are shown on **Figure 3**.

The results of the 2018 groundwater levels monitoring are outlined in **Table 7.5**. Monitoring results are displayed for both the original monitoring bores and the newly constructed bores.

Table 7.5
Results of 2018 Groundwater Levels Monitoring Program

Bore Hole	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Depth to water (mbgs)											
TP22	1.94	1.91	1.82	1.97	2.20	2.37	2.39	2.51	2.61	2.26	2.38	2.10
TP06	3.32	3.59	3.46	3.58	3.76	3.92	3.95	4.07	4.17	3.95	4.01	3.79
TP12	4.16	4.77	4.62	4.87	5.07	5.67	5.47	5.37	5.57	5.57	5.67	5.62
TP23	3.99	4.17	4.29	4.40	4.52	4.72	5.07	5.17	5.57	5.37	5.27	5.42
TP14	6.44	6.75	6.74	7.04	7.14	7.24	7.24	7.44	7.49	7.54	7.14	7.59
TP08	4.75	4.96	5.10	5.01	5.28	5.41	5.76	5.62	5.96	5.76	5.76	5.66
TP05	7.29	7.50	7.8	7.90	8.10	8.18	8.40	8.45	8.70	8.75	8.60	8.65
TP20	3.32	3.58	3.52	3.62	3.88	4.03	4.04	4.21	4.23	3.97	4.04	3.59
TP21	2.80	2.82	2.72	3.01	3.26	3.47	3.43	3.58	3.65	3.24	3.35	2.85
TP47	-	-1.00	-1.04	-0.99	-0.98	-0.91	-0.56	-0.31	-0.22	-0.84	-1.01	-1.12
TP46	-	0.30	0.02	0.18	0.44	0.6	0.56	0.71	0.72	0.1	0.1	0.31
TP51	-	0.77	0.83	0.86	1.14	1.23	1.27	1.49	1.53	1.24	1.1	0.95
TP45	-	1.85	1.85	1.88	2.06	2.25	2.24	2.36	2.41	2.12	2.04	1.77
TP44	-	1.57	1.77	1.62	1.82	2.01	2.00	2.11	2.18	1.91	1.85	1.59
TP48	-	4.16	4.16	4.19	4.43	4.65	4.62	4.8	4.89	4.85	4.85	4.81
TP49	-	4.13	4.13	4.18	4.38	4.6	4.61	4.76	4.86	4.8	4.78	4.78
TP50	-	5.77	5.84	5.90	6.07	6.3	6.30	6.51	6.57	6.61	6.67	6.73

7.1.4 Analysis of Groundwater Level Results

No exceedances of the relevant groundwater trigger levels were noted during the reporting period except at TP05 which exceeded the relevant trigger level from September 2018 to December 2018. **Figure 5** displays hydrographs for site bores with monthly rainfall which clearly shows that groundwater levels respond quickly to recharge.

Figure 5 also clearly displays the effects of the weather experienced throughout 2018 with groundwater levels falling consistently throughout the reporting period in response to atypically dry conditions.

Groundwater Investigation - Bore TP05

Monitoring bore TP5 is located to the south of the Domain 6 and recorded a decline in groundwater level of 1.7 m in the period from October 2017 to October 2018. This decline in water level exceeded the trigger set in the approved *Water Management Plan*.

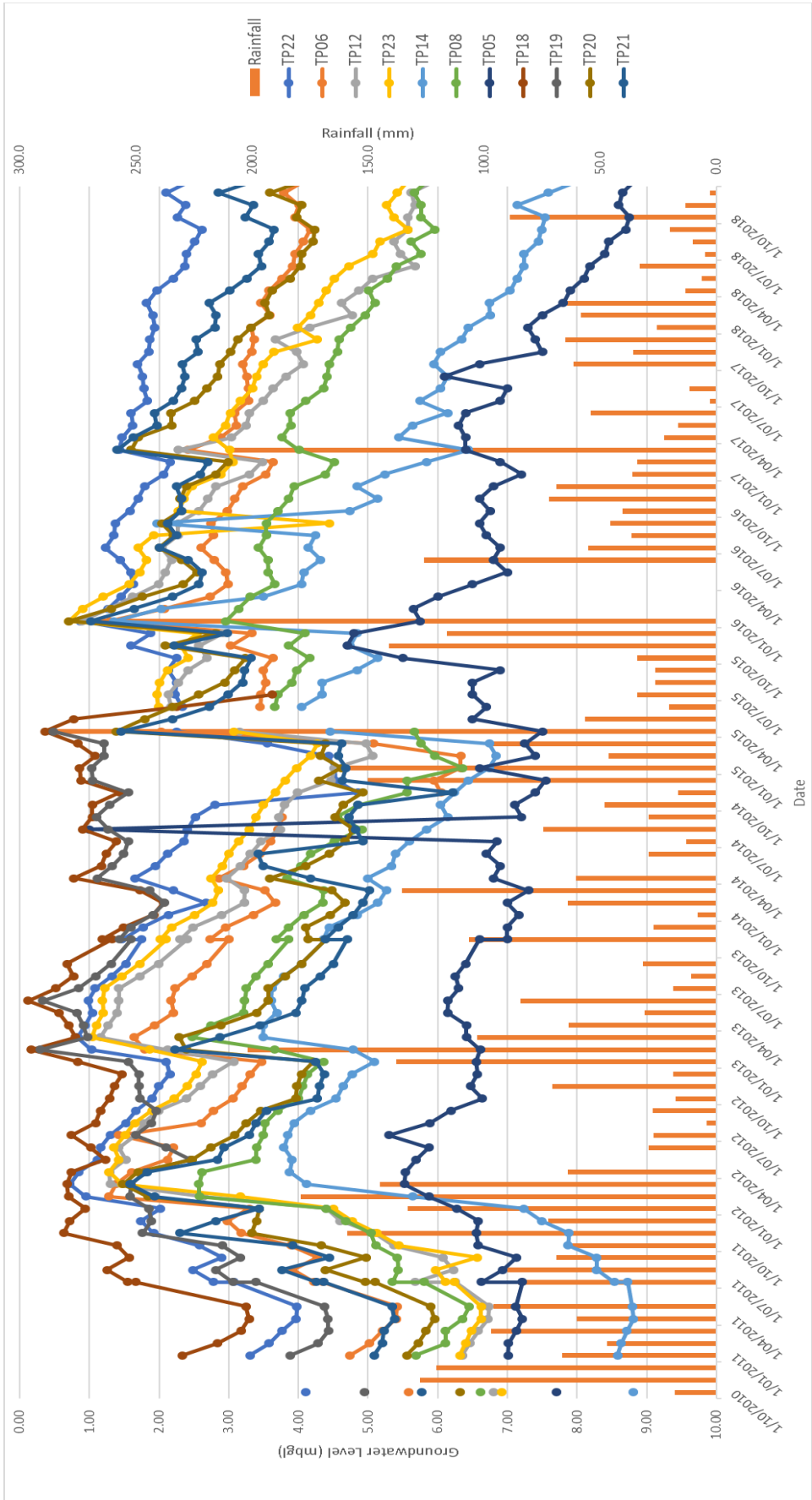


Figure 5 Hydrography for Site Bore with Monthly Rainfall

A groundwater investigation was undertaken by Ms Katarina David in December 2018 to understand the driver for the change in groundwater level at TP05. This report was submitted to DPE on 7 December 2018 and is included in full as **Appendix 5**. It is noted that Hy-Tec has not yet received any formal correspondence from DPE regarding this investigation.

The groundwater investigation noted that the observed change in groundwater levels across the site during 2018 coincided with a prolonged absence of rain. The investigation concluded that the decline in groundwater levels at TP05 was mostly attributable to a reduction in rainfall. This conclusion was based on comparison with historical data and other bores located upgradient or downgradient and not considered to be influenced by site activities. It was determined that the variables that could not be explained by the model were likely due to Quarry operations, primarily due to the proximity of TP05 to the extraction area. These variables included temporary changes in drainage patterns, soil consolidation and/or temporary disturbance of groundwater levels during the extraction of sand. The variables were considered to be within the natural seasonal variation and were determined to only contribute to minor groundwater level changes.

7.1.5 Groundwater Usage

Hy-Tec have the capacity to extract 55 million litres (ML) of water per year under its water access licences and water supply works approvals (see Section 3 and Table 4). Following a successful application for additional 60ML of water allocation, it is expected that this allocation will commence upon issuance of the appropriate documentation. extracted from the surrounding aquifers was primarily used to fill the dredge pond and for use in dust suppression during extended dry periods.

The approved *Water Management Plan* requires that the quantity of water obtained from production bores is monitored on a monthly basis. **Table 7.6** presents a summary of the groundwater usage from January 2018 until December 2018.

Table 7.6
Groundwater Usage – Meter Reading and Monthly Usage

Date	Meter Reading (KL)	Usage (ML)
January	8636	2.6
February	11152	2.5
March	12358	1.2
April	13676	1.3
May	15582	1.9
June	17060	1.5
July	20146	3.1
August	25615	5.5
September	31219	5.6
October	31303	0.1
November	31304	0.0
December	31307	0.0
Total	-	25.3

A total of 25.302ML of groundwater was utilised over the reporting period which represents an increase of 23.893ML compared to 2017. This increase can be attributed to the dry conditions experienced in 2018 and the subsequent need to extract an increased quantity of water for use in the dredging pond and for dust suppression. WAL 24367 permits extraction of 15ML of water per annum (based on a water year (July to June)). It is noted that between July 2016 to June 2017 5.4ML of water was used and from July 2017 to June 2018 11.1ML of water was used. Water use therefore remains within licensed levels. During the last six months of the reporting period (July 2018 to Dec 2018) 14.2ML of water was used.

7.2 SURFACE WATER

7.2.1 Introduction

The Tinda Creek Quarry is situated near the top of the Tinda Creek catchment. Tinda Creek itself typically experiences intermittent, short duration flows immediately following heavy rainfall events. Previous monitoring, conducted in 2008 and 2015, indicates that quarrying activities have not impacted negatively on the Tinda Creek system and the downstream portions of the creek remain consistent with other creek systems in the vicinity of the Quarry.

The Quarry utilises a closed water management system in order to minimise any potential impacts on downstream water quality, flow regimes and habitats. This system has been successfully implemented for the past 30 years and involves a number of pump lines and catch drains.

Clean water diversion drains have been constructed within the Quarry Site in order to prevent clean runoff entering the operations area (refer **Plate 4**). The diversion drain system shown on **Figure 3** comprises the following components.

- Southern Diversion
- Southern Diversion Extension
- Existing Diversion.

Clean water diversion for operations in Domain 6 were constructed in 2017. No further changes were required in 2018.

During the reporting period the closed water management system covered an area of 33.5ha and remained within the limit of 40ha at any one time, as described in *Condition 3(12)* of SSD 4978.

7.2.2 Surface Water Monitoring

Surface water monitoring was conducted generally in accordance with the approved *Water Management Plan* over the reporting period. A summary of the required surface water monitoring is provided in **Table 7.7**.

Table 7.7
Surface Water Monitoring Regime

Monitoring Type	Location	Parameters Monitored	Frequency of Monitoring	Monitoring Method
Dredge Pond Level	Dredge Pond	Level (depth below ground)	Monthly (first 3 years)	Observation or dip
Surface Water Quality	Upstream and downstream of Quarry	pH, EC, turbidity	Monthly if water is present in creek and after more than 50mm of rain in 24 hours	Grab Sample
Drainage Lines and Diversion Drains	Upstream and downstream of quarry	Stability, erosion, and sediment build up	Monthly and event based	Observation and photography
Closed Water Management System	Quarry	Stability, erosion, and sediment build up	Monthly and event based	Observation and photograph

7.2.3 Dredge Pond Water Levels

The *Water Management Plan* requires that dredge pond water levels are assessed on a monthly basis over the first three years of operation. The depth to water in any operating dredge pond from the adjoining ground surface is to remain less than 10m to avoid triggering further investigations. Documented monthly monitoring of dredge pond levels was undertaken by Hy-Tec from January to December 2018. Water levels were recorded as between 7mbgs and 8mbgs during each survey and no further investigations were required.

7.2.4 Surface Water Quality

Insufficient water was available to sample upstream and downstream of the Quarry due to the exceptionally dry conditions experienced throughout the reporting period.

7.2.5 Drainage Lines, Diversion Drains and Water Management System

Hy-Tec have implemented a range of measures to ensure sediment movement within the Quarry (in clean water diversion drains) is limited. These measures include the following.

- Construction and maintenance of spoon drains.
- Lining of drains with geofabric and rock armouring.
- Installation of a gabion mattress at the end of drain in the vicinity of Domain 6 to capture sediment and slow the flow of water.
- Installation of rows of hay bales and silt fencing.
- Re-seeding of the drain to establish a suitable ground cover.

Condition M2.1 of the EPL 12007 requires that the licensee undertake monthly inspections of the surface water system at the premises. The monthly inspection must:

- be undertaken immediately upstream and downstream of the Quarry disturbance area;

- include visual inspection for litter, oil and grease and sediment within the surface water system, including diversion channels;
- include visual inspection of the physical integrity of the surface water system, including any signs of erosion; and
- include visual inspection of the water level/flow in Tinda Creek.

A summary of the monitoring data as required by EPL 12007 is presented in **Table 7.8**.

Table 7.8
Results of Surface Water Monitoring - 2018

Observation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Litter	No	No	No	No	No	No	No	No	No	No	No	No
Oil/Grease	No	No	No	No	No	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No	No	No	No	No	No
Erosion	No	No	No	No	No	No	No	No	Yes	No	No	Yes
Water Level/Flow	No	No	No	No	No	No	No	No	No	No	No	No

Minor erosion was noted within the clean water diversion drain during the monthly inspections undertaken in September and December 2018. The erosion was the result of minor structural faults within the diversion drains and did not result in sediment entering the Tinda Creek system. Maintenance activities within the diversion drains are undertaken as issues are identified.

Throughout the monitoring period, no water was observed in Tinda Creek. This is consistent with the intermittent flows typical of this creek system.

8. REHABILITATION AND LANDSCAPE MANAGEMENT

8.1 REHABILITATION MANAGEMENT

Rehabilitation objectives for the Quarry are described in Schedule 3, Condition 17 of SSD 4978 and reiterated in the approved *Landscape Management Plan* for the Quarry. The objectives for progressive and final rehabilitation of the Quarry include the following.

- The Quarry Site is safe, stable and non-polluting.
- Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native species and habitat, including at least 0.35ha of Mellong Sandmass Sedgeland.
- Surface infrastructure is to be decommissioned and removed (unless the Secretary agrees otherwise).
- Minimise the size, depth, batter slope and the drainage catchment of the final void.

- Ensure that the volume of VENM and ENM detailed in the EIS is imported for rehabilitation of the site.
- Ensure that the surface area of the final voids is no greater than 16ha in total.
- Ensure that final voids are separated from the surface water drainage system, unless the Secretary agrees otherwise.
- Restore alignment and hydraulic function of watercourses, as far as practical.
- Ensure public safety.

Rehabilitation works continued in the 2ha domain in the south-eastern quadrant of the Quarry Site and the north eastern corner of the historic extraction area as shown on **Figure 2**. Rehabilitation works comprised primarily backfilling the area with overburden, silt and clay material. Backfilled areas were then allowed to dry prior to being covered with topsoil, mulch and timber to create a growth medium and habitat areas (refer **Plate 5**). This activity was consistent with the methods and timing presented in the *Landscape Management Plan*.

It is noted that a significant quantity of waste material comprising building materials (i.e. two dilapidated dwellings and associated sheds), car bodies, water tanks and miscellaneous rubbish was also removed from the approved Biodiversity Offset Area on Lot 1 during the reporting period. **Plates 7 to 10** display progress photographs taken within the approved Biodiversity Offset Area from December 2017 and March 2019. One of the buildings contained asbestos that was removed by a licensed contractor (Quibicon Group Pty Ltd).

Hy-Tec considers that the potential for successful rehabilitation of the Quarry Site remains positive. During the life of the Quarry, natural regeneration following bush fire has demonstrated the natural resilience of the vegetation. **Plate 11** presents photos of the Mellong Sandmass Sedgeland immediately after fires in October 2013 and the same location in October 2014. Quarry personnel report that within a matter of months the vegetation was re-establishing and within one year there was almost no evidence of the fire.

8.2 LANDSCAPE MANAGEMENT

Landscape management was undertaken generally in accordance with the approved *Landscape Management Plan* which was prepared in accordance with *Condition 3(19)* of SSD_4978. Activities involved predominantly weed management, maintenance of clean water diversions and some vegetation maintenance.

The approved *Landscape Management Plan* includes a range of monitoring activities to be undertaken by Hy-Tec to demonstrate compliance with the objectives and performance criteria for landscape and rehabilitation management. A summary of these activities is provided in **Table 8.1**.



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Plate 7: Location 1 within the approved biodiversity offset area - December 2017
(Ref: E980A_074)



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Plate 11: View of the Mellong Sandmass Sedgeland immediately after bushfires in October 2013 (left) and one year later (right)
(Photo source: HyTec)



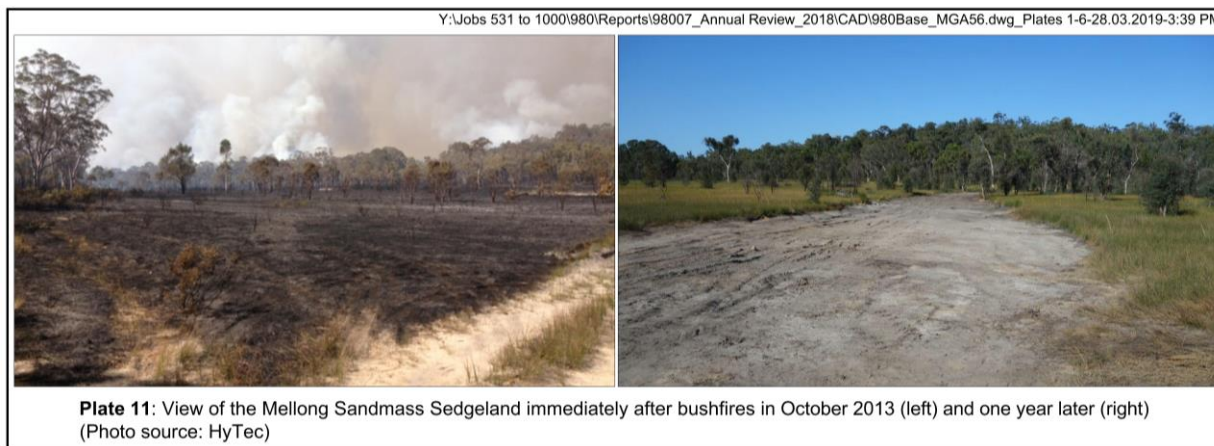
Plate 9: Location 2 within the approved biodiversity offset area - December 2017
(Ref: E980A_096)

Plate 10: Location 2 within the approved biodiversity offset area - March 2019
(Ref: E890F_101)



Table 8.1
Ecological Monitoring Requirements at Tinda Creek Quarry

Type of Monitoring	Location	Parameters Monitored	Frequency	Monitoring Method	Responsibility
Rehabilitation	Rehabilitation Areas	Inspections of drainage lines, water management systems and rehabilitation areas	Monthly	Visual Inspection	Quarry Manager
Long-term rehabilitation	Rehabilitation Areas	Soil conditions, erosion, environmental controls	Six Monthly	Field Survey	Quarry Manager
Habitat Assessment	Biodiversity Offset Areas	Erosion, general health of vegetation, floristic structure and diversity, occurrence of weeds, signs of disturbance by stock or humans, evidence of feral animal, evidence of fire, seedling recruitment, characteristic of ground cover, nectar and fruit resources, water resources, fauna usage	Annually unless otherwise agreed	Field Survey	Quarry Manager
Koala	Biodiversity Offset Areas	Targeted Spot Assessment Technique, Call playback surveys, Spotlight surveys	Annually unless otherwise agreed	Field Survey	Quarry Manager
Aquatic Monitoring	Drainage lines upstream and downstream of site.	Stream width and edge habitat, stream features including substrate, vegetation and organic material, site observation including catchment description and local land use practises, and riparian characteristics	Annually	Field Survey and Photography	Quarry Manager
Nest Boxes	Biodiversity Offset Areas	Condition assessment	Annually for first 5 years	Field inspection and LED camera.	Quarry Manager
Threatened Fauna Species Monitoring		Koala, eastern pygmy possum, squirrel glider, forest owls, threatened micro-bat species, diurnal reptiles/amphibians, introduced species	After first 5 years of operation	Diurnal bird area searches, diurnal reptile/amphibian area searches, nocturnal call playback surveys, remote camera surveys, nocturnal Anabat surveys	Quarry Manager
<i>Grevillea parviflora</i>	Biodiversity Offset Areas	Surveys during known flowering period (July to December), stem counts in permanent plots, photo monitoring, habitat quality	Annually for first 5 years	Field Survey	Quarry Manager



8.2.1 Rehabilitation Monitoring

Visual inspections of the areas under active rehabilitation were undertaken monthly during the reporting period (rather than six-monthly) and cross-over with requirements for monitoring of erosion and sediment controls and surface water quality in accordance with the *Water Management Plan*. A summary of the outcomes of monitoring during the reporting period is provided in **Table 8.2**. Visual inspections of the Quarry Site were supplemented by monitoring undertaken by Niche in December 2018 (Niche, 2019a) with the outcomes of this monitoring presented in **Appendix 6**.

Table 8.2
Rehabilitation Inspections

Rehabilitation Monitoring Aspect	Comment
<p>Monitoring is to include:</p> <ul style="list-style-type: none"> • soil conditions and erosion (i.e. stability); • drainage and sediment control structures; • runoff water quality; • germination rates; • plant health; • natural regeneration; and • weed infestation. 	<p>Visual inspections were undertaken monthly by the Quarry Manager with photographic evidence of drain conditions and stability recorded. Only minor structural issues were identified in clean water diversion structures during the reporting period. Nonetheless, it is considered that existing erosion and sediment controls were functioning appropriately (see Plate 4 and Section 7.2.5).</p> <p>There was insufficient water in the clean water diversions to permit water quality testing.</p> <p>Drainage structures are stabilised with vegetation, with some of the monitored areas amongst sedge vegetation containing original vegetation.</p> <p>Weeds identified during site inspections were sprayed and removed or manually removed.</p>

8.2.2 Long-Term Rehabilitation Monitoring

The first campaign of long-term rehabilitation monitoring was undertaken by Niche in December 2018 (Niche, 2019a). The outcomes of this monitoring are described in detail in the monitoring report presented as **Appendix 6** of this report. **Table 8.3** presents an overview of key monitoring aspects and outcomes.

Table 8.3
Long-Term Rehabilitation Monitoring

Rehabilitation Monitoring Aspect	Comment
<p>Monitoring is to:</p> <ul style="list-style-type: none"> • compare results against rehabilitation objectives and targets • identify possible trends and continuous improvement • link to records of rehabilitation to determine causes and explain results • assess effectiveness of environmental controls implemented • where required, identify modifications required for the monitoring program, rehabilitation practices or areas requiring research • compare flora species present against original seed mix and/or analogue sites • assess vegetation health • assess vegetation structure (e.g. upper, mid and lower storey) • the presence and abundance of any weed species • assessment of natural regeneration/recruitment of new species • where applicable, assess native fauna species diversity and the effectiveness of habitat creation for target fauna species. 	<p>The majority of the rehabilitation objectives do not yet apply, however progressive rehabilitation and management of the rehabilitating landscape remains consistent with these objectives (described in Section 8.1).</p> <p>The site is stable, safe and non-polluting and those areas that are undergoing rehabilitation have started to demonstrate features of the Mellong Sandmass woodland communities.</p> <p>Niche has confirmed that the rehabilitation activities are having positive outcomes and should be continued. The monitoring undertaken by Niche indicates that the rehabilitating areas contained high diversity that is aligned closest to the Mellong Sandmass Swamp Woodland community. There were weeds present in the rehabilitating areas, however these are subject to regular weed control activities (manual removal and spraying, as needed).</p> <p>Rehabilitation controls principally involve weed management and restrictions to access, which have been successful in promoting native vegetation establishment.</p> <p>Vegetation health, structure and baseline flora records have been established in monitoring. Comparison with records of field surveys for the EIS presentation indicate that species assemblages remain consistent with historic records.</p> <p>Native fauna surveys have identified a range of native fauna using the Biodiversity Offset Area and habitat features within the site.</p>

8.2.3 Biodiversity Offset Area Monitoring

Monitoring within the Biodiversity Offset Area was undertaken by Niche in December 2018 in accordance with the *Landscape Management Plan*. A total of 17 monitoring plots were established for monitoring with locations presented in **Figure 6**. The monitoring demonstrates that there are very little obvious impacts from quarrying activities identified in the Biodiversity Offset Area. **Table 8.4** presents the monitoring aspects and general conclusions of the monitoring campaign. A more detailed review of the monitoring outcomes and the data collected from monitoring plots is provided in **Appendix 6**.

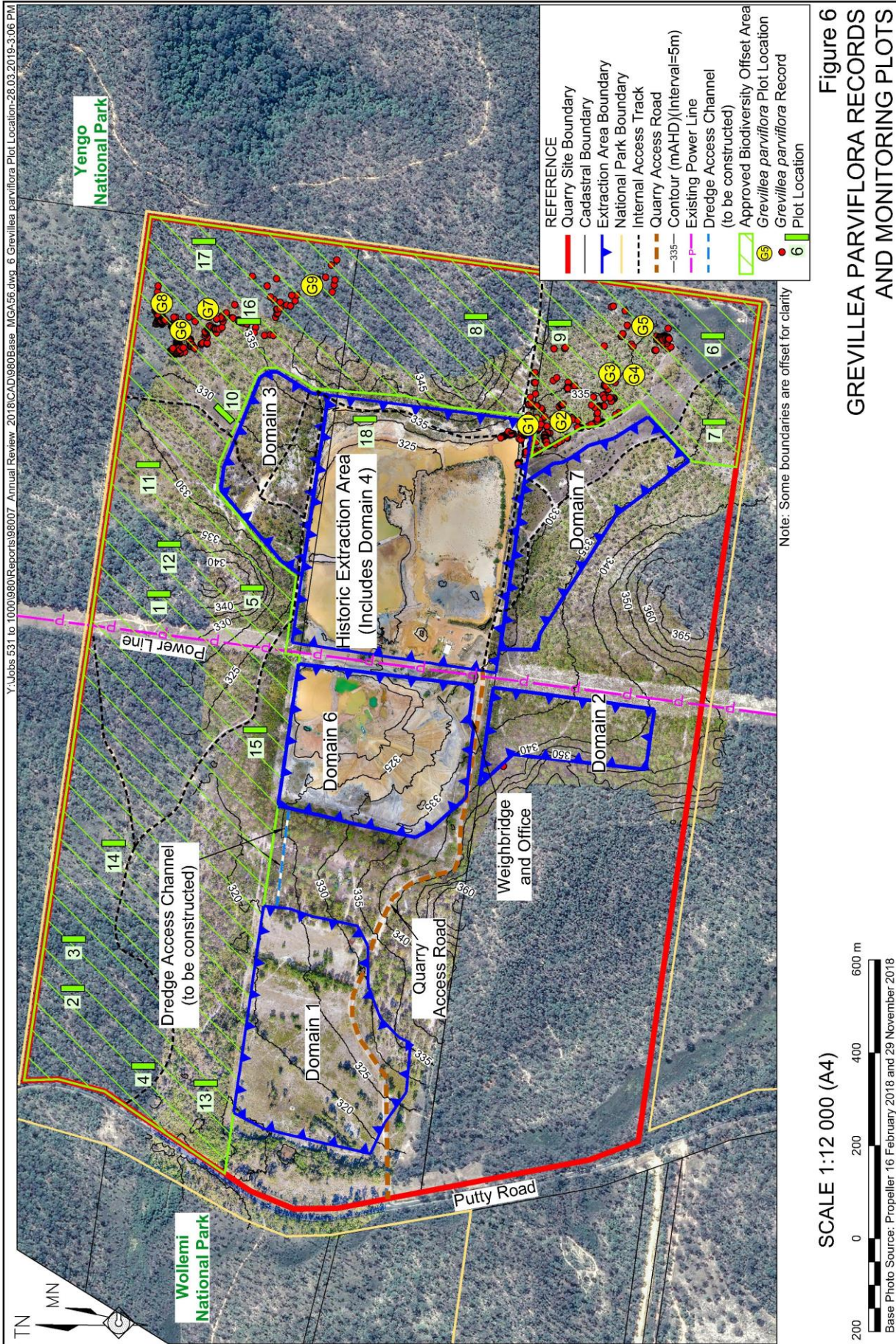


Table 8.4
Biodiversity Offset Area Monitoring

Biodiversity Offset Area Monitoring Aspect	Comment
<p>Monitoring is to include:</p> <ul style="list-style-type: none"> • general vegetation health • evidence of natural seedling recruitment • occurrence and abundance of weed species • structure and floristics of vegetation cover • signs of disturbance (by stock, people or feral animals) • nature and extent of erosion • evidence of fire • characteristic of ground cover (e.g. leaf litter, rocks, logs and soil) • nectar or fruit resources and perch sites • water resources • secondary evidence of fauna use such as scats, tree scratches or diggings. 	<p>Monitoring has indicated that flora species within the Biodiversity Offset Area are broadly comparable to those found in the earlier surveys. Much of the vegetation is in good condition with only minor weed presence on the edges of vegetation zones.</p> <p>The monitoring campaign reviewed the composition, structure, function, general trends and signs of disturbance within the Biodiversity Offset Area. This included overstorey vegetation. While the presence of some weed and feral animal species has been identified, there are only limited signs of disturbance in the Biodiversity Offset Area consistent with past human habitation.</p> <p>Some vegetation management activities (slashing) have inadvertently entered the Biodiversity Offset Area in the vicinity of Domain 7. These activities will remain within the active Quarry areas in future and Niche have confirmed that vegetation in these areas are likely to quickly recover.</p> <p>There is no obvious evidence of erosion in the Biodiversity Offset Area and water resources were consistent with the dry conditions evident within the Quarry.</p> <p>There were no bush fires in the vicinity of the Quarry during the reporting period and no evidence of fire identified within the Biodiversity Offset Area.</p>

8.2.4 Koala Monitoring

Niche also undertook Koala population monitoring surveys in December 2018 (Niche, 2019a) at each of the permanent remnant vegetation monitoring points in areas of potential koala habitat. These surveys were undertaken using a modified Spot Assessment Technique (SAT) methodology and were complemented by call playback and spotlighting surveys.

No Koala were identified during the surveys, however potential Koala scats were identified on or immediately adjacent to two of the permanent monitoring plots. The results were confounded by the presence of Common Brushtail Possum scats.

Niche concluded that Koalas are still using the property, however, in low numbers as is typical of Hawkesbury sandstone geology.

The approved *Landscape Management Plan* for the Quarry contains a Koala Plan of Management (Appendix 1 of the plan) that specifies performance criteria for Koala management. These include the following:

- No koalas will be harmed as a result of any tree-clearing practices that take place as a result of this Project.
- Potential quarry-induced impacts will not result in the alteration to the floristics, structure or condition of non-cleared areas of potential koala habitat.

No vegetation clearing was required during the reporting period and Quarry personnel have reported no incidents involving Koala vehicle strikes. There is no evidence that there are Quarry-related impacts occurring to Koala habitat.

8.2.5 Aquatic Monitoring

In September 2018, Niche (2019b) established an aquatic monitoring program to monitor the river health of Tinda Creek and its tributaries and to assess any potential impacts from Quarry development. A report detailing the methods, outcomes and conclusions of the aquatic monitoring program is provided as **Appendix 7**. The monitoring program is consistent with the previous monitoring and presented as Appendix 2 of the *Landscape Management Plan* (Umwelt, 2016).

The monitoring program in 2018 included the following.

- Assessment of stream condition using Riparian and Channel and Environment inventory assessment (RCE).
- Assessment of habitat condition using AUSRIVAS proforma.
- Assessment of water quality against default ANZECC trigger values.
- Assessment of the macroinvertebrate community condition using Stream Invertebrate Grade Number Average Level (SIGNAL).

Niche (2019b) compared the results of the monitoring to the monitoring undertaken in 2015 and identified that predominantly dry conditions meant that sites were much dryer resulting in less aquatic habitat, poorer water quality and fewer sites able to be sampled.

The monitored sites were in moderate to good health although the majority of sites within the Quarry were dry. Downstream of the Tinda Creek Quarry the aquatic environments were found to have a good riparian condition and channel morphology. Water quality (where it could be sampled) was consistent with intermittent/ephemeral nature of water flows. The macroinvertebrate community had low AUSRIVAS and SIGNAL scores indicative of poor stream health, however this is the result of the streams having limited water and aquatic habitat and hence influenced by natural stressors associated with intermittent/ephemeral streams.

Niche (2019b) concluded that the Quarry was not impacting the health of streams but that predominantly dry conditions were influencing the aquatic environment and key indicators such as macroinvertebrate presence, water quality and riparian vegetation.

8.2.6 Nest Box Monitoring

No nesting boxes have been installed at the Quarry and therefore no monitoring has been required to date.

8.2.7 Threatened Fauna Species Monitoring

Threatened fauna monitoring was undertaken by Niche in December 2018, predominantly focused on the Biodiversity Offset Area (Niche, 2019a). The outcomes of these surveys are presented in **Appendix 6**.

A range of native fauna was identified during the surveys. Species recorded during the surveys that have not previously been recorded include the following.

- Emu (*Dromaius novaehollandiae*).
- Red-crowned Broodfrog (*Pseudophryne australis*).
- Grey-headed Flying-fox (*Pteropus poliocephalus*).
- Little Lorikeet (*Glossopsitta pusilla*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)

The Red-crowned Broodfrog and the Grey-headed Flying Fox were the only identified threatened fauna.

There is no indication of Quarry impact to threatened fauna presence within the Biodiversity Offset Area.

8.2.8 *Grevillea parviflora* Monitoring

Monitoring of the condition and persistence of the small flower *Grevillea parviflora* subsp. *parviflora* was undertaken in March and September 2018 and is considered to provide an indication of the condition of this species for the reporting period. Reports prepared by Niche Environment and Heritage (Niche, 2018a & 2018b) describing the location and condition of monitored plots is provided as **Appendix 8**. A series of nine 10m x 10m plots were established within the approved Biodiversity Offset Area to facilitate annual stem counts of the species. The locations of these plots can be seen on **Figure 6**. The goal of this monitoring program is to assess the ongoing viability and health of the species and to ensure the habitat is maintained or improved over the life of the operations. The monitoring results of the March and September stem counts are included in **Table 8.5**.

Table 8.5
Ecological Monitoring Requirements at Tinda Creek Quarry

Plot Number	Stem Count		Notes
	March	September	
G1	18	18	Significant numbers to south of plot
G2	51	48	More to the south
G3	33	30	Heath reverting to forest
G4	47	41	Larger shrubs dominate plot
G5	20	20	Spread evenly spread around plot
G6	16	13	Sedge heath
G7	11	21	Dense <i>Angophora bakeri</i> regeneration
G8	14	14	Mostly very small
G9	2	3	Diverse floristic and structural heath

Source: After Niche (2018a) – Table 2

Monitoring results to date show abundant *Grevillea parviflora* in the vicinity of the Quarry. This clearly shows that operations have not had a deleterious impact on the health of the species and demonstrates the high ecological value of the Biodiversity Offset Area. Monitoring during September 2018 noted the lack of flowering plants, which is considered to be indicative of the prevailing dry conditions. As this species may be difficult to identify if not flowering, some plants may have been missed and therefore under-reported during this monitoring campaign.

Conclusion

On the whole, Hy-Tec has continued to operate the Tinda Creek Quarry with minimal evident impact to the surrounding landscape within the Quarry Site, the Biodiversity Offset Area and in aquatic environments downstream of the Quarry. Rehabilitation activities have started to demonstrate preliminary signs of vegetation community establishment consistent with the Mellong Sandmass Swamp Woodland. This indicates that rehabilitation methods have been successful.

9. COMMUNITY

9.1 COMMUNITY COMPLAINTS

No community complaints were received in regard to the Tinda Creek Quarry during the reporting period.

Complaints will continue to be logged within the complaints register and investigated fully when they are received. The complaints register will continue to be kept in the weighbridge office and updated on the Hy-Tec website on a monthly basis.

9.2 COMMUNITY LIAISON

The Tinda Creek Quarry Community Consultative Committee (CCC) met twice within the reporting period. Meetings were held on 14 May 2018 and 15 October 2018. Minutes of the meetings are provided in **Appendix 9**.

There were no issues raised during the CCC meetings that were considered to be complaints or required investigation by Hy-Tec.

Given the remote location of the Quarry, no further community engagement activities occurred within the reporting period.

10. INCIDENTS AND NON COMPLIANCES DURING THE REPORTING PERIOD

10.1 INTRODUCTION

The following subsections outline incidents and non-compliances that occurred during the reporting period. An internal review of compliance with the conditions of SSD 4978 was undertaken by Hy-Tec and RWC and is included as **Appendix 1**. The operation remained generally compliant with development conditions throughout the reporting period with the exception of the non-compliances listed below.

10.2 INCIDENTS

There were no incidents that threatened or caused material environmental harm and required notification to DPE or the EPA during the reporting period.

10.3 NON-COMPLIANT CONDITIONS (SSD 4978)

Schedule 3, Condition 7

Deposited dust monitoring results were generally above the trigger value at each dust gauge throughout the reporting period (see Section 6.2). As a result of the high monthly records, the annual average level exceeded the criteria level for the reporting period. As noted in Section 6.2, the Quarry is primarily a “wet” operation and it is unlikely that elevated deposited dust levels were attributable to Quarry operations.

In response to elevated samples, Hy-Tec sent representative samples collected in March and April to a laboratory operated by UQ Materials Performance for further analysis. Samples were examined by stereo and scanning electron microscopy in order to ascertain the composition of the materials present and identified high levels of polysaccharide slime and fungi, insect debris and plant debris were typical in all samples accounting for between 20% to 35% of total particle types. It is, therefore, appropriate to consider that samples showing high deposited dust levels do not accurately reflect quarry-generated dust. **Appendix 3** presents the records of field conditions identified when samples were collected and demonstrate the presence of contaminants.

Hy-Tec has since installed bird deterrence collars on all dust gauges in an effort to deter birds from landing on the gauges and introducing matter into the gauge when perching on the edge.

10.4 ENVIRONMENT PROTECTION LICENCE

Operations generally complied with the conditions of EPL 12007 during the reporting period.

10.5 WATER ACCESS LICENCES

Water extraction and management complied with the conditions of WAL 24367 and WAL 24381 during the reporting period.

10.6 VOLUNTARY UNDERTAKING

During a site inspection and audit by officers of DPE on 6 June 2017, it was identified that equipment and other materials historically stored within the southeast corner of the Quarry Site constituted a breach of *Condition 3(30)* of SSD_4978 in relation to waste management at the Quarry. The material was subsequently removed by Hy-Tec and the Company entered into a voluntary undertaking with the DPE regarding revegetation in this area. The requirements of the voluntary undertaking were completed in September 2018.

Table 10.1 presents a summary of the commitments made under the voluntary undertaking and an update on the progress in addressing the requirements. **Appendix 10** provides a series of photographs taken within the area taken between September 2017 and March 2019 which clearly demonstrates the progress of revegetation within the area. It is noted that access to the area is restricted for all vehicles.

Table 10.1
Voluntary Undertaking Progress

Page 1 of 2

Undertaking	Comment
1. Promote appropriate vegetation growth in the affected area by using the natural seed bank within the soil to regenerate the vegetation	The provided photos (Appendix 10) demonstrate that natural regeneration of vegetation is occurring successfully. Vegetation establishment has been limited by dry conditions. Where practicable, Hy-Tec will undertake a campaign of surface ripping in Autumn/Winter 2019 to mulch surface litter and improve the condition of the topsoil and water holding capacity along historical access tracks.
2. If growth of the appropriate vegetation has not occurred by October 2018, promptly implement the Seed Collection and Propagation method outlined in Section 3.1.5 in the approved <i>Landscape Management Plan</i> (LMP) dated May 2017.	Vegetation growth to date indicates that this will not be required.
3. Control unauthorised access to the affected area, in accordance with Section 3.2.1 of the approved LMP.	Access to the area is restricted through the infrastructure area of the Quarry and the boundary of Yengo National Park. Access by Quarry personnel is limited.
4. Provide reports updating the Department of any vegetation growth in the affected area in March 2018, June 2018 and September 2018.	Completed

Table 10.1 (Cont'd)
Voluntary Undertaking Progress

Page 2 of 2

Undertaking	Comment
5. Undertake appropriate monitoring of any <i>Grevillea parviflora</i> that was in the vicinity of the affected area, in accordance with Section 7.2.5 of the LMP, and include the results of this monitoring when available in the reports mentioned under 4. Above.	Nine permanent monitoring plots have been established within the Quarry Site and offset area. An ecological survey by Niche Environment and Heritage (dated 11 September 2018) confirmed that quarrying activities have not negatively impacted growth of the <i>Grevillea parviflora</i> in the vicinity of the Quarry Site.
6. A copy of this undertaking, signed and dated, should be sent to the nominee of the Secretary by close of business 8 December 2017.	Completed
7. This undertaking comes into effect on the date it is signed, unless otherwise agreed in writing by the Secretary.	Noted

Recent rainfall at the Quarry (October 2018 and January 2019) has provided sufficient moisture to encourage plant growth and establishment of saplings. The nearby access road has not re-vegetated due to the compacted surface. During the next reporting period Hy-Tec will, where practicable, lightly rip this area to encourage similar growth on the former access road. A final review of the area is planned for Spring 2019 during which time the need for direct seeding to enhance vegetation establishment will be considered.

11. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The following operational activities are planned throughout the 2019 reporting period.

- Extraction will continue within Domain 6.
- The production forecast for 2019 is to extract, process and transport approximately 150 000t of sand product.
- Ongoing monitoring and maintenance of erosion and sediment controls and diversion drains.
- Continuation of progressive rehabilitation as practicable. This will primarily continue within south-eastern rehabilitation area.
- Continuation of water management and dust control measures.
- Continue to monitor deposited dust and confirm the success of bird control measures through review of results against historic trends.
- Waste will continue to be collected by licensed contractors and volumes and dates recorded.
- Continuation of LiDAR Survey or other aerial imagery capture of the Quarry Site.
- Continued implementation of all requirements and conditions prescribed under Development Consent SSD_4978, EPL 12007 and approved management plans.

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Appendices

(Total No. of pages including blank pages = 206)

- Appendix 1 Internal Compliance Audit (SSD_4978) –
1 January 2018 to 31 December 2018 (28 pages)
- Appendix 2 Return for Extractive Industries – June 2018 (4 pages)
- Appendix 3 Deposited Dust Field Records (4 pages)
- Appendix 4 Noise Monitoring Report (24 pages)
- Appendix 5 Groundwater Investigation Report (20 pages)
- Appendix 6 Offset Vegetation, Revegetation and Koala
Monitoring Report – 2018 (32 pages)
- Appendix 7 Aquatic Monitoring Report – Spring 2018 (32 pages)
- Appendix 8 *Grevillea Parviflora* subsp. *Parviflora* Monitoring
at Tinda Creek Offset Area – March 2018 and
September 2018 (32 pages)
- Appendix 9 Minutes of Tinda Creek Quarry Community
Consultative Committee Meetings (8 pages)
- Appendix 10 Photographs from within the Voluntary
Undertaking Area (20 pages)



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Appendix 1

Internal Compliance Audit (SSD_4978) – 1 January 2018 to 31 December 2018

(Total No. of pages including blank pages = 28)



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Table A1
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

Page 1 of 14

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 2: ADMINISTRATION CONDITIONS				
Obligation to Minimise Harm to the Environment				
1.	In addition to meeting the specific performance criteria established under this consent, the Applicant shall implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation, or rehabilitation of the development.	Y	All management measures were implemented successfully and there was no identified material harm to the environment during the reporting period.	O
TERMS OF CONSENT				
2.	The Applicant shall carry out the development generally in accordance with the: (a) EIS; (b) Statement of Commitments; and (c) conditions of this consent.	N	A single non-compliance issue was identified during the reporting period as detailed in this table.	O/D
3.	If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this consent shall prevail to the extent of any inconsistency.	Noted		
4.	The Applicant shall comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of: (a) any strategies, plans, programs, reviews, audits, reports or correspondence that are submitted in accordance with this consent; (b) any reports, reviews or audits commissioned by the Department regarding compliance with this consent; or (c) the implementation of any actions or measures contained in these documents.	Y	No requests were received from DPE during the reporting period (see Section 10 of the Annual Review 2018 for more details).	D
LIMITS ON CONSENT				
Extraction Operations				
5.	The Applicant may undertake extraction operations on the site until 31 December 2045.	Noted		
Production Limits				
6.	The Applicant shall not: (a) extract or process more than 300,000 tonnes of sand in any calendar year; or (b) undertake extraction operations beyond 15 m below the natural ground surface.	Y	Approximately 114,269 tonnes of sand were extracted and processed and depth restrictions were not exceeded during the reporting period.	D
Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance * = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit Yes# / No# = Complied / not complied with and compliance no longer required to be assessed				

Table A1 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

Page 2 of 14

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 2: ADMINISTRATION CONDITIONS (Cont'd)				
Transportation Limits				
7.	The Applicant shall not: (a) transport more than 300,000 tonnes of sand from the site in a calendar year; and (b) dispatch more than 34 trucks per day or receive more than 34 trucks per day, averaged over a calendar month.	Y	Product despatch was limited to 116 865 tonnes and truck level limits were not exceeded during the reporting period.	D
SURRENDER OF EXISTING DEVELOPMENT CONSENT				
8.	Within 6 months of the date of this consent, unless the Secretary agrees otherwise, the Applicant shall surrender the development consent (DA 0134/95) for the existing operations on the site in accordance with Section 104A of the EP&A Act. Prior to the surrender of development consent DA 0134/95, the conditions of this consent shall prevail to the extent of any inconsistency with the conditions of that consent.	Y	DA 1034/95 was surrendered on 10 December 2015.	D
STRUCTURAL ADEQUACY				
9.	The Applicant shall ensure that any new buildings and structures, and any alterations, or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.	Noted	No new buildings and structures were constructed during the reporting period.	O
DEMOLITION				
10.	The Applicant shall ensure that all demolition work on site is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version.	Noted	No demolition occurred during the reporting period.	O
PROTECTION OF PUBLIC INFRASTRUCTURE				
11.	The Applicant shall: (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development. <i>Note: This condition does not apply to any damage to roads caused as a result of general road usage.</i>	Noted	There was no damage or necessary relocation of public infrastructure during the reporting period.	O
OPERATION OF PLANT AND EQUIPMENT				
12.	The Applicant shall ensure that all plant and equipment used on site is: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Y	All equipment was maintained and operated in an acceptable manner during the reporting period.	D
Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance * = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit Yes# / No# = Complied / not complied with and compliance no longer required to be assessed				

Table A1 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

Page 3 of 14

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 2: ADMINISTRATION CONDITIONS (Cont'd)				
UPDATING & STAGING STRATEGIES, PLANS OR PROGRAMS				
13.	With the approval of the Secretary, the Applicant may submit any strategies, plans or programs required by this consent on a progressive basis. To ensure the strategies, plans or programs under the conditions of this consent are updated on a regular basis, the Applicant may at any time submit revised strategies, plans or programs to the Secretary for approval. With the agreement of the Secretary, the Applicant may prepare any revised strategy, plan or program without undertaking consultation with all parties under the applicable condition of this consent.	Noted	Not required during the reporting period.	D
14.	Until they are replaced by an equivalent strategy, plan or program approved under this consent, the Applicant shall implement the existing strategies, plans or programs for the site that have been approved under DA 0134/95.	Noted	All management strategies, plans and programs have been updated except the Water Management Plan.	D
PRODUCTION DATA				
15.	The Applicant shall: (a) provide annual quarry production data to DRE using the standard form for that purpose; and (b) include a copy of this data in the Annual Review (see condition 4 of schedule 5).	Y	See Appendix 9 .	
DEVELOPER CONTRIBUTIONS				
16.	The Applicant shall pay Council road maintenance contributions consistent with Council's Section 94 Contributions Plan, or its latest version.	Y	Road maintenance contributions are paid monthly.	D
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS				
IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION				
1.	Prior to undertaking extraction operations under this consent, the Applicant shall: (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the site; and (b) submit a survey plan of these boundaries with applicable GPS coordinates to the Secretary.	Y	All relevant boundaries have been surveyed and marked to comply with this condition.	
2.	While extraction operations are being carried out, the Applicant shall ensure that these boundaries are clearly marked at all times.	Noted	All boundaries were clearly marked during the reporting period.	
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*											
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)															
HOURS OF OPERATION															
3.	<p>The Applicant shall comply with the operating hours set out in Table 1.</p> <p>Table 1: Operation Hours</p> <table border="1"> <thead> <tr> <th>Activity</th> <th>Operating Hours</th> </tr> </thead> <tbody> <tr> <td>Extraction operations and deliveries</td> <td>7 am to 6 pm, Monday to Friday 7 am to 3 pm, Saturday No activities on Sundays or Public Holidays</td> </tr> <tr> <td>Dispatch</td> <td>5 am to 10 pm, Monday to Friday 6 am to 3 pm, Saturday</td> </tr> <tr> <td>Construction activities</td> <td>7 am to 6 pm, Monday to Friday 8 am to 1 pm, Saturday No construction to be undertaken on Sundays or Public Holidays</td> </tr> <tr> <td>Maintenance activities</td> <td>24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence</td> </tr> </tbody> </table>	Activity	Operating Hours	Extraction operations and deliveries	7 am to 6 pm, Monday to Friday 7 am to 3 pm, Saturday No activities on Sundays or Public Holidays	Dispatch	5 am to 10 pm, Monday to Friday 6 am to 3 pm, Saturday	Construction activities	7 am to 6 pm, Monday to Friday 8 am to 1 pm, Saturday No construction to be undertaken on Sundays or Public Holidays	Maintenance activities	24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence	Y	Hy-Tec complied with all approved operating hours during the reporting period.	D	
Activity	Operating Hours														
Extraction operations and deliveries	7 am to 6 pm, Monday to Friday 7 am to 3 pm, Saturday No activities on Sundays or Public Holidays														
Dispatch	5 am to 10 pm, Monday to Friday 6 am to 3 pm, Saturday														
Construction activities	7 am to 6 pm, Monday to Friday 8 am to 1 pm, Saturday No construction to be undertaken on Sundays or Public Holidays														
Maintenance activities	24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence														
NOISE															
Noise Criteria															
4.	<p>The Applicant shall ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land.</p> <p>Table 2: Noise criteria dB(A)</p> <table border="1"> <thead> <tr> <th rowspan="2">Receiver</th> <th>Day/Evening</th> <th colspan="2">Night</th> </tr> <tr> <th>L_{Aeq}(15 min)</th> <th>L_{Aeq}(15 min)</th> <th>L_{A1}(max)</th> </tr> </thead> <tbody> <tr> <td>All receivers</td> <td>35</td> <td>35</td> <td>45</td> </tr> </tbody> </table>	Receiver	Day/Evening	Night		L _{Aeq} (15 min)	L _{Aeq} (15 min)	L _{A1} (max)	All receivers	35	35	45	Y	Noise monitoring undertaken during the reporting period demonstrates that Hy-Tec complied with this criteria. There were no noise complaints during the reporting period.	D
Receiver	Day/Evening		Night												
	L _{Aeq} (15 min)	L _{Aeq} (15 min)	L _{A1} (max)												
All receivers	35	35	45												
Operating Conditions															
5.	<p>The Applicant shall:</p> <p>(a) implement all reasonable and feasible mitigation measures to minimise the construction, operational and road noise of the development;</p> <p>(b) regularly assess noise monitoring data and relocate, modify and/or stop operations on site to ensure compliance with the noise criteria in this consent;</p> <p>(c) minimise the noise impacts of the development during meteorological conditions under which the noise criteria in this consent do not apply (see Appendix 6); and</p> <p>(d) carry out regular noise monitoring to determine whether the development is complying with the relevant conditions of this consent,</p> <p>to the satisfaction of the Secretary.</p>	Y	See previous response. Hy-Tec has not been required to modify operations due to noise-related concerns during the reporting period.												
<p>Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined</p> <p>NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance</p> <p>* = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit</p> <p>Yes# / No# = Complied / not complied with and compliance no longer required to be assessed</p>															

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*																							
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)																											
NOISE (Cont'd)																											
Noise Management Plan																											
6.	The Applicant shall prepare and implement a Noise Management Plan for the development to the satisfaction of the Secretary.	Y	A Noise Management Plan has been approved by the Secretary and is implemented at the Quarry. The Noise Management Plan is available from the Hy-Tec website.																								
AIR QUALITY																											
Air Quality Criteria																											
7.	The Applicant shall implement all reasonable and feasible avoidance and mitigation measures so that particulate matter emissions generated by the development do not exceed the criteria in Tables 3 to 5 at any residence on privately-owned land. Table 3: Long-Term Criteria for Particulate Matter <table border="1" data-bbox="327 974 1013 1120"> <thead> <tr> <th>Pollutant</th> <th>Averaging period</th> <th>^d Criterion</th> </tr> </thead> <tbody> <tr> <td>Total suspended particulates (TSP)</td> <td>Annual</td> <td>^a 90 µg/m³</td> </tr> <tr> <td>Particulate matter < 10µm (PM₁₀)</td> <td>Annual</td> <td>^a 30 µg/m³</td> </tr> </tbody> </table> Table 4: Short-Term Criteria for Particulate Matter <table border="1" data-bbox="327 1142 1013 1232"> <thead> <tr> <th>Pollutant</th> <th>Averaging period</th> <th>^d Criterion</th> </tr> </thead> <tbody> <tr> <td>Particulate matter < 10µm (PM₁₀)</td> <td>24 hour</td> <td>^a 50 µg/m³</td> </tr> </tbody> </table> Table 5: Long-Term Criteria for Deposited Dust <table border="1" data-bbox="327 1265 1013 1411"> <thead> <tr> <th>Pollutant</th> <th>Averaging period</th> <th>Maximum increase in deposited dust level</th> <th>Maximum total deposited dust level</th> </tr> </thead> <tbody> <tr> <td>^c Deposited dust</td> <td>Annual</td> <td>^b 2g/m²/month</td> <td>^a 4g/m²/month</td> </tr> </tbody> </table>	Pollutant	Averaging period	^d Criterion	Total suspended particulates (TSP)	Annual	^a 90 µg/m ³	Particulate matter < 10µm (PM ₁₀)	Annual	^a 30 µg/m ³	Pollutant	Averaging period	^d Criterion	Particulate matter < 10µm (PM ₁₀)	24 hour	^a 50 µg/m ³	Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level	^c Deposited dust	Annual	^b 2g/m ² /month	^a 4g/m ² /month	N	Dust monitoring undertaken during the reporting period indicates that the operation complied with the criteria in this condition. Although elevated deposited dust monitoring results were recorded, additional analysis of these results indicated that the elevated results were influenced by insects and other organic matter. In addition, the introduction of bird deterrence on deposited dust gauges in January 2019 has reduced deposited dust levels significantly. This indicates that elevated deposited dust levels are not attributable to Quarry operations.	D
Pollutant	Averaging period	^d Criterion																									
Total suspended particulates (TSP)	Annual	^a 90 µg/m ³																									
Particulate matter < 10µm (PM ₁₀)	Annual	^a 30 µg/m ³																									
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^c Deposited dust	Annual	^b 2g/m ² /month	^a 4g/m ² /month																								
Operating Conditions																											
8.	The Applicant shall: (a) implement all reasonable and feasible measures to minimise the dust emissions of the development; (b) minimise surface disturbance of the site; and (c) monitor and report on compliance with the relevant air quality criteria in this consent; to the satisfaction of the Secretary.	Y	Dust impacts were effectively managed during the reporting period.	D																							
Air Quality Management Plan																											
9.	The Applicant shall prepare and implement an Air Quality Management Plan for the development to the satisfaction of the Secretary.	Y	An Air Quality Management Plan has been approved by the Secretary and is implemented at the Quarry. The Air Quality Management Plan is available from the Hy-Tec website																								
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
METEOROLOGICAL MONITORING				
10.	For the life of the development, the Applicant shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline.	Partial	A meteorological station was installed in July 2016.	D
SOIL AND WATER				
Water Supply				
11.	The Applicant shall ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of operations under the consent to match its available water supply to the satisfaction of the Secretary.	Noted	Water use during the reporting period was within the licence limits for extraction. It was not necessary to modify operations due to water availability restrictions.	D
Operating Conditions				
12.	The Applicant shall: (a) comply with Section 120 of the POEO Act, unless an EPL authorises otherwise; (b) ensure that the catchment of the water management system is not larger than 40 ha, unless the Secretary agrees otherwise; (c) maintain the dredge and silt ponds to capture a 1 in 100 ARI storm event plus adequate freeboard to ensure no offsite discharge; and (d) ensure that the loss of groundwater and surface water to Tinda Creek is no greater than predicted in the EIS.	Y	Hy-Tec contends that his conditions was satisfied during the reporting period. The total catchment area was calculated to be 32ha and therefore less than the approved extent.	D
Water Management Plan				
13.	The Applicant shall prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary. This plan must:	Y	Hy-Tec submitted an updated Water Management Plan to DPE on 29 January 2019 and is currently waiting for approval. The existing approved Water Management Plan has been implemented during the reporting period in accordance with Condition 14 of Schedule 2.	
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*						
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)										
HERITAGE										
Heritage Management Plan										
14.	The Applicant shall prepare and implement a Heritage Management Plan for the development to the satisfaction of the Secretary.	Y	A Heritage Management Plan has been approved by the Secretary and is implemented at the Quarry. The Heritage Management Plan is available from the Hy-Tec website							
LANDSCAPE AND REHABILITATION										
Biodiversity Offset Strategy										
15.	The Applicant shall implement the biodiversity offset strategy described in the EIS, as summarised and revised in Table 6, and shown conceptually in Appendix 5, to the satisfaction of the Secretary. Table 6: Biodiversity Offset Strategy (ha)	NYA	Hy-Tec has been in discussions with NPWS and DPE regularly regarding the actions necessary to implement the biodiversity offset strategy.							
	<table border="1"> <thead> <tr> <th>Area</th> <th>Offset Type</th> <th>Minimum Size (ha)</th> </tr> </thead> <tbody> <tr> <td>On-site Offset Area</td> <td>Existing vegetation to be enhanced</td> <td>106.6</td> </tr> </tbody> </table>	Area	Offset Type	Minimum Size (ha)	On-site Offset Area	Existing vegetation to be enhanced	106.6			
Area	Offset Type	Minimum Size (ha)								
On-site Offset Area	Existing vegetation to be enhanced	106.6								
Security of Offsets										
16.	Within 2 years of this consent, unless otherwise agreed with the Secretary, the Applicant shall make suitable arrangements to provide appropriate long-term security for the offset area, to the satisfaction of the Secretary.	NYA	Hy-Tec is currently planning to secure the offset area under an 88B Instrument under the Conveyancing Act 1919.							
Rehabilitation Objectives										
17.	The Applicant shall rehabilitate the site to the satisfaction of the Secretary. The final landform must: (a) be generally consistent with the proposed rehabilitation strategy in the EIS, and the final landform shown conceptually in Appendices 4 and 5. and	Y	Progressive rehabilitation is consistent with the EIS. The final landform is yet to be developed.	O						
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*											
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)															
17. (Cont'd)	(b) comply with the objectives in Table 7. Table 7: Rehabilitation Objectives	Y	Operations and progressive rehabilitation complied with these objectives during the reporting period.	O											
	<table border="1"> <thead> <tr> <th>Feature</th> <th>Objective</th> </tr> </thead> <tbody> <tr> <td>Site (as a whole)</td> <td> <ul style="list-style-type: none"> Safe, stable and non-polluting Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native species and habitat, including at least 0.35 ha of Mellong Sandmass Sedgeland </td> </tr> <tr> <td>Surface Infrastructure</td> <td> <ul style="list-style-type: none"> To be decommissioned and removed (unless the Secretary agrees otherwise) </td> </tr> <tr> <td>Final Voids</td> <td> <ul style="list-style-type: none"> Minimise the size, depth, batter slope and the drainage catchment of the final void Ensure that the volume of VENM and ENM detailed in the EIS is imported for rehabilitation of the site Ensure that the surface area of the final voids is no greater than 16 ha in total Separated from the surface water drainage system, unless the Secretary agrees otherwise </td> </tr> <tr> <td>Watercourses</td> <td> <ul style="list-style-type: none"> Restore alignment and hydraulic function, as far as practical </td> </tr> <tr> <td>Community</td> <td> <ul style="list-style-type: none"> Ensure public safety </td> </tr> </tbody> </table>	Feature			Objective	Site (as a whole)	<ul style="list-style-type: none"> Safe, stable and non-polluting Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native species and habitat, including at least 0.35 ha of Mellong Sandmass Sedgeland 	Surface Infrastructure	<ul style="list-style-type: none"> To be decommissioned and removed (unless the Secretary agrees otherwise) 	Final Voids	<ul style="list-style-type: none"> Minimise the size, depth, batter slope and the drainage catchment of the final void Ensure that the volume of VENM and ENM detailed in the EIS is imported for rehabilitation of the site Ensure that the surface area of the final voids is no greater than 16 ha in total Separated from the surface water drainage system, unless the Secretary agrees otherwise 	Watercourses	<ul style="list-style-type: none"> Restore alignment and hydraulic function, as far as practical 	Community	<ul style="list-style-type: none"> Ensure public safety
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Watercourses	<ul style="list-style-type: none"> Restore alignment and hydraulic function, as far as practical 														
Community	<ul style="list-style-type: none"> Ensure public safety 														
Progressive Rehabilitation															
18.	The Applicant shall rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. Interim stabilisation measures must be implemented where reasonable and feasible to control erosion (both wind and water) in disturbed areas that are not active and which are not ready for final rehabilitation.	Y	Rehabilitation continued in Domain 4 during the reporting period with this landform progressively being stabilised prior to revegetation.	O											
Landscape Management Plan															
19.	The Applicant shall prepare and implement a Landscape Management Plan for the development to the satisfaction of the Secretary.	Y	<p>A Landscape Management Plan has been approved by the Secretary and is being implemented at the Quarry.</p> <p>The Landscape Management Plan is available from the Hy-Tec website</p>	D											
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
Conservation and Rehabilitation Bond				
20.	<p>Within 6 months of the approval of the Landscape Management Plan, the Applicant shall lodge a Conservation and Rehabilitation Bond with the Department to ensure that the biodiversity offset strategy and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the plan and relevant conditions of this consent. The sum of the bond shall be determined by:</p> <p>(a) calculating the cost of implementing the biodiversity offset strategy over the next 3 years;</p> <p>(b) calculating the cost of rehabilitating the site, taking into account the likely surface disturbance over the next 3 years of extraction operations; and</p> <p>(c) employing a suitably qualified quantity surveyor or other expert to verify the calculated costs,</p> <p>to the satisfaction of the Secretary.</p>	Y	A conservation and rehabilitation bond was lodged with DPE on 11 December 2017.	D
	<p>Within 3 months of each Independent Environmental Audit (see condition 9 of schedule 5), the Applicant shall review, and if necessary revise, the sum of the Conservation and Rehabilitation Bond to the satisfaction of the Secretary.</p>	NA		
TRANSPORT				
Monitoring of Product Transport				
22.	The Applicant shall keep accurate records of all laden truck movements to and from the site (hourly, daily, weekly, monthly and annually) and publish these records on its website every 6 months.	Y	See Section 4.2.2 of the Annual Review. Truck movement records are also available from the Hy-Tec website.	D
Operating Conditions				
23.	<p>The Applicant shall ensure that:</p> <p>(a) all laden vehicles have appropriate signage, including a contact phone number, so they be easily identified by road users;</p> <p>(b) all laden vehicles entering or exiting the site have their loads covered;</p> <p>(c) all laden vehicles exiting the site are cleaned of sand and other material that may fall on the road, before leaving the site; and</p> <p>(d) no trucks queue at the entrance to the site before 6am.</p>	Y	All laden vehicles complied with these requirements during the reporting period.	D
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
Access Road and Intersection Construction				
24.	Within 12 months from the date of this consent, unless the Secretary agrees otherwise, the Applicant shall upgrade the site access road and its intersection with Putty Road in accordance with applicable AUSTRROADS standards, and to the satisfaction of RMS.	Y	Intersection upgrade completed in November 2015.	D
Transport Management Plan				
25.	The Applicant shall prepare and implement a Transport Management Plan for the development to the satisfaction of the Secretary.	Y	A Transport Management Plan has been approved by the Secretary and is implemented at the Quarry. The Transport Management Plan is available from the Hy-Tec website	D
VISUAL				
26.	The Applicant shall: (a) implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development on local residences and road users; and (b) ensure that all external lighting associated with the development complies with the relevant Australian Standards.... to the satisfaction of the Secretary.	Y	Visual amenity was managed effectively during the reporting period. No complaints were received during the reporting period regarding visual impacts.	
BUSHFIRE MANAGEMENT				
27.	The Applicant shall ensure that the development is suitably equipped to respond to any fires on site; and assist the Rural Fire Service, emergency services and National Parks and Wildlife Service as much as practicable if there is a fire in the surrounding area.	Y	Firefighting equipment is readily available at the Quarry.	D
WASTE				
28.	The Applicant shall ensure that only certified VENM and ENM is imported to the site to aid in the minimisation of final voids.	Y	No material was imported during the reporting period.	D
29.	The Applicant shall manage on-site sewage treatment and disposal in accordance with the requirements of its EPL, and to the satisfaction of the EPA and Council.	Y	There were no compliance issues with regards to sewerage management during the reporting period.	D
30.	The Applicant shall: (a) minimise the waste generated by the development; (b) ensure that the waste generated by the development is appropriately stored, handled, and disposed of; and (c) report on waste management and minimisation in the Annual Review, to the satisfaction of the Secretary.	Y	Historically stored waste located on the premises was identified as part of site visit by DPE representatives in June 2017. The items were disposed of in September 2017, and the area is being revegetated, in liaison with the DPE and EPA.	D
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SCHEDULE 4: ADDITIONAL PROCEDURES				
NOTIFICATION OF LANDOWNERS				
1.	As soon as practicable after obtaining monitoring results showing an exceedance of any relevant criteria in schedule 3, the Applicant shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the development is again complying with the relevant criteria.	Y	Hy-Tec did not receive monitoring results that indicated impacts at a nearby residence.	D
INDEPENDENT REVIEW				
2.	If an owner of privately-owned land considers the development to be exceeding the relevant criteria in schedule 3, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land. If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:	NYA	No requests for an independent review of impacts of the Quarry were received during the reporting period.	
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING				
ENVIRONMENTAL MANAGEMENT				
Environmental Management Strategy				
1.	The Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Secretary.	Y	An Environmental Management Strategy has been approved by the Secretary and is implemented at the Quarry. The Environmental Management Strategy Plan is available from the Hy-Tec website.	D
Adaptive Management				
2.	The Applicant shall assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant shall, at the earliest opportunity: (a) take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;	Y	Both groundwater level (Section 7.1) and air quality criteria (Section 6.2) exceedances were recorded in 2018. A groundwater investigation was undertaken in December 2018 and submitted to DPE which determined that the decline in groundwater levels was primarily caused by a reduction in rainfall. Exceedances of air quality criteria were also determined to be caused by high levels of slime, fungi, insect debris and plant debris and were unlikely to be caused by Quarry activities.	
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
ENVIRONMENTAL MANAGEMENT (Cont'd)				
Adaptive Management (Cont'd)				
2. (Cont'd)	(b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and (c) implement remediation measures as directed by the Secretary; to the satisfaction of the Secretary.			
Management Plan Requirements				
3.	The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data; (b) a description of: <ul style="list-style-type: none"> • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; and • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; (d) a program to monitor and report on the: <ul style="list-style-type: none"> • impacts and environmental performance of the development; and • effectiveness of any management measures (see (c) above); (e) a contingency plan to manage any unpredicted impacts and their consequences; (f) a program to investigate and implement ways to improve the environmental performance of the development over time; (g) a protocol for managing and reporting any: <ul style="list-style-type: none"> • incidents; • complaints; • non-compliances with statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and (h) a protocol for periodic review of the plan.	Y	All management plans and strategies have been approved by the Secretary.	D
Yes = Complied with during 2018 NYA = Not Yet Applicable * = Basis for assessment of compliance		No = Not complied with during 2018 HNC = Historical Non-Compliance D = Documentation/Discussion		ND = Not Determined ANC = Administrative Non-Compliance O = Observation during audit
Yes# / No# = Complied / not complied with and compliance no longer required to be assessed				

Table A1 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
ENVIRONMENTAL MANAGEMENT (Cont'd)				
Annual Review				
4.	By the end of December each year, or other timing as may be agreed by the Secretary, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary.	Y	This document.	D
Revision of Strategies, Plans and Programs				
5.	Within 3 months of a modification to this consent or following the submission of an: (a) annual review under condition 4 above; (b) incident report under condition 7 below; or (c) audit report under condition 9 below, the Applicant shall review, and if necessary revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary. <i>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.</i>	Y	Correspondence relating to the review of management plans was provided to DPE on 11 July 2018	D
Community Consultative Committee				
6.	The Applicant shall establish and operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. This CCC must be operated in general accordance with the Guidelines for Establishing and Operating Community Consultative Committees for Mining Developments (Department of Planning, 2007, or its latest version), and be operating within 6 months of the date of this consent.	Y	CCC Meetings were held on 14 May 2018 and 14 October 2018.	D
REPORTING				
Incident Reporting				
7.	The Applicant shall immediately notify the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the Development, the Applicant shall notify the Secretary. Within 7 days of the date of the incident, the Applicant shall provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.	Y	There were no incidents that threatened or caused material harm to the environment that required notification to DPE during the reporting period.	
Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance * = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit Yes# / No# = Complied / not complied with and compliance no longer required to be assessed				

Table A1 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
REPORTING (Cont'd)				
Regular Reporting				
8.	The Applicant shall provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.	Y	All relevant documents and monitoring results are available from the Hy-Tec website.	O
INDEPENDENT ENVIRONMENTAL AUDIT				
9.	Within a year of the date of this consent, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development.	Y	No IEA was required during the reporting period.	D
10.	Within 6 weeks of the completion of this audit, unless the Secretary agrees otherwise, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report. If the Applicant intends to defer the implementation of a recommendation, reasons must be documented.	NYA		D
11.	Within 6 months of the date of this consent, the Applicant shall: (a) make copies of the following publicly available on its website: <ul style="list-style-type: none"> • the EIS; • current statutory approvals for the development; • approved strategies, plans and programs required under the conditions of this consent; • a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs; • a complaints register, which is to be updated monthly; • minutes of CCC meetings; • the annual reviews of the development (for the last 5 years); • any independent environmental audit of the development, and the Applicant's response to the recommendations in any audit; • any other matter required by the Secretary; and (b) keep this information up-to-date, to the satisfaction of the Secretary.	Y	All relevant documents and monitoring results are available from the Hy-Tec website.	D
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Table A2
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
1. Administrative Conditions				
What the licence authorises and regulates				
A1.1	This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation. Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.	Yes	Scheduled Activity Fee Based Activity Scale > 100000 - 500000m ³ annual extractive capacity	D
	Scheduled Activity	Fee Based Activity	Scale	
	Extractive activities	Water-based extractive activity	>100000 – 500000m ³ annual extractive capacity	
A1.2	Notwithstanding condition A1.1, the scale of the water-based extractive activity authorised under this licence must not exceed more than 300,000 tonnes of sand extracted or processed in any calendar year, being the amount equivalent to the annual extraction limit approved by the development consent granted under the Environmental Planning and Assessment Act 1979 for the premises specified in A2.	Yes	Water-based extractive activity did not exceed more than 300,000 tonnes of sand extracted or processed during the reporting period.	D
Premises or plant to which this licence applies				
A2.1	The licence applies to the following premises: TINDA CREEK QUARRY 6102 PUTTY ROAD MELLONG NSW 2756 LOT 1 DP 628806, LOT 2 DP 628806, LOT 3 DP 628806 AS DEPICTED IN THE MAP OF THE APPROVED PROJECT AREA FOR SSD 4978 IN CONDITION A2.2	N/A		
A2.2	The premises location is shown on the map below	N/A		
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*						
Information supplied to the EPA										
A3.1	Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence. In this condition the reference to "the licence application" includes a reference to: a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.	Yes	All works and activities were carried out in accordance with SSD_4978 during the reporting period.							
A3.2	Works and activities must be carried out in accordance with the Development Consent for State Significant Development 4978 approved by the Department of Planning and Environment on 10 April 2015.	Yes	All works and activities were carried out in accordance with SSD_4978 during the reporting period.	D						
2. Discharges to Air and Water and Applications to Land										
P1 Location of monitoring/discharge points and areas										
P1.1	The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.	Yes	A Noise Management Plan has been approved by the Secretary and is implemented at the Quarry. The Noise Management Plan is available from the Hy-Tec website and identifies monitoring locations.	D						
	<table border="1"> <thead> <tr> <th>EPA identification no.</th> <th>Type of monitoring point</th> <th>Location Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Noise monitoring</td> <td>The boundary of "Receiver 1" as detailed in Figure 6.1 of the document titled "Tinda Creek Sand Quarry Noise Management Plan Final October 2015", submitted to the EPA on 18 November 2015</td> </tr> </tbody> </table>	EPA identification no.	Type of monitoring point	Location Description	1	Noise monitoring	The boundary of "Receiver 1" as detailed in Figure 6.1 of the document titled "Tinda Creek Sand Quarry Noise Management Plan Final October 2015", submitted to the EPA on 18 November 2015			
EPA identification no.	Type of monitoring point	Location Description								
1	Noise monitoring	The boundary of "Receiver 1" as detailed in Figure 6.1 of the document titled "Tinda Creek Sand Quarry Noise Management Plan Final October 2015", submitted to the EPA on 18 November 2015								
3. Limit Conditions										
L1 Pollution of waters										
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	Yes	There was no evidence or records of pollution as a result of the operation during the reporting period.	D						
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*																
L2 Waste																				
L2.1	The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.	Yes	No waste material was received on site during the reporting period.	D																
L2.2	This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.	Yes	No waste material was received on site during the reporting period.	D																
L3 Noise Limits																				
L3.1	Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4">POINT 1</th> </tr> <tr> <th>Time period</th> <th>Measurement parameter</th> <th>Measurement frequency</th> <th>Noise level dB(A)</th> </tr> </thead> <tbody> <tr> <td>All hours</td> <td>LAeq (15 minute)</td> <td>-</td> <td>35</td> </tr> <tr> <td>Night</td> <td>Lmax OR LA1,1min</td> <td>-</td> <td>45</td> </tr> </tbody> </table>	POINT 1				Time period	Measurement parameter	Measurement frequency	Noise level dB(A)	All hours	LAeq (15 minute)	-	35	Night	Lmax OR LA1,1min	-	45	Yes	Noise monitoring undertaken during the reporting period demonstrates that Hy-Tec complied with the criteria. There were no noise complaints during the reporting period.	D
POINT 1																				
Time period	Measurement parameter	Measurement frequency	Noise level dB(A)																	
All hours	LAeq (15 minute)	-	35																	
Night	Lmax OR LA1,1min	-	45																	
L3.2	For the purposes of the table under Condition L3.1 "Night" has the same meaning as in the NSW Industrial Noise Policy (EPA, 2000).	Noted																		
L4 Hours of Operation																				
L4.1	Unless permitted by another condition of this licence, activities at the premises must: a) only be undertaken between 7:00 am and 6:00 pm Monday to Friday; b) only be undertaken between 7:00 am and 3:00 pm Saturday; and c) not be undertaken on Sundays or public holidays.	Yes	Hy-Tec reports that all hours of operation were complied with during the reporting period.	D																
L4.2	In addition to the limitations imposed by Condition L4.1, construction activities must not be undertaken: a) between 7:00 am and 8:00 am Saturdays; and b) between 1:00 pm and 3:00 pm Saturdays.	Yes	No construction activities were undertaken in the reporting period.	D																
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
L4 Hours of Operation (Cont'd)				
L4.3	In addition to the hours of operation specified in Condition L4.1, dispatch activities may be undertaken: a) between 5:00 am and 10:00 pm Monday to Friday; and b) between 6:00 am and 3:00 pm Saturdays	Yes	Hy-Tec reports that dispatch occurred during the approved hours throughout the reporting period.	D
L4.4	Maintenance activities may be undertaken at any time if those activities are inaudible at all residential premises.	Yes	Hy-Tec has confirmed that all maintenance activities were inaudible at residential premises. No noise complaints were received through the reporting period.	D
4. Operating Conditions				
O1 Activities must be carried out in a competent manner				
O1.1	Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.	Yes	Hy-Tec reports that all activities were carried out in a competent manner during the reporting period. This includes the management of materials and substances used to carry out the operation such as diesel and other hazardous substances. All waste generated by the operation was managed in accordance with the Environmental Management Strategy.	D
O2 Maintenance of plant and equipment				
O2.1	All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.	Yes	Hy-Tec reports that all plant and equipment was maintained and operated in a proper and efficient manner.	D
O3 Dust				
O3.1	The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.	Yes	Hy-Tec reports that quarry-generated dust was minimal throughout the reporting period. Elevated deposited dust levels at DG1, DG2 and DG3 were largely attributable to other sources. No complaints relating to dust impacts were received.	D
O3.2	The licensee must ensure that all laden vehicles exiting the site have their loads covered.	Yes	Hy-Tec reports that all loads were covered during the reporting period.	D
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
5. Monitoring and Recording Conditions				
M1 Monitoring Records				
M1.1	The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.	Yes	All monitoring was conducted and retained in accordance with M1 of EPL 12007	D
M1.2	All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them.	Yes	All records have been kept in accordance with condition M1 of EPL 12007.	D
M1.3	The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.	Yes	Hy-Tec confirms that all relevant details have been recorded for monitoring activities.	D
M2 Environmental Monitoring				
M2.1	a) The licensee must undertake monthly inspections of the surface water management system at the premises. b) The monthly inspections must: (i) be undertaken immediately upstream and downstream of the quarry disturbance area; (ii) include visual inspection of litter, oil and grease and sediment levels within the surface water system, including diversion channels; (iii) include visual inspection of the physical integrity of the surface water management system, including any signs of erosion; and (iv) include visual inspection of the water level and flow in Tinda Creek.	Yes	Monthly inspections of the surface water management system were undertaken throughout the reporting period in accordance with condition M2 of EPL 12007.	D
M3 Recording of pollution complaints				
M3.1	The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.	Yes	A complaints register is maintained, however, no complaints were received during the reporting period.	D
Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance * = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit Yes# / No# = Complied / not complied with and compliance no longer required to be assessed				

Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*												
M3 Recording of pollution complaints (Cont'd)																
M3.2	The record must include details of the following: a) the date and time of the complaint; b) the method by which the complaint was made; c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; d) the nature of the complaint; e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and f) if no action was taken by the licensee, the reasons why no action was taken.	Yes	A complaints register is maintained, however, no complaints were received during the reporting period.													
M3.3	The record of a complaint must be kept for at least 4 years after the complaint was made.	Yes	A complaints register is maintained, however, no complaints were received during the reporting period.	D												
M3.4	The record must be produced to any authorised officer of the EPA who asks to see them.	NYA	No requests were provided during the reporting period.	D												
M4 Telephone complaints line																
M4.1	The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.	Yes	A telephone complaints line was maintained, however, no complaints were received during the reporting period.	D												
M4.2	The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.	Yes	The telephone complaints number is displayed on a sign at the front gate of the Quarry.	D												
M4.3	The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.	Noted														
M5 Noise Monitoring																
M5.1	To assess compliance with the noise limits specified within this licence, the licensee must undertake operator attended noise monitoring at each specified noise monitoring point in accordance with the table below. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4">POINT 1</th> </tr> <tr> <th>Assessment period</th> <th>Minimum frequency in a reporting period</th> <th>Minimum duration within assessment period</th> <th>Minimum number of assessment period</th> </tr> </thead> <tbody> <tr> <td>All hours when in use</td> <td>Yearly</td> <td>1 hour</td> <td>1 operation day</td> </tr> </tbody> </table>	POINT 1				Assessment period	Minimum frequency in a reporting period	Minimum duration within assessment period	Minimum number of assessment period	All hours when in use	Yearly	1 hour	1 operation day	Yes	Noise monitoring was undertaken by Muller Acoustic Consultants in April 2018 in accordance with the approved Noise Management Plan.	D
POINT 1																
Assessment period	Minimum frequency in a reporting period	Minimum duration within assessment period	Minimum number of assessment period													
All hours when in use	Yearly	1 hour	1 operation day													
M5.2	The licensee must undertake noise monitoring as directed by an authorised officer of the EPA.	NYA	No request was made for additional noise monitoring during the reporting period.	D												
<p>Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance * = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit Yes# / No# = Complied / not complied with and compliance no longer required to be assessed</p>																

Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
M5 Noise Monitoring (Cont'd)				
M5.3	All noise monitoring required by this licence must be undertaken in accordance with Australian Standard AS 2659.1 - 1998: Guide to the use of sound measuring equipment - Portable sound level meters, or any revisions of that standard that may be made by Standards Australia, and the compliance monitoring guidance provided in the NSW Industrial Noise Policy.	Yes	Noise monitoring was undertaken in accordance with Australian Standard AS 2659.1 – 1998.	D
6. Reporting Conditions				
R1 Annual Return Documents				
R1.1	The licensee must complete and supply to the EPA an Annual Return in the approved form comprising: 1. a Statement of Compliance, 2. a Monitoring and Complaints Summary, 3. a Statement of Compliance - Licence Conditions, 4. a Statement of Compliance - Load based Fee, 5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan, 6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and 7. a Statement of Compliance - Environmental Management Systems and Practices. At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.	Yes	Annual Return submitted to EPA on 10 July 2018.	D
R1.2	An Annual Return must be prepared in respect of each reporting period, except as provided below.	Noted		
R1.3	Where this licence is transferred from the licensee to a new licensee: a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.	Noted		
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
R1 Annual Return Documents (Cont'd)				
R1.4	Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on: a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.	Noted		
R1.5	The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').	Yes	Annual Return submitted to EPA on 10 July 2018.	D
R1.6	The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.	Noted		
R1.7	Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by: a) the licence holder; or b) by a person approved in writing by the EPA to sign on behalf of the licence holder.	Yes	Compliance declaration was signed by a Director and Company Secretary.	D
R2 Notification of environmental harm				
R2.1	Notifications must be made by telephoning the Environment Line service on 131 555.	Noted		
R2.2	The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.	Noted	No notifications were required during the reporting period.	D
R3 Written Report				
R3.1	Where an authorised officer of the EPA suspects on reasonable grounds that: a) where this licence applies to premises, an event has occurred at the premises; or b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.	Noted		
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Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
R3 Written Report (Cont'd)				
R3.2	The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.	Noted		
R3.3	The request may require a report which includes any or all of the following information: a) the cause, time and duration of the event; b) the type, volume and concentration of every pollutant discharged as a result of the event; c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort; e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants; f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and g) any other relevant matters.	Noted		
R3.4	The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.	Noted		
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Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
R4 Other reporting conditions				
Noise Monitoring Results				
R4.1	<p>a) The licensee must submit the results of any noise monitoring undertaken in accordance with the requirements of Condition M5.1 or Condition M5.2 to the EPA within three weeks of the noise monitoring being undertaken.</p> <p>b) The noise monitoring results submitted to the EPA must include:</p> <p>(i) a map of each noise monitoring location in relation to the noise source, including relevant distances;</p> <p>(ii) an analysis of the noise monitoring results;</p> <p>(iii) any detected exceedance of the noise limits specified in Condition L4.1;</p> <p>(iv) details of any remedial action taken or proposed to be taken in relation to any exceedance of the noise limits specified in Condition L4.1;</p> <p>(v) details of the prevailing meteorological conditions during the period when the noise monitoring was undertaken; and</p> <p>(vi) confirmation that noise monitoring was/was not undertaken in accordance with Condition M5.3.</p>	Yes	A copy of the Noise Monitoring Assessment is available on the Hy-Tec website and was provided to the EPA within the allocated timeframe. No exceedances were recorded during the reporting period.	D
Surface Water Management System reporting				
R4.2	In accordance with section 5.3 of the approved Water Management Plan for the premises, the licensee must notify the EPA when surface water triggers are exceeded and provide a written report to the EPA.	NYA	No surface water triggers were exceeded during the reporting period.	D
R4.3	<p>The report to the EPA must include:</p> <p>a) the results of surface water management system inspections required in condition M2.1 for the month related to the exceedance, including photographs; and</p> <p>b) appropriate mitigation and contingency measures to be implemented within one month of the exceedance being detected.</p>	NYA	No surface water triggers were exceeded during the reporting period.	D
R4.4	The report must be submitted to the EPA within one month of surface water triggers being detected and be directed to the Manager, Sydney Industry Section by email to metro.regulation@epa.nsw.gov.au	NYA	No surface water triggers were exceeded during the reporting period.	D
<p>Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined</p> <p>NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance</p> <p>* = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit</p> <p>Yes# / No# = Complied / not complied with and compliance no longer required to be assessed</p>				

Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2018 to 31 December 2018

Page 11 of 11

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
7. General Conditions				
G1 Copy of licence kept at the premises or plant				
G1.1	A copy of this licence must be kept at the premises to which the licence applies.	Yes	A copy of the licence is available at the Quarry.	D
G1.2	The licence must be produced to any authorised officer of the EPA who asks to see it.	Noted		
G1.3	The licence must be available for inspection by any employee or agent of the licensee working at the premises.	Noted		
Yes = Complied with during 2018 No = Not complied with during 2018 ND = Not Determined NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance * = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit Yes# / No# = Complied / not complied with and compliance no longer required to be assessed				



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Appendix 2

Return for Extractive Industries – June 2018

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Planning & Environment
Resources & Geoscience

Form S 1

RETURN FOR EXTRACTIVE MATERIALS: YEAR ENDED 30 JUNE 2018

Quote RIMS ID in all correspondence

<p>Quarry Id: Rims ID:401060</p> <p>Operators Name: Aus-10 Rhyolite T/A Hy-Tec industries Address: P.O Box 6770 Silverwater, NSW, 1811</p> <p>Email: darryl.thiedeke@hy-tec.com.au</p> <p>Quarry Name: Tinda Creek Quarry Address: 6102 Putty Rd Mellong, NSW</p>	<p>Inquiries please telephone: (02) 4063 6713 Completed or Nil Returns</p> <p>Email – mineral.royalty@industry.nsw.gov.au Postal Address (see address below)</p> <p><i>Please amend name, postal address and location of mine or quarry if incorrect or incomplete</i></p>	<p>2 0 1 7 - 2 0 1 8</p>
--	--	--

The return should be completed and forwarded to the **MANAGER, ASSESSMENT COORDINATION, RESOURCE OPERATIONS, NSW DEPARTMENT OF PLANNING & ENVIRONMENT, PO BOX 344 HUNTER REGION MAIL CENTRE NSW 2310** on or before **30 November 2018**. If completion of the return is unavoidably delayed, an application for extension of time should be requested **before** the due date. If no work was done during the year, a **NIL** return must be forwarded.

The return should relate to the **above quarrying establishment**, and should cover the operations of quarrying and treatment (such as crushing, screening, washing etc.) carried out at or near the quarry. A return is required even if the operations are solely of a developmental nature, and whether the area being worked is held under a mining title or otherwise.

Director, Title Assessments

Please complete the following information to assist in identifying the location of the Quarry

Typical Geology: Friable Sandstone / Lacustrine

Nearest Town to Quarry: Wilberforce

Local Council Name: Hawkesbury Shire Council

Deposited Plan and Lot Number/s of Quarry: lot 1 to 3, DP628806

Email Address of Operator: darryl.thiedeke@hy-tec.com.au

Name of Owner or Licensee: As above

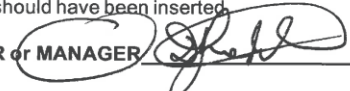
Postal Address of Licensee: As Above

Licence/Lease Number/s (if any)
From Mineral Resources NSW (Industry & Investment NSW): N/A

From Department of Lands or other Department: N/A

If any output was obtained from land NOT held under licence from the above Departments, state the Name/s and Address/es of the Owners of the land: N/A

- To the best of my knowledge, the particulars which have been entered in this return are correct and no blank spaces have been left where figures should have been inserted.

- SIGNATURE** of PROPRIETOR or **MANAGER**  DATE 26.11.2018
- PERSON** to be contacted if queries arise regarding this return Darryl Thiedeke
- NAME** (Block letters) Darryl Thiedeke Telephone 02 96472866

SALES During 2017-2018

Production information may be published in aggregated form for statistical reporting. However, production data for individual operations is kept strictly confidential.

Product	Description	Quantity Tonnes
Virgin Materials		
• Crushed Coarse Aggregates		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		
Under 5mm		
Natural Sand	Washed Fine sand	166,585
Manufactured Sand		
Prepared Road Base & Sub Base		
Other Unprocessed Materials		
Recycled Materials		
• Crushed Coarse Aggregates		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		
Under 5mm		
Natural Sand		
Manufactured Sand		
Prepared Road Base & Sub Base		
Other Unprocessed Materials		
• River Gravel		
Over 30mm		
5mm to 30mm		
Under 5mm		
• Construction Sand	Excluding Industrial	
• Industrial Sand		
Foundry, Moulding		
Glass		
Other (Specify)		
• Dimension Stone	Building, Ornamental, Monumental	
Quarried in Blocks		
Quarried in Slabs		
• Decorative Aggregate	Including Terrazzo	
• Loam	Soil for Topdressing, Garden soil, Horticultural purposes)	
• TOTAL SITE PRODUCTION		
• Gross Value (\$) of all Sales	\$4.2Mill	
• Type of Material	Fine Sand	
• Number of Full-Time Equivalent (FTE) Employees	Employees: 5	Contractors: 2

Please Note: A return for clay based products can be obtained by contacting the inquiry number.

Appendix 3

Deposited Dust Field Records

(Total No. of pages including blank pages = 4)



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Air Quality Field Notes for DG1, DG2 and DG3 for 2018

Page 1 of 2

Month	Report No.	Dust Gauge	Analysis Observations
January	24006402	DG1	Slightly Cloudy, Insects, Organic Matter, Fine Green Dust, Coarse Brown/Black Dust
		DG2	Clear, Insects, Organic Matter, Fine Brown/Black Dust, Coarse Black Dust
		DG3	Cloudy, Insects, Organic Matter, Fine Brown Dust, Coarse Brown/Black Dust
February	24006479	DG1	Clear, Organic Matter, Fine Brown Dust, Coarse, Black Dust
		DG2	Slightly Cloudy, Insects, Organic Matter, Fine Brown Dust, Coarse Black Dust.
		DG3	Slightly Cloudy, Insects, Organic Matter, Brown Dust, Coarse Black Dust.
March	24006519	DG1	Clear, Insects, Organic Matter, Fine Brown Dust, Coarse, Black Dust
		DG2	Clear, Insects, Organic Matter, Fine Brown Dust, Coarse Black Dust.
		DG3	Clear, Insects, Organic Matter, Fine Green Dust, Coarse Black Dust.
April	24006559	DG1	Clear, Insects, Organic Matter, Fine Brown Dust, Coarse, Black Dust
		DG2	Clear, Insects, Organic Matter, Fine Brown Dust, Coarse Black Dust.
		DG3	Clear, Insects, Organic Matter, Fine Green Dust, Coarse Black Dust.
May	24006608	DG1	Slightly Cloudy, Insects, Organic Matter, Fine Grey/green Dust, Coarse, Black/Brown Dust
		DG2	Clear, Insects, Organic Matter, Fine Green Dust, Coarse Black/Brown Dust.
		DG3	Clear, Insects, Organic Matter, Fine Green Dust, Coarse Black Dust.
June	24006651	DG1	Slightly Cloudy, Insects, Organic Matter, Fine Grey/green Dust, Coarse, Black Dust
		DG2	Clear, Insects, Organic Matter, Fine brown Dust, Coarse Brown Dust.
		DG3	Slightly Cloudy, Insects, Organic Matter, Fine Green/ Brown Dust, Coarse Black/Brown Dust.
July	24006701	DG1	Cloudy, Organic Matter, Fine Grey Dust, Course Brown Dust
		DG2	Cloudy, Insects, Organic Matter, Fine Grey Dust, Course Brown Dust
		DG3	Cloudy, Insects, Organic Matter, Bird Droppings, Fine Grey Dust, Course Black/ Brown Dust

Air Quality Field Notes for DG1, DG2 and DG3 for 2018 (Cont'd)

Page 2 of 2

Month	Report No.	Dust Gauge	Analysis Observations
August	24006744	DG1	Cloudy, Insects, Organic Matter, Bird Droppings, Fine Black Dust, Course Brown/ Green Dust
		DG2	Cloudy, Insects, Organic Matter, Bird Droppings, Fine Green Dust, Course Black Dust
		DG3	Cloudy, Organic Matter, Bird Droppings, Fine Grey Dust, Course Black/ Brown Dust
September	24006791	DG1	Cloudy, Insects, bird dropping, Organic Matter, Fine Brown/green Dust, Course Black Dust
		DG2	Cloudy, Insects, Organic Matter, Fine Green Dust, Course Black Dust
		DG3	No Sample bottle and flask broken
October	24006791-2	DG1	Slightly Cloudy, Insects, Organic Matter, Fine green Dust, Course Black/brown Dust
		DG2	Cloudy, Insects, Organic Matter, Fine Green Dust, Course Black Dust
		DG3	Slightly Cloudy, Insects, Fine green/grey Dust, Course Black Dust
November	24006791-3	DG1	Cloudy, Insects, Organic Matter, Fine Grey/ Black Dust, Course Black/ Grey Dust
		DG2	Slightly Cloudy, Organic Matter, Fine Grey Dust, Course Black Dust
		DG3	Cloudy, Insects, Bird Droppings, Organic Matter, Fine Grey/ Black Dust, Course Black/ Brown Dust
December	24006845	DG1	Cloudy, insects, bird droppings, organic matter, fine green dust, course black dust.
		DG2	Slightly cloudy, insects, fine green dust, course black dust.
		DG3	Cloudy, organic matter, fine green dust, course black dust.

Appendix 4

Noise Monitoring Report

(Total No. of pages including blank pages = 24)

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Noise Monitoring Assessment

Tinda Creek Quarry,
Tinda Creek, NSW

April 2018

Prepared for: RW Corkery & Co Pty Ltd
May 2018
MAC180647RP1



Document Information

Noise Monitoring Assessment,

Tinda Creek Quarry, Tinda Creek, NSW

April 2018

Prepared for: RW Corkery & Co Pty Ltd
Level 1, 12 Dangar Road
Brooklyn NSW 2083

Prepared by: Muller Acoustic Consulting Pty Ltd
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Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180647RP1	Draft	8 May 2018	Robin Heaton	<i>Robin Heaton</i>	Oliver Muller	<i>Oliver Muller</i>

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by RW Corkery & Co Pty Limited (RWC) on behalf of Hy-Tec Industries Pty Ltd (Hy-Tec) to complete a Noise Monitoring Assessment (NMA) for the Tinda Creek Quarry, Tinda Creek, NSW (the 'project').

The monitoring has been conducted in accordance with the approved Tinda Creek Quarry Noise Management Plan and in general accordance with Conditions L3.1 and M5 of EPL#12007 (EPL).

The assessment was conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Environment Protection Licence EPL#12007;
- Umwelt Pty Ltd, Tinda Creek Quarry Noise Management Plan (NMP); and
- Australian Standard AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

This assessment was undertaken on Wednesday 18 April 2018 and forms part of the noise monitoring program to address conditions of EPL#12007, and the Noise Management Plan.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

2.1 Attended Noise Compliance

Section L3.1 of the Tinda Creek EPL, approved on 3 March 2017, outlines the applicable noise criteria for all privately owned residential receivers surrounding the project. The operating criteria specified in the EPL at all receivers is 35dBA LAeq(15min) for all periods and 45dBA LAmax during the night time period. **Table 1** presents the criteria for privately owned residential receivers surrounding the project, as outlined in the EPL.

Table 1 Noise Criteria		
Receiver	All Hours dB(A) LAeq(15min)	Night (10pm to 7am) dB(A) LAmax
All privately owned residences	35	45

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3 Methodology

3.1 Locality

The project is located on Putty Road, Tinda Creek, NSW approximately 67km north of Windsor, NSW. Receivers in the locality surrounding the project are primarily rural/residential. Putty Road is situated to the west of the site with the Yengo National park bordering the site in all other directions.

3.2 Noise Monitoring Locations

Section M5.1 of the EPL specifies that noise monitoring is to be conducted for a minimum duration of 1 hour at the boundary of R1, (6255 Putty Road, Mellong) as detailed in Figure 6.1 of the Tinda Creek Noise Management Plan.

It should be noted that access to the property was not possible during the time of the noise measurements. Therefore, attended measurements were conducted at the boundary gate (NM1) of the property, as shown in **Figure 1**.

Following a request from the Department of Environment and Planning (DPE) on 20 January 2017, two additional near-field monitoring locations were selected to quantify project noise levels and limiting noise influence from Putty Road. The locations include a position adjacent to the dam and a second location adjacent to the main plant. The noise levels monitored at these locations were used to quantify the overall sound power of the onsite operations, which was then used to calculate the noise contribution at surrounding noise sensitive receivers.

The three monitoring locations, their MGA 56 coordinates and duration of measurement period are outlined in **Table 2** and are presented graphically in the locality plan shown in **Figure 1**.

Table 2 Receiver Locations					
Receiver ID	Receiver Location	Coordinates		Duration	Periods Monitored
R1	6255 Putty Road	284801	6329055	1 Hour	Morning Shoulder, Day
Q1	Dam Plant	286026	6328048	15 mins	Morning Shoulder, Day
Q2	Main Plant	285987	6327885	15 mins	Morning Shoulder, Day

3.3 Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 18 April 2018. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ± 0.5 dBA.

Four noise measurements of 15 minutes in duration were conducted at the R1 monitoring location and where possible, throughout each survey, the operator quantified the contribution of each significant noise source. Additionally, one 15-minute measurement was conducted at each nearfield monitoring location during the day and morning shoulder monitoring periods to quantify the noise from the quarry. Nearfield measurements were supplemented with unattended monitoring during the morning shoulder period.

3.4 Operational Log

Transportation activities commenced at 5:30am and work shifts including operation of processing equipment commenced at 7:00am on the day of the survey. Morning shoulder measurements were conducted from 5:45am to 6:45am on 18 April 2018 to capture the onsite loading and transportation operations. Daytime operations commenced at approximately 8:40am following plant maintenance with the daytime monitoring being conducted from 8:45am to 11:00am.



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4 Results

4.1 Morning Shoulder Results

Four attended noise measurements of 15-minutes in duration were completed during the morning shoulder assessment period at NM1 on Wednesday 18 April 2018. **Table 3** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 3 Operator-Attended Noise Survey Results – Morning Shoulder Period, Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}		
18/4/18	05:43	65	45	24	Dir: E	Traffic 38-65
					Wind Speed: 0.1m/s	Birds 26-28
					Rain: Nil	Quarry Hum 18-21
18/4/18	05:58	63	44	25	Dir: E	Traffic 34-63
					Wind Speed: 0.1m/s	Quarry Hum 20-22
					Rain: Nil	Wildlife 40-46 Birds 31-54
18/4/18	06:13	63	42	25	Dir: E	Traffic 32-63
					Wind Speed: 0.1m/s	Quarry Hum 19-21
					Rain: Nil	Wildlife 32-46 Birds 25-40
18/4/18	06:29	65	46	21	Dir: E	Traffic 33-65
					Wind Speed: 0.1m/s	Quarry Hum 19-22
					Rain: Nil	Birds 25-30
Tinda Creek Quarry L _{Aeq} (15min) Contribution						20

Unattended noise monitoring was completed during the morning shoulder assessment period at Q1 and Q2 on Wednesday 18 April 2018 to supplement the attended monitoring data. **Table 4** presents the monitored 15-minute noise levels, observed on-site activities (during deployment) and meteorological conditions at the time of measurements.

Table 4 Unattended Noise Survey Results – Morning Shoulder Period, Location Q1 and Q2

Location	Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Onsite Activities
			L _{Amax}	L _{Aeq}	L _{A90}		
Q1	18/4/18	05:45	68	54	47	Dir: E	Sand Plant Generator
Q2	18/4/18	05:45	92	70	53	Wind Speed: 0.1m/s	Loader
						Rain: Nil	Export Trucks

4.2 Day Assessment Results

Operational attended noise monitoring was completed during the daytime assessment period at NM1 on Wednesday 18 April 2018. **Table 5** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 5 Operator-Attended Noise Survey Results – Day Period, Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}		
18/4/18	09:57	66	47	24	Dir: E	Birds 27-32
					Wind Speed: 0.2m/s	Quarry Hum 20-22
					Rain: Nil	Traffic 35-66 Aircraft 33-38
18/4/18	10:13	63	45	26	Dir: E	Traffic 50-64
					Wind Speed: 0.3m/s	Birds 32-54
					Rain: Nil	Leaves 29-34 Aircraft 34-38 Quarry Hum 18-20
18/4/18	10:28	62	45	24	Dir: E	Traffic 55-62
					Wind Speed: 0.1m/s	Aircraft 36-47
					Rain: Nil	Quarry 22-24
18/4/18	10:44	64	44	23	Dir: E	Traffic 50-64
					Wind Speed: 0.1m/s	Birds 36-38
					Rain: Nil	Aircraft 32-34 Quarry hum 20-24
Tinda Creek Quarry L _{Aeq} (15min) Contribution						20

Attended noise monitoring was completed during the daytime assessment period at Q1 and Q2 on Wednesday 18 April 2018. **Table 6** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 6 Attended Noise Survey Results – Day Period, Location Q1 and Q2

Location	Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
			L _{Amax}	L _{Aeq}	L _{A90}		
Q1	18/4/18	08:46	71	57	53	Dir: E	Generator 62-63
						Wind Speed: 0.2m/s	Main plant 60-62
						Rain: Nil	
Q2	18/4/18	09:05	77	65	63	Dir: E	Generator 52-54
						Wind Speed: 0.2m/s	Onsite Truck 45-71
						Rain: Nil	Main Plant 51-54 Loader 50-60

5 Noise Compliance Assessment

5.1 Attended Noise Measurement Compliance Assessment

The compliance assessment summary for R1 are presented in **Table 7** for day and morning shoulder assessment periods and compares project contributions against relevant criteria.

Table 7 Day and Morning Shoulder Noise Compliance Assessment

Period	Quarry Noise Contribution	Quarrying Noise Criteria	Compliant
	LAeq(15min)	LAeq(15min)	
Day	20	35	✓
Morning Shoulder	20	35	✓

5.2 Calculated DPE Assessment Methodology

From the noise measurements at monitoring location Q1 and Q2 the LAeq(15min) sound power of the quarry was calculated to be 108dBA. The contribution at each of the receivers R1 to R3 has been calculated taking into account loss due to distance and topography. This noise level was propagated to the surrounding noise sensitive receivers, with the calculated received noise level presented in **Table 8**. Results of the calculations generally align with the measured noise contributions from the project and therefore validate compliance.

Table 8 Calculated DPE Compliance Assessment

Receiver	Quarry Sound Power	Distance to Receiver	Distance attenuation, dB	Attenuation due to Topography, dB	Calculated Quarry Contribution, LAeq(15min)
R1	108	2050	74	12	22
R2	108	2210	75	12	21
R3	108	2030	74	12	22

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6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment for RW Corkery & Co Pty Limited on behalf of Hy-Tec Industries Pty Ltd at the Tinda Creek Quarry, Tinda Creek, NSW. The assessment was completed to assess the quarry's compliance with the relevant criteria outlined in EPL#12007 for the nominated residential receiver surrounding the quarry.

Operator attended noise monitoring was undertaken on Wednesday 18 April 2018 at the nominated monitoring location with quarry noise contributions compared against the relevant criteria.

The assessment has identified that noise emissions generated by Tinda Creek Quarry comply with relevant noise criteria specified in EPL#12007 at the assessed receiver location for both the morning shoulder and daytime monitoring periods.

Furthermore, the calculated noise contribution at two nearfield reference locations demonstrate that project noise contributions satisfy relevant criteria at R1, R2 and R3.

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Appendix A – Glossary of Terms

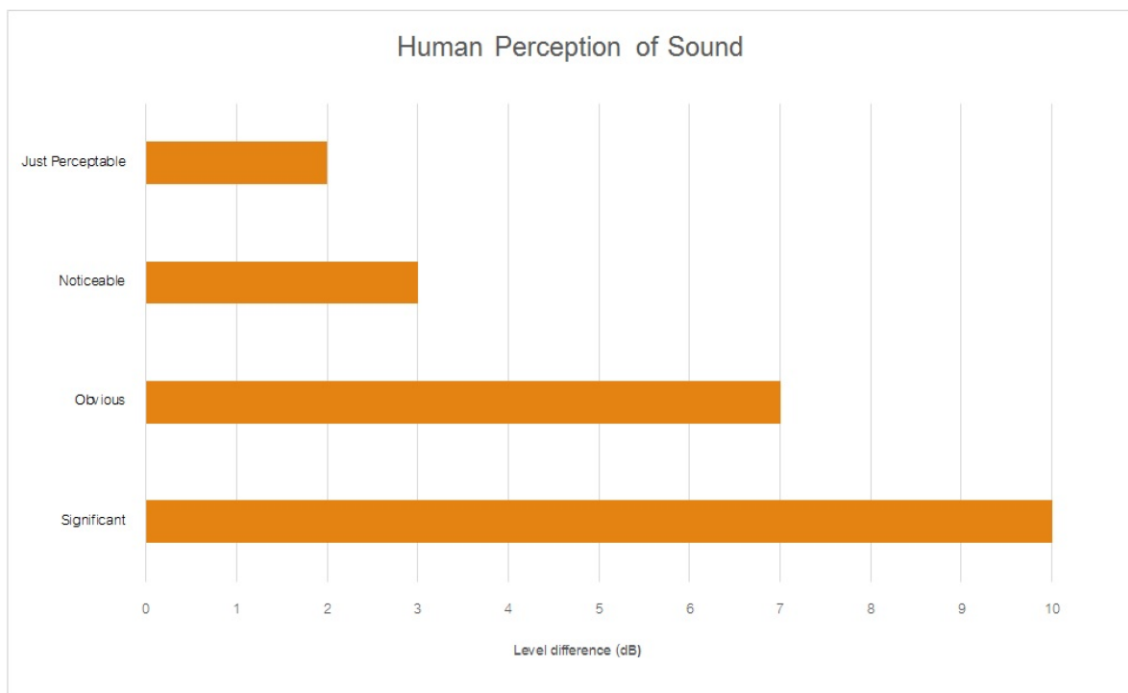
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm _{ax}	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ Where : W is the sound power in watts and W ₀ is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.


Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound





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MAC
Muller Acoustic Consulting

Appendix 5

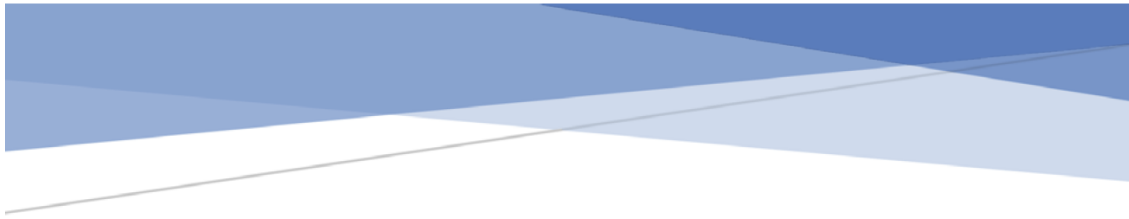
Groundwater Investigation Report

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**INVESTIGATION OF GROUNDWATER LEVEL CHANGES
AT TINDA CREEK QUARRY - 2018**

December, 2018

Prepared for
Hy-Tec Pty Ltd

Katarina David
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Report KD2018/10

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1. Introduction

1.1 Overview

Hy-Tec Pty Ltd operates Tinda Creek Quarry under the current development consent SSD_4978. Under this consent the sand quarry can produce up to a maximum of 300,000 tonnes per year. The site is located around 60 km north of Windsor on Putty Road and next to Yengo National Park. Tinda Creek Quarry has been operational for the last 30 years with the current extraction of sand resource from Domain 6 (Figure 1).

The groundwater levels on site have been monitored in accordance with the Water Management Plan (Umwelt, 2016) prepared for the site. Recent collation of groundwater level data for 2018 identified progressive decline in groundwater levels across the site coincidental with the lack of rainfall during the same time period.

Monitoring bore TP5 located to the south of the Domain 6 has recorded a decline in groundwater level of 1.7 m in the period from October 2017 to October 2018 and has exceeded trigger set in the Water Management Plan (WMP). The trigger levels specified for this site in the WMP (Umwelt, 2016) were based on previously determined prolonged dry weather period (2010 to 2014). The observed change in groundwater levels across the site during 2018 coincides with prolonged absence of rain, and the decline in groundwater level at TP5 was significant enough to warrant a groundwater investigation.

The primary objective of this report is to understand the driver for a change in groundwater level in TP5 during 2018 and provide comparison with historical data in relation with other upgradient and downgradient bores.

1.2 Topography and site drainage

The site slopes gently from the east, north and south towards the low laying Tinda Creek, which drains to the west into the Blue Mountains World Heritage Area (Figure 1). The quarry is located below the top of the Tinda Creek catchment area and the creek flows only intermittently following intense rainfall periods. The creek in this area receives no baseflow contribution.

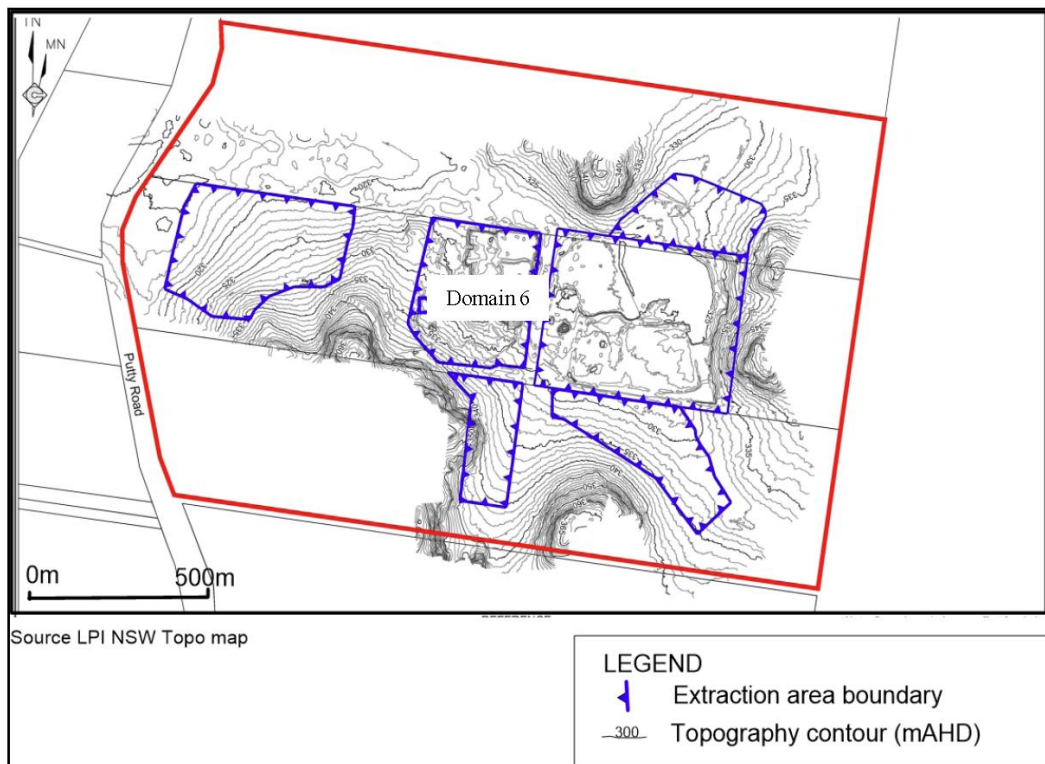


Figure 1 Site topography and extraction areas

1.3 Scope of works

The scope of work for this groundwater study includes the following:

- Historical groundwater data collation from existing piezometer monitoring results;
- Graphical and statistical analysis of groundwater data and interpretation;
- Summary of outcomes of investigation relating to the possibility of Quarry operations influencing the change in groundwater levels;
- Review of potential impacts to native vegetation.

2. Groundwater Monitoring Network

The groundwater monitoring network at Tinda Creek Quarry is comprehensive and includes a network of 19 monitoring bores (Figure 2). The monitoring bores are installed either as single standpipe piezometers or as nested sites (in two separately drilled holes). Six nested sites monitor both shallow (up to 10m depth) and deep (13-18m depth) aquifers.

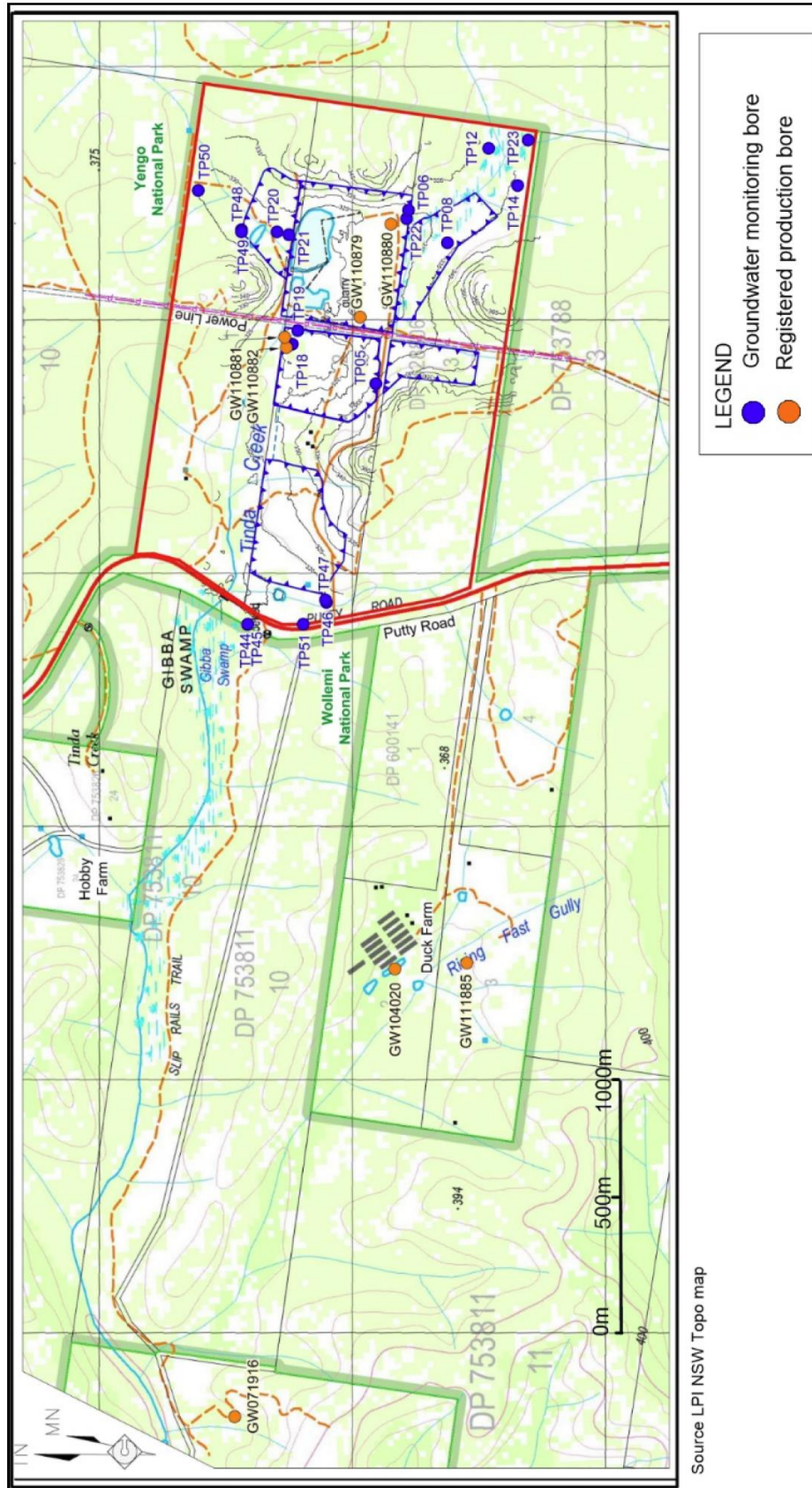


Figure 2 Location of groundwater bores

2.1 Data Collation and Review

2.1.2 Groundwater levels

Data on water table elevations has been collected since 2010 from eleven bores located in the vicinity of extraction area. During 2016 and 2017, an additional eight bores were drilled at upgradient and downgradient locations to improve groundwater understanding across the site. In addition, some bores were installed to replace the ones that were going to be destroyed as part of the ongoing quarry activities.

While monthly manual gauging has been ongoing since 2010 in all bores; all site monitoring bores have also been equipped with dataloggers since 2017. The dataloggers provide 4 hourly records of groundwater levels on a continuous basis. Readings obtained using dataloggers are corrected for barometric pressure using the barometric reading from the dedicated datalogger which records at the same frequency.

2.1.4 Groundwater Quality

Data on groundwater quality are collected on a quarterly basis and include pH, electrical conductivity (EC), nitrate, ammonia and TRH. For the purpose of this investigation pH and EC will be discussed only.

3. Data analysis results

The results of groundwater level data collation is presented here using two methods:

- Graphical groundwater trend analysis and comparison with monthly rainfall and residual rainfall mass (RM); and
- Statistical estimation of trends by Hydrograph Analysis – Rainfall and Time Trend (HARTT)

3.1 Comparison with rainfall and RM

Groundwater levels for piezometers are plotted (Figure 3 and 4) along with the monthly rainfall (Figure 3 and 4) and rainfall residual mass (RM) (Figure 5). RM is calculated as the cumulative difference between total and long term mean monthly rainfall. Rainfall data used for this time period is sourced from Tinda Creek Quarry site.

Positive, rising trends in RM represent above average rainfall periods and negative trends represent below average rainfall periods. The RM curve helps interpretation of the water level fluctuations and allows differentiation between climate and other impacts on groundwater.

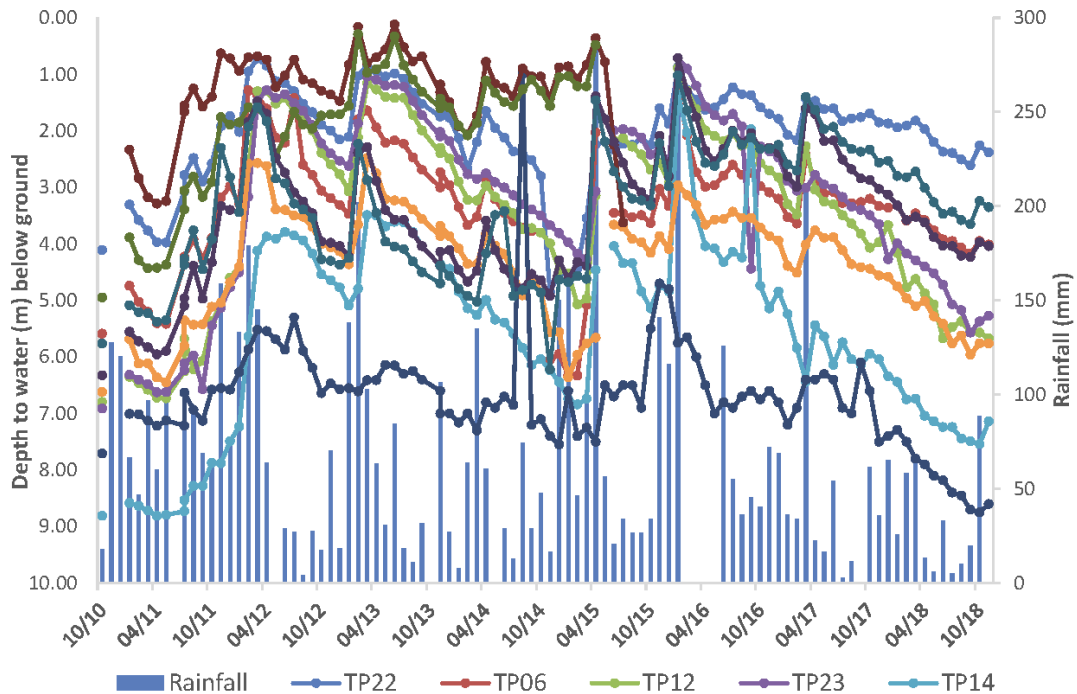


Figure 3 Hydrographs for site bores with monthly rainfall

Based on individual monthly rainfall events and hydrographs (Figure 3), groundwater levels in general respond quickly to recharge. For the newly installed bores, monthly groundwater level readings indicate that upgradient bores TP48, TP49 and TP50 have continued declining while other downgradient bores show a rise in groundwater levels. Long term data for site bores show agreement with rainfall residual mass, with a lag resulting from different gauging time compared to rainfall data. However, a rising rainfall trend from 2014 to 2016 is reflected in rising groundwater level during the same period. Similarly, a declining trend in rainfall is observed in groundwater data after 2016 (Figure 5).

Figure 6 shows the high frequency groundwater data and the linear regression fit to the trends. In order to understand the behaviour of groundwater in TP5, the hydrographs of four bores were compared. Selected bores included: TP22 located upgradient, TP21 located within the former excavated area and upgradient of the TP5, TP12 in the south-eastern corner and upgradient of TP5 and TP47 downgradient bore. These sites were selected as they are at a significant distance from the current excavation area, topographically elevated (except TP47) and therefore not impacted by the site activities.

The slope of linear regression for these bores varies in a small range from 0.0017 to 0.003 with a high R-squared indicating similar trend (Figure 6) in both upgradient and downgradient bores compared to TP5. Overall, based on the linear regression, the variation in groundwater levels in TP5 during 2018 is observed to be consistent with changes in upgradient and downgradient bores.

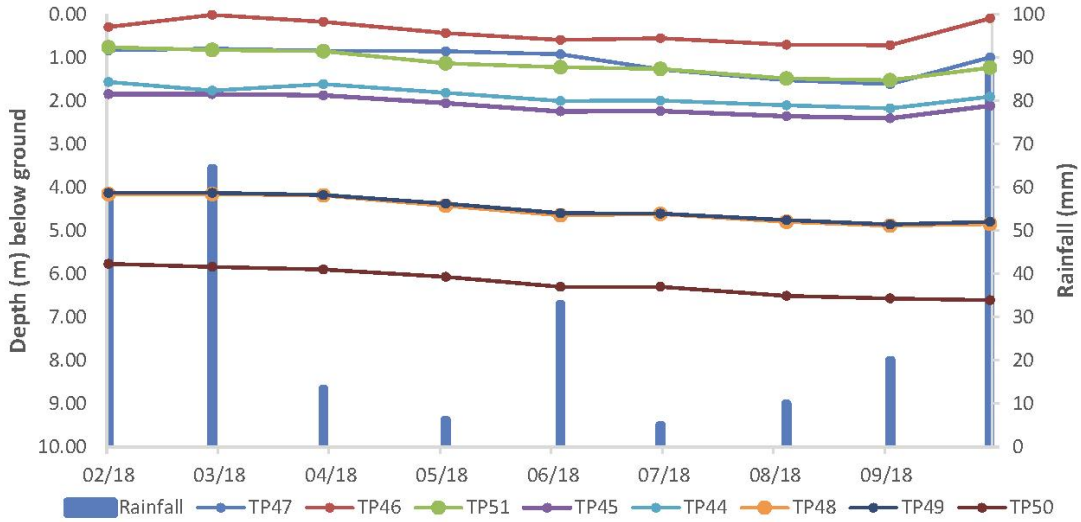


Figure 4 Hydrograph for new bores for the period from February 2018 onwards

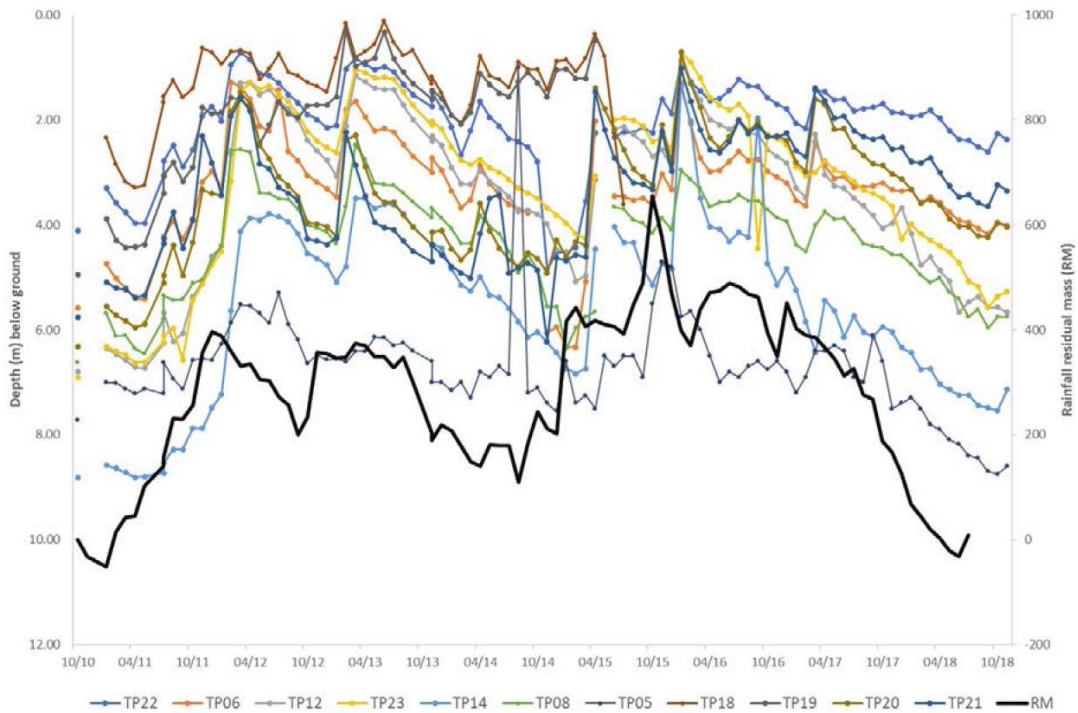


Figure 5 Hydrographs and residual rainfall mass

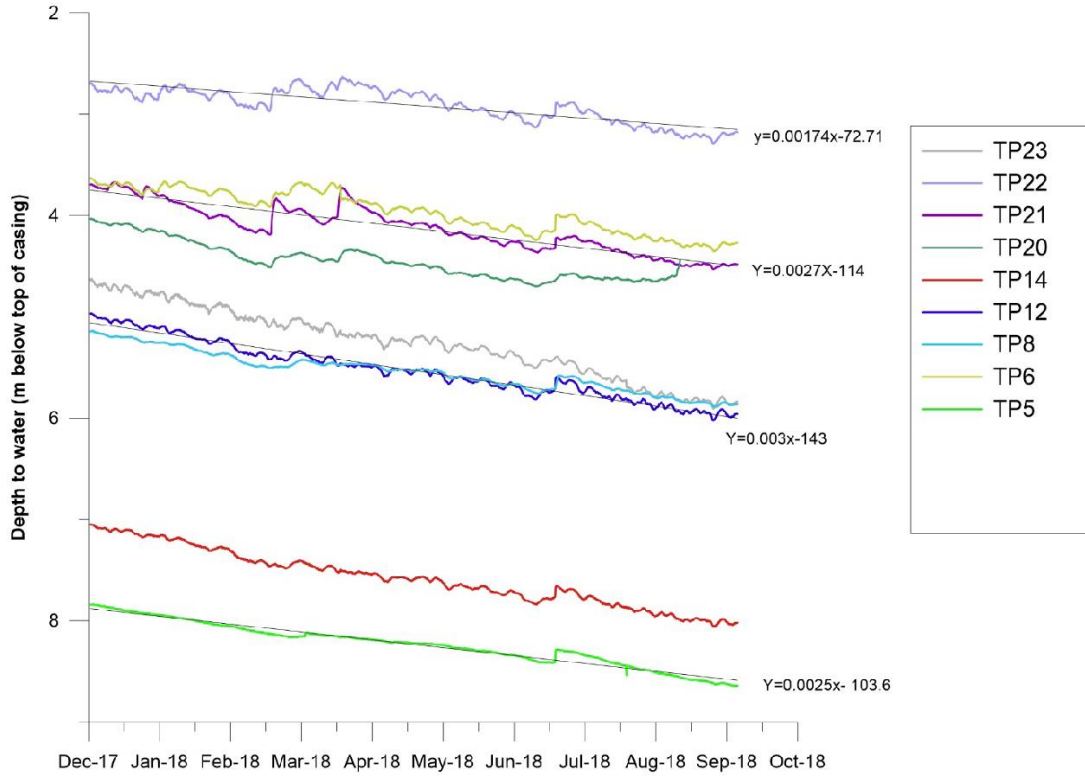


Figure 6 High frequency groundwater data (4 hourly) plotted with linear regression for TP5 and upgradient bores

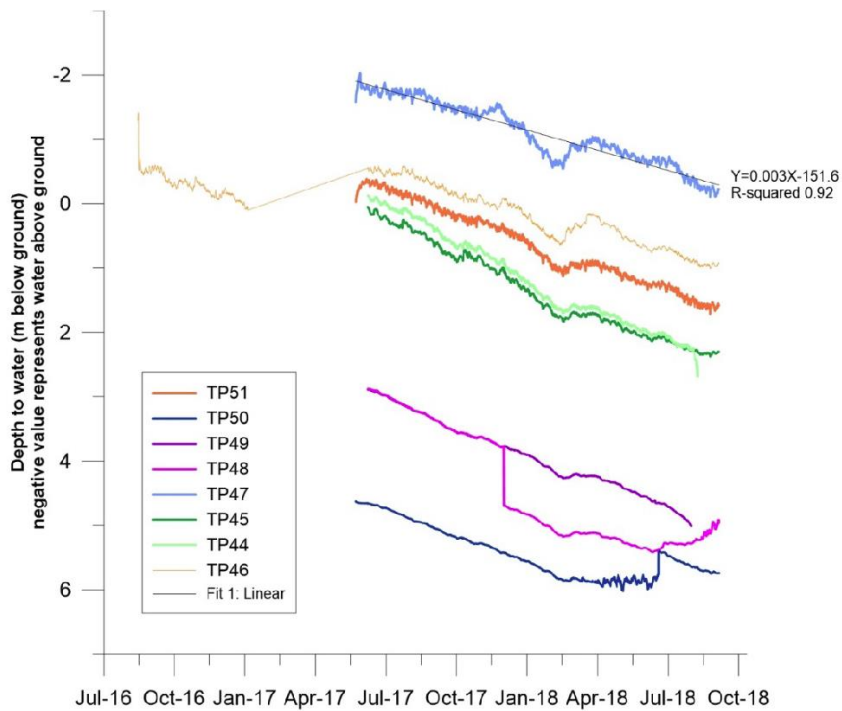


Figure 7 High frequency groundwater data plotted with linear regression for upgradient bore TP47

3.2 HARTT analysis

HARTT is an analytical method developed by Ruhi Ferdowsian of the Department of Agriculture, Western Australia, to statistically analyse and estimate trends in groundwater levels. The approach separates the effect of atypical rainfall events from the underlying time trend and the lag between rainfall and its impact on groundwater is explicitly represented (Majidi et al, 2002). For the HARTT method it is recommended that long-term rainfall dataset is used to understand the delay period and long-term trend analysis.

The method produces a fitted curve through the groundwater level readings using two variables: rainfall Variable Accumulative Monthly Residual Rainfall (AMRR) or Accumulative Annual Residual Rainfall (AARR) and time trend. Rainfall is represented as an accumulation of deviations from average rainfall, and the lag between rainfall and its impact on groundwater is explicitly represented (Ferdowsian et al. 2001). With the HARTT method, it is possible to distinguish between the rainfall fluctuations and the underlying trend of groundwater levels. The HARTT method (Emelyanova et al, 2013) in effect takes into account the effect of residual rainfall when calculating the underlying trend (Ramin et al, 2002).

The R^2 value is the degree of fit of the calculated curve compared to the recorded water levels (1 is a perfect fit) and therefore the agreement between rainfall and groundwater level response. The p-value indicates the level of significance of each variable. If the p-value is less than 0.05 then the variable is significant, and the groundwater response is related to rainfall recharge.

For the purpose of this report the method has been applied to selected piezometers based on their location and period of data available for the piezometers (Table 1). All bores (except TP22) show that the groundwater level variation could be explained by climatic variations and underlying time trends (80-90% of the variation in groundwater level). Eighty-six percent of the variance in TP5 could be explained using the HARTT model (Table 1). The non-linear model for TP5 captured the long-term trend well, showing the long-term decline in groundwater levels (Figure 8).

The p-value for the standard HARTT model parameters was <0.05 . For TP5, the $p>0.05$ indicates that rainfall recharge is not the only variable impacting the groundwater levels. However, 86% of the variance in groundwater levels can be explained by HARTT model, therefore, by rainfall influence. Similarly, high variance can be explained by the model for TP12 and TP21, while for TP22 the HARTT model poorly explains the relationship between rainfall and groundwater trends.

The variables that cannot be explained by the model are likely due to Quarry operations, and the proximity of the TP5 to the extraction area. This may include the temporary change in drainage pattern and/or temporary disturbance of groundwater levels during the extraction of sand and certain time period before the groundwater recovers to its equilibrium. Based on the statistical analysis these variables are within the natural seasonal variation and contribute to a minor extent to groundwater level change.

Figures 8 and 9 indicate that for TP5 and TP12 (located upgradient and outside of the quarry influence) the modelled (fitted) and observed water levels are in reasonable correlation indicating good calibration. The observed water level trend (dotted line) is declining from 2016 onwards and modelled projected water levels show the declining trend reversing in late October 2018 with an increase in rainfall. The continuing decline in the observed and modelled water levels reflects the delay in the response of

groundwater to rainfall and is closely related to the long-term trend rather than short term effect of rainfall.

3.3 Groundwater quality

Groundwater quality in this report relates to the review of pH and EC as indicators of groundwater quality. The range of pH on site varies from slightly acidic to neutral, with very low and stable standard deviation (SD) in the range from 0.1 to 0.3. There is no change in SD in pH in the period from 2010 to 2016 compared to period after 2016.

Similarly, the EC indicates that groundwater is relatively fresh with EC of up to 500 $\mu\text{S}/\text{cm}$. There is very little variation in EC over time, irrespective of reduction in rainfall recharge, indicating that lateral groundwater flow in unconsolidated strata may be significant.

There has been no change in standard deviation from long term average for individual bores since late 2017. This indicates that site groundwater conditions have not changed.

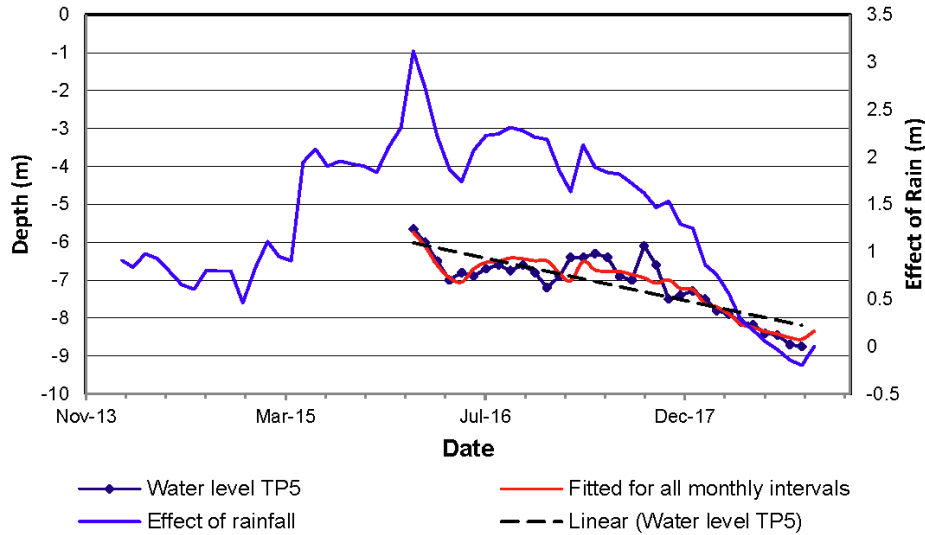


Figure 8 Water levels with accumulative monthly residual rainfall for TP5 (1 months delay)

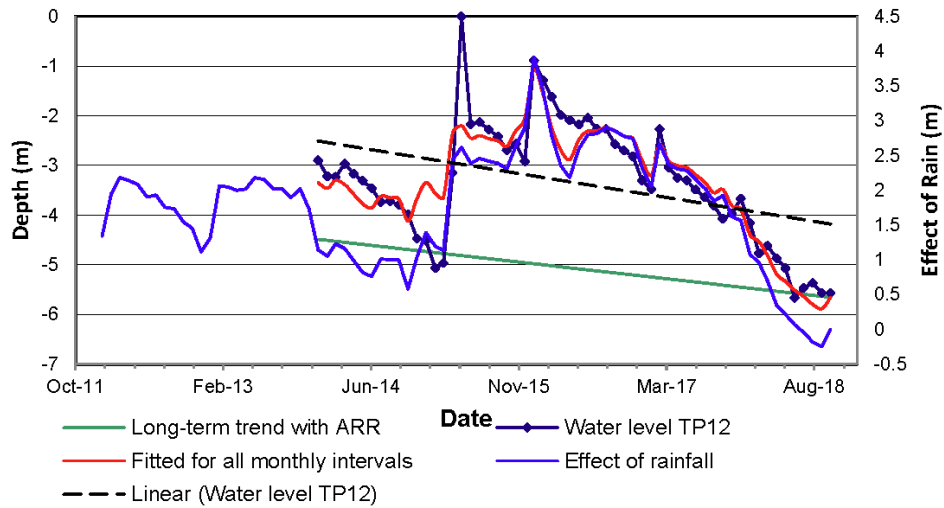


Figure 9 Water levels with accumulative monthly residual rainfall for TP12 (0 months delay)

Table 1 Evaluation of cumulative rainfall deviation and impact of rainfall on groundwater

BORE	DEPTH INITIAL- K ₀	DEPTH K ₀	FINAL K ₀	BEST FIT DELAY AMRR (MONTHS)	R ² FOR SELECTED ONE	C	ACC. RESIDUAL RAINFALL (MM)	P	TIME (M/MONTH) VALUES	P	MONITORING PERIOD (YEARS)	NO. READINGS
TP5	-5.65	8.75	1	0.86	-8.868	0.004850474	8.38059E-07	0.015428722	0.3020906	2	33	
TP12	-2.9	5.57	0	0.80	-4.469	0.006088838	1.2405E-18	-0.020477689	2.6795E-05	4	58	
TP21	-4.62	3.24	0	0.79	-5.364	0.005109781	3.70968E-15	0.042401901	5.9682E-09	3	44	
TP22	-2.25	2.26	0	0.48	-3.073	0.002596784	7.42205E-06	0.015329212	0.03895691	3	43	

4. Summary and conclusion

The review of historical groundwater level data (8 years of data) combined with high frequency datalogging (4 hourly readings for a period of 18 months) provides a comprehensive dataset which allowed investigation of groundwater trends in TP5 and comparison with other site bores. The following are the findings of the investigation:

- There are 19 groundwater monitoring points at Tinda Creek quarry which provide sufficient spatial and depth resolution for understanding the groundwater level behaviour.
- In general, groundwater levels in most bores fluctuate seasonally with a rise in groundwater levels following rainfall events and decline in groundwater levels with natural dissipation following dry periods. Historical groundwater level monitoring confirms these trends.
- High frequency groundwater data (4 hourly) indicates that the trends in decline observed in the period from late 2017 to September 2018 are consistent in TP5 and other upgradient and downgradient bores TP12, TP21, TP22 and TP47. The site topography and location of the upgradient and downgradient bores indicates that they are distant from current site activities and therefore can be used as a proxy for comparison. Slope of regression line for TP5 is similar to other investigated upgradient and downgradient bores with a difference attributed to heterogeneity and hydraulic conductivity.
- Long-term groundwater trends in TP5 are similar to rainfall residual mass trend, indicating strong rainfall influence on groundwater levels.
- HARTT analysis of groundwater data for TP5 and several distant upgradient bores indicates overall good calibration of the model which provides high confidence in the results. With the exception of TP22 all other bores show that the groundwater level variation can be explained by rainfall variations and underlying time trends (80- 90% of the variation in groundwater level).
- The p-value for the standard HARTT model parameters was statistically significant at $p < 0.05$ for most bores. For TP5 the $p > 0.05$ indicates that rainfall recharge is not the only variable impacting the groundwater levels. Eighty-six percent of the variance can be explained by the model, namely rainfall influence. Decline in groundwater levels in TP5 for the period from late 2017 to October 2018 is mostly attributed to reduction in rainfall as observed from RM trend and HARTT analysis (86%). This is based on comparison with historical data and other bores which are located sufficiently upgradient or downgradient and are not considered influenced by site activities.
- The variables that cannot be explained by the model are likely due to Quarry operation, mainly to the proximity of the bore TP5 to the extraction area. These may include the temporary change in drainage pattern, soil consolidation and/or temporary disturbance of groundwater levels during the extraction of sand and longer time period before the groundwater recovers to its equilibrium. These variables are within the natural seasonal variation and contribute to a minor extent to groundwater level change.
- Regression analysis of high frequency groundwater data indicates high similarity in groundwater variation with other upgradient and downgradient site bores.
- Groundwater quality parameters pH and EC indicate stable conditions over the period from 2010 to 2018.

- The potential impacts to native vegetation are considered to be limited due to small variation in groundwater level caused by other variables such as the quarry activities. Given that most of the observed variation is caused by natural seasonal and annual climate variation, the native vegetation is considered to be resilient to these changes. However, the ongoing groundwater monitoring and continuation of high frequency data collection is required to ensure that any changes to the groundwater regime are captured and managed.
- The trigger levels set in the WMP need to be reviewed considering all historical rainfall and groundwater data including the current period.

6. References

Emelyanova, R. Ali, W. Dawes, S. Varma, G. Hodgson and D. McFarlane (2013) Evaluating the cumulative rainfall deviation approach for projecting groundwater levels under future climate. *Journal of Water and Climate Change*, 04.4, pg 317-337

Ferdowsian, R., Pannell D.J., McCarron, C., Ryder A. and Crossing, L. (2001), Explaining Groundwater Hydrographs: Separating Atypical Rainfall Events from Time Trends. *Australian Journal of Soil Research*. 39, 861-875.

Majidi, Ramin; Ferdowsian, Ruhi and McCarron, Clare. HARTT: User-Friendly Software for Hydrograph Analysis to Separate Rainfall and Time Trend [online]. In: Water Challenge: Balancing the Risks: Hydrology and Water Resources Symposium 2002. Barton, A.C.T.: Institution of Engineers, Australia, 2002: [314]-[320]. Availability: <[https://search-informit-com-au.wwwproxy1.library.unsw.edu.au/documentSummary;dn=317501125663614;res=IELENG](https://search.informit-com-au.wwwproxy1.library.unsw.edu.au/documentSummary;dn=317501125663614;res=IELENG)> ISBN: 0858257785. [cited 03 Dec 18].

Umwelt, (2016) Water Management Plan - Tinda Creek Quarry. Report prepared for Aus-10 Rhyolite Pty Ltd.

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Appendix 6

Offset Vegetation, Revegetation and Koala Monitoring Report 2018

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5 July 2017

Darryl Thiedeke
Adelaide Brighton Ltd
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Dear Darryl

Re: Establishment of permanent monitoring plots for *Grevillea parviflora* at Tinda Creek offset area

On 20th March 2018 Niche performed a survey and established a series of permanent monitoring plots for *Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea) on the offset area adjacent to the Tinda Creek sand quarry, Putty Road, Mellong, NSW.

As a guideline for this survey Niche used three conditions set-out in section 7.2.5 of the May 2017 management plan for the site:

- stem counts in permanent plots
- photo monitoring to assist in recording observable changes over time
- habitat quality and evidence or not of adverse impacts

The minimum suggested number of plots was exceeded in this study (nine plots as opposed to “two of the four transects/plots”). The time of year made it more difficult to rapidly recognise plants, including the *Grevillea*. It is recommended that future surveys are undertaken during the species known flowering period (July to December).

While this is the baseline data for monitoring, *Grevillea parviflora* was observed to remain common through the offset area with a median measured density of 1800 stems per hectare.

I have included the methods and results of the survey in the following attached document.

Yours sincerely

A handwritten signature in black ink, appearing to read "Matthew Stanton".

Matthew Stanton
Niche Environment and Heritage



Scope of the survey for *Grevillea parviflora* subsp. *parviflora*

The following statement has guided the establishment of the permanent monitoring plots. “The goal of the monitoring is to ensure that the expansion of quarry activities does not have an adverse effect on the habitat of *Grevillea parviflora* and that the habitat for the species is maintained or improved over the life of the operation”.

Because the surveys were done out of flowering season, the numbers recorded may be expected to be an under estimate.

Methods

Plot establishment.

The two areas mapped as containing *Grevillea parviflora* (Umwelt 2017) measure approximately 5.4 hectares for the southern group and approximately 4.4 hectares for the northern group although this depends on how one defines the area. It was decided that a sampling ratio of around 1:100 would be appropriate. Nine 10x10 metre plots were randomly located in the two areas, five in the southern area and four plots in the northern area. Plot location conditions were that there was to be a minimum distance of 50 metres between plot centres and that there must be a confirmed presence of *Grevillea parviflora* within sight of the plot (even if there were none within the plot).

10x10 metre plots were chosen as these will form a component of general flora surveys for other monitoring requirements. The established plots may become part of the future flora survey plots.

Each plot was aligned to the UTM grid. The corner co-ordinates are given in Table 1 and plot locations shown in Figure 1. All plots contained at least one tree trunk and these were marked with paint to aid relocating the plots. Each corner of the plot was marked with a painted marker.

Grevillea counts

Grevilleas were counted by individual stem except where the stems were clearly radiating from the same base, i.e. where stems were issuing from within a few centimetres of each other at ground height. To minimise trampling, counting was first performed around the perimeter of the plot, then transiting a smaller square within the plot about three metres inside the boundary. This method was varied depending on the density and height of vegetation within the plot which sometimes meant that individual stems were obscured until the observer was almost on top of them. Approximately 10 to 15 minutes was taken for each search by a single observer. This time may be able to be reduced for spring searches where the Grevilleas are flowering.

Plot photographs

A photograph was taken from the north-east corner of each plot looking directly towards the south west corner. The camera was located at 1.5 m high with the top edge of the photograph keeping some sky present but the camera angled down by about 10°. The images were in a 3:4 ratio in landscape orientation with a 64° field of view (broadly equivalent to a 28 mm lens on a 35mm camera). Photographs should be representative enough of the site to allow for an assessment of reasons for dramatic changes in the grevillea count.



Table 1: Corner point co-ordinates for Grevillea parviflora stem count plots

Point Name	Zone (GDA)	Easting	Northing
Gp01ne	56H	286483	6327773
Gp01nw	56H	286473	6327773
Gp01se	56H	286483	6327763
Gp01sw	56H	286473	6327763
Gp02ne	56H	286491	6327702
Gp02nw	56H	286481	6327702
Gp02se	56H	286491	6327692
Gp02sw	56H	286481	6327692
Gp03ne	56H	286594	6327597
Gp03nw	56H	286584	6327597
Gp03se	56H	286594	6327587
Gp03sw	56H	286584	6327587
Gp04ne	56H	286591	6327545
Gp04nw	56H	286581	6327545
Gp04se	56H	286591	6327535
Gp04sw	56H	286581	6327535
Gp05ne	56H	286696	6327526
Gp05nw	56H	286686	6327526
Gp05se	56H	286696	6327516
Gp05sw	56H	286686	6327516
Gp06ne	56H	286687	6328520
Gp06nw	56H	286677	6328520
Gp06se	56H	286687	6328510
Gp06sw	56H	286677	6328510
Gp07ne	56H	286733	6328462
Gp07nw	56H	286723	6328462
Gp07se	56H	286733	6328452
Gp07sw	56H	286723	6328452
Gp08ne	56H	286745	6328561
Gp08nw	56H	286735	6328561
Gp08se	56H	286745	6328551
Gp08sw	56H	286735	6328551
Gp09ne	56H	286784	6328238
Gp09nw	56H	286774	6328238
Gp09se	56H	286784	6328228
Gp09sw	56H	286774	6328228
Photo point ()	56H	286474	6327780

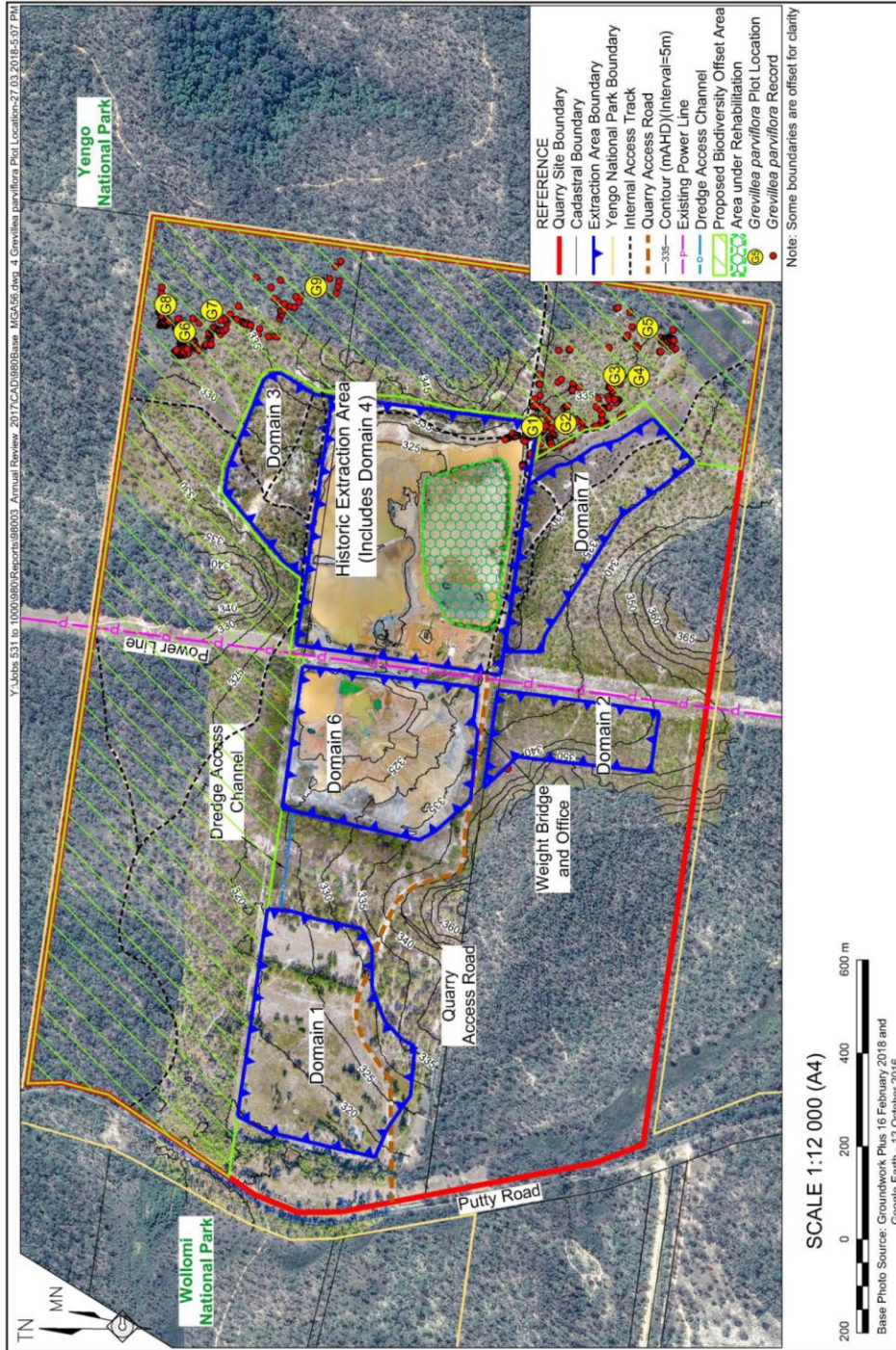


Figure 1: Map of Tinda Creek operations areas including the *Grevillea parviflora* records and permanent monitoring plots.

Area search

A walk was undertaken around the approximate boundary of the two population areas searching for additional and continued occurrences of *Grevillea parviflora*. Plants that were clearly additional to those already mapped were recorded.

Results

Plot stem counts

Table 2 presents the stem counts in each of the nine plots. Each plot had some stems of *Grevillea parviflora*. The plots with the highest density were all in the southern group of plots. There were a total of 212 stems counted which represents approximately a quarter of all the previous records. This gives an average density of 2356 stems/ha. There was a median density of 1800 stems/ha. Based on the plot with the lowest stem count, we might expect that there are a minimum of 1800 *Grevillea parviflora* stems on the site. It is not clear if earlier records (2011/2012) were made on all stems or larger groups of stems representing a single plant.



Plate 1: Small specimens of *Grevillea parviflora* without flowers and standing less than 300 mm high. Easily overlooked.



Table 2: *Grevillea parviflora* stem counts for nine 10x10 m plots at Tinda Creek offset area

Group	Name	<i>Grevillea parviflora</i> count	Notes
South	Gp01	18	Significant numbers of <i>Grevillea parviflora</i> to south of plot. Substantial tree regeneration on the NW side of the plot
South	Gp02	51	More <i>Grevillea parviflora</i> to the south.
South	Gp03	33	Heath reverting to forest
South	Gp04	47	Larger shrubs dominate plot
South	Gp05	20	<i>Grevillea parviflora</i> evenly spread around plot
North	Gp06	16	Sedge heath
North	Gp07	11	Dense <i>Angophora bakeri</i> regeneration
North	Gp08	14	<i>Grevillea parviflora</i> mostly very small
North	Gp09	2	Diverse (floristic and structural) heath

Plot photo monitoring

The plot photos are presented below. As with the permanent plot stem counts, these will become valuable in following years of monitoring.



Gp01



Gp02



Gp03



Gp04



Gp05





20 March 2018

Gp06



20 March 2018

Gp07



Gp08



Gp09



Area search observations

The general area search did not reveal any additional stands of *Grevillea parviflora* more than 15 m (the approximate reliability of non-differential GPS) from already mapped plants although there were substantial numbers of plants encountered, particularly in woodland more than in open “swamp” environments. There seemed to be a notable absence of *Grevillea parviflora* immediately adjacent to tracks or other disturbance. However, they were present after about one meter into undisturbed vegetation. Some of the densest areas of *Grevillea parviflora* stems were in areas that appeared to have been old tracks, now revegetated with a range of sedges and small heath plants including the grevillea.

Judging from imagery available through Google Earth, there has been no recent disturbance of the *Grevillea parviflora* habitat in the offset area, since the current management plan was implemented.

An additional photo point was established at the edge of the approved disturbance area (about 7 metres north of plot 1) with photos taken looking south-east (Plate 2) and south west (Plate 3).



Plate 2: Additional photo point looking south-east



Plate 3: Additional photo point looking south-west

Because the photo point is at the edge of the disturbance, any continuing encroachment of the pit into the *Grevillea parviflora* habitat will be relatively obvious



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26 September 2018

Darryl Thiedeke
Adelaide Brighton Ltd
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Dear Darryl

Re: *Grevillea parviflora* subsp. *parviflora* monitoring at Tinda Creek offset area

On 11th September 2018, Niche performed a survey on an already established series of permanent monitoring plots for *Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea) on the offset area adjacent to the Tinda Creek sand quarry, Putty Road, Mellong, NSW.

As a guideline for this survey, Niche used the methods set-out in section 7.2.5 of the May 2017 management plan for the site:

- stem counts in permanent plots
- photo monitoring to assist in recording observable changes over time
- habitat quality and evidence or not of adverse impacts.

The minimum suggested number of plots was exceeded in this study (nine plots as opposed to “two of the four transects/plots”). The time of year that the monitoring was undertaken was within the *Grevillea parviflora* subsp. *parviflora* known flowering period (July to December). However, flowering was not occurring at the time of monitoring. Most plants did not have any buds or signs of recent flowering. Approximately 5% of observed plants had some buds present. Typically these were the larger specimens.

This survey represents the second baseline survey for ongoing monitoring. *Grevillea parviflora* subsp. *parviflora* was observed to remain common through the offset area with a median measured density of 1800 stems per hectare, similar densities to the autumn monitoring.

I have included the methods and results of the survey in the following attached document.

Yours sincerely

A handwritten signature in black ink that reads "Matthew Stanton".

Matthew Stanton
Niche Environment and Heritage



Scope of the survey for *Grevillea parviflora* subsp. *parviflora*

The following statement has guided the establishment of the permanent monitoring plots. “The goal of the monitoring is to ensure that the expansion of quarry activities does not have an adverse effect on the habitat of *Grevillea parviflora* and that the habitat for the species is maintained or improved over the life of the operation”.

Because the original March 2018 surveys were done out of flowering season, the numbers recorded may be expected to be an under estimate. However, when revisited in September 2018 within the known flowering period for the species, there was still little sign of flowering.

Methods

Plot establishment

The two areas mapped as containing *Grevillea parviflora* subsp. *parviflora* (Umwelt 2017) measure approximately 5.4 hectares for the southern group and approximately 4.4 hectares for the northern group although this depends on how one defines the area. It was decided that a sampling ratio of around 1:100 would be appropriate. Nine 10x10 metre plots were randomly located in the two areas, five in the southern area and four plots in the northern area. Plot location requirements were that there was to be a minimum distance of 50 metres between plot centres and that there must be a confirmed presence of *Grevillea parviflora* subsp. *parviflora* within sight of the plot (even if there were none within the plot).

10x10 metre plots were chosen as these will form a component of general flora surveys for other monitoring requirements. The established plots may become part of the future flora survey plots.

Each plot was aligned to the UTM grid. The corner co-ordinates are given in Table 1 and plot locations shown in Figure 1. All plots contained at least one tree trunk and these were marked with paint to aid relocating the plots. Each corner of the plot was marked with a painted marker.

Grevillea counts

Grevilleas were counted by individual stem except where the stems were clearly radiating from the same base, i.e. where stems were issuing from within a few centimetres of each other at ground height. To minimise trampling, counting was first performed around the perimeter of the plot, then transiting a smaller square within the plot about three metres inside the boundary. This method was varied depending on the density and height of vegetation within the plot which sometimes meant that individual stems were obscured until the observer was almost on top of them. Approximately 10 to 15 minutes was taken for each search by a single observer. This time may be able to be reduced for spring searches where the Grevilleas are flowering.

Plot photographs

A photograph was taken from the north-east corner of each plot looking directly towards the south west corner. The camera was located at 1.5 m high with the top edge of the photograph keeping some sky present but the camera angled down by about 10°. The images were in a 3:4 ratio in landscape orientation with a 64° field of view (broadly equivalent to a 28 mm lens on a 35mm camera). Photographs should be representative enough of the site to allow for an assessment of reasons for dramatic changes in the grevillea count.



Table 1: Corner point co-ordinates for *Grevillea parviflora* subsp. *parviflora* stem count plots

Point Name	Zone (GDA)	Easting	Northing
Gp01ne	56H	286483	6327773
Gp01nw	56H	286473	6327773
Gp01se	56H	286483	6327763
Gp01sw	56H	286473	6327763
Gp02ne	56H	286491	6327702
Gp02nw	56H	286481	6327702
Gp02se	56H	286491	6327692
Gp02sw	56H	286481	6327692
Gp03ne	56H	286594	6327597
Gp03nw	56H	286584	6327597
Gp03se	56H	286594	6327587
Gp03sw	56H	286584	6327587
Gp04ne	56H	286591	6327545
Gp04nw	56H	286581	6327545
Gp04se	56H	286591	6327535
Gp04sw	56H	286581	6327535
Gp05ne	56H	286696	6327526
Gp05nw	56H	286686	6327526
Gp05se	56H	286696	6327516
Gp05sw	56H	286686	6327516
Gp06ne	56H	286687	6328520
Gp06nw	56H	286677	6328520
Gp06se	56H	286687	6328510
Gp06sw	56H	286677	6328510
Gp07ne	56H	286733	6328462
Gp07nw	56H	286723	6328462
Gp07se	56H	286733	6328452
Gp07sw	56H	286723	6328452
Gp08ne	56H	286745	6328561
Gp08nw	56H	286735	6328561
Gp08se	56H	286745	6328551
Gp08sw	56H	286735	6328551
Gp09ne	56H	286784	6328238
Gp09nw	56H	286774	6328238
Gp09se	56H	286784	6328228
Gp09sw	56H	286774	6328228
Photo point ()	56H	286474	6327780

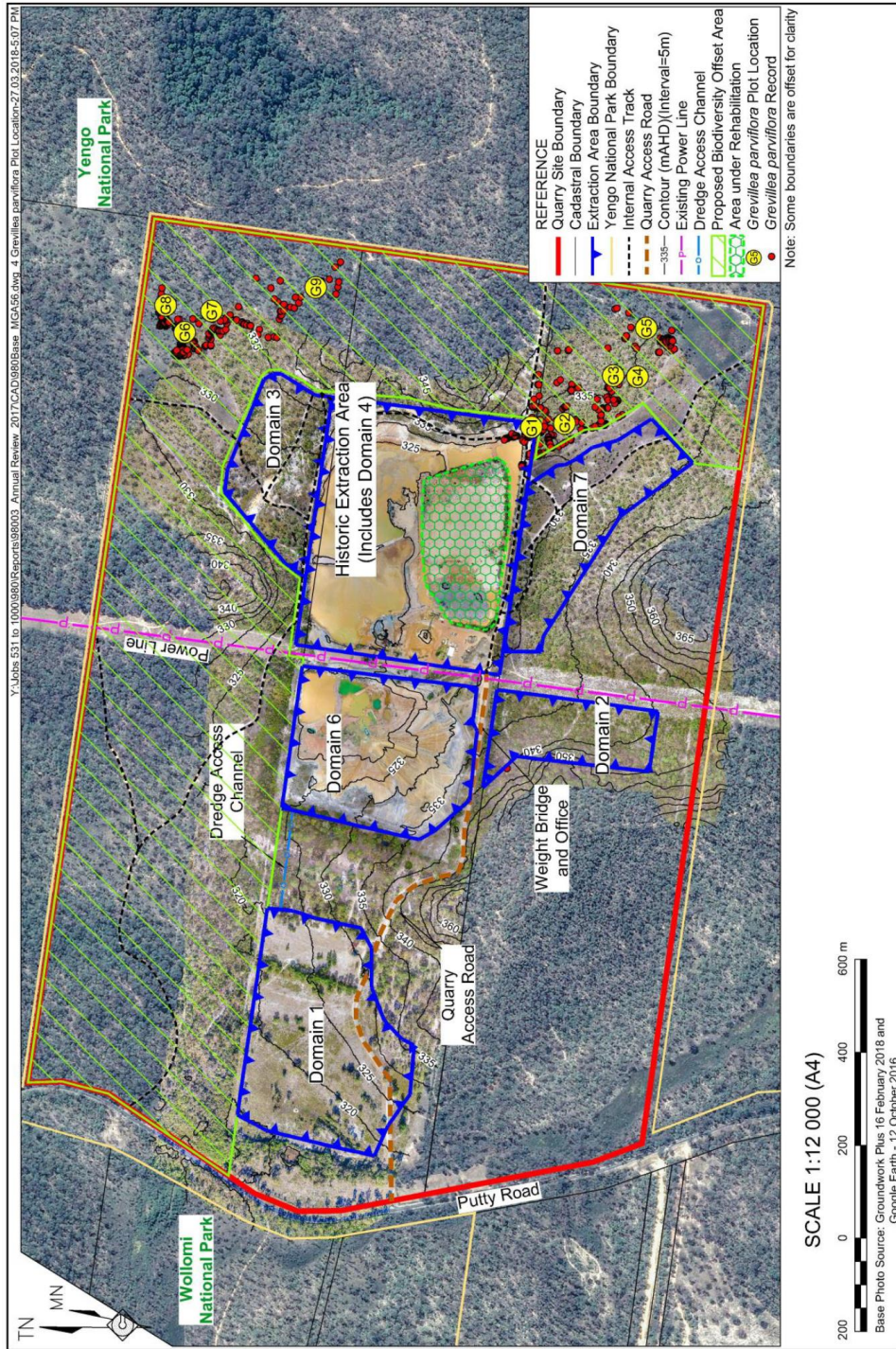


Figure 1: Map of Tinda Creek operations areas including the *Grevillea parviflora* subsp. *parviflora* records and permanent monitoring plots

Area search

A walk was undertaken around the approximate boundary of the two population areas searching for additional and continued occurrences of *Grevillea parviflora* subsp. *parviflora*. Plants that were clearly additional to those already mapped were recorded. A second walk was planned for spring, however, this has been delayed until there is a flowering event.

Results

Plot stem counts

Table 2 presents the stem counts in each of the nine plots. Each plot contained some stems of *Grevillea parviflora* subsp. *parviflora* (Plate 1). The plots with the highest density were all in the southern group of plots. For the March 2018 count, there were a total of 212 stems counted which represents approximately a quarter of all the previous records. The September 2018 count had a total of 208 stems. This gives an average density of 2356 and 2311 stems/ha. There was a median density of 1800 and 2000 stems/ha. Based on the plot with the lowest stem count, we might expect that there are a minimum of 1800 *Grevillea parviflora* subsp. *parviflora* stems on the site. It is not clear if earlier records (2011/2012) were made on all stems or larger groups of stems representing a single plant.



Plate 1: Small specimens of *Grevillea parviflora* subsp. *parviflora* without flowers and standing less than 300 mm high. Easily overlooked.



Table 2: *Grevillea parviflora* subsp. *parviflora* stem counts for nine 10x10 m plots at Tinda Creek offset area

Group	Name	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> March	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> September	Notes
South	Gp01	18	18	Significant numbers of <i>Grevillea parviflora</i> subsp. <i>parviflora</i> to south of plot. Substantial tree regeneration on the NW side of the plot
South	Gp02	51	48	More <i>Grevillea parviflora</i> subsp. <i>parviflora</i> to the south.
South	Gp03	33	30	Heath reverting to forest
South	Gp04	47	41	Larger shrubs dominate plot
South	Gp05	20	20	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> evenly spread around plot
North	Gp06	16	13	Sedge heath
North	Gp07	11	21	Dense <i>Angophora bakeri</i> regeneration
North	Gp08	14	14	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> mostly very small
North	Gp09	2	3	Diverse (floristic and structural) heath

Plot photo monitoring

The plot photos are presented below. As with the permanent plot stem counts, these will become valuable in following years of monitoring.



Gp01





Gp02





20 March 2018

Gp03



11 Sept 2018



Gp04





Gp05





Gp06





Gp07





Gp08





Gp09



Area search observations

The general area search did not reveal any additional stands of *Grevillea parviflora* subsp. *parviflora* more than 15 m (the approximate reliability of non-differential GPS) from already mapped plants although there were substantial numbers of plants encountered, particularly in woodland more than in open “swamp” environments. There seemed to be a notable absence of *Grevillea parviflora* subsp. *parviflora* immediately adjacent to tracks or other disturbance. However, they were present after about one meter into undisturbed vegetation. Some of the densest areas of *Grevillea parviflora* subsp. *parviflora* stems were in areas that appeared to have been old tracks, now revegetated with a range of sedges and small heath plants including the grevillea.

Judging from imagery available through Google Earth, there has been no recent disturbance of the *Grevillea parviflora* subsp. *parviflora* habitat in the offset area, since the current management plan was implemented.

An additional photo point was established at the edge of the approved disturbance area (about 7 metres north of plot 1) with photos taken looking south-east (Plate 2) and south west (Plate 3).



Plate 2: Additional photo point looking south-east



Plate 3: Additional photo point looking south-west

Because the photo point is at the edge of the disturbance, any continuing encroachment of the pit into the *Grevillea parviflora* subsp. *parviflora* habitat will be relatively obvious.

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Appendix 7

Aquatic Monitoring Report

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Aquatic Monitoring Report

Spring 2018

Prepared for Tinda Creek Quarry Pty Ltd

March 2019



Document control

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Cover photograph: Control tributary stream



Executive summary

An aquatic monitoring program was established as a requirement of the Landscape Management Plan (LMP) for the Tinda Creek Quarry. The program involves survey and analytical methods for measuring macroinvertebrates, stream health, water quality and catchment-riparian conditions.

The aim of the monitoring program is to monitor the river health of Tinda Creek and its tributaries. The monitoring includes:

- Assessment of stream condition using Riparian and Channel and Environment inventory assessment (RCE)
- Assessment of habitat condition using AUSRIVAS proforma
- Assessment of water quality against default ANZECC trigger values
- Assessment of the macroinvertebrate community condition using Stream Invertebrate Grade Number Average Level (SIGNAL).

In comparison to 2015, the sites were much dryer which resulted in less aquatic habitat, poorer water quality and fewer sites able to be sampled. Aquatic environments downstream of Tinda Creek Quarry infrastructure were found to have a good riparian condition and channel morphology. The macroinvertebrate community had low AUSRIVAS and SIGNAL scores indicative of poor stream health, however this is the result of the streams having limited water and aquatic habitat and hence influenced by natural stressors associated with intermittent/ephemeral streams.



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Glossary and abbreviations

ANZECC	Australian and New Zealand Environment and Conservation Council
Anthropogenic	Caused or produced by humans
Aquatic macroinvertebrates	Animals that have no backbone, are visible with the naked eye and spend all or part of their life in water
AUSRIVAS	Australian Rivers Assessment System
CMA	Catchment Management Area
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
Ecology	The study of the relationship between living things and the environment.
Ephemeral	Existing for a short amount of time.
Habitat	The place where a species, population or ecological community lives (whether permanently, periodically or occasionally).
LMP	Landscape Management Plan
RCE inventory	Riparian and Channel and Environment inventory assessment.
Riparian	Relating to the banks of a natural waterway.
SIGNAL	Stream Invertebrate Grade Number Average Level. SIGNAL2 scores are indicative only and pollution does not refer to just anthropogenic sources. Environmental stress may result in poor water quality occurring naturally in waterways such as those conditions found in ephemeral streams. Low family richness and the occurrence of pollution tolerant invertebrates can give a low SIGNAL score even though they are a natural condition
Stress	Response to a stressor such as an environmental condition or a stimulus.



1. Introduction

1.1 Background

As part of the Tinda Creek Quarry Landscape Management Plan (LMP), a macroinvertebrate monitoring program within the Tinda Creek system and its tributaries was established to monitor changes to the system over time and assess possible influence from Quarry operations. The program includes methods for assessing stream health through the monitoring of macroinvertebrates, water quality and catchment-riparian conditions.

A baseline survey and assessment of eight sites was conducted in August 2007 shortly after a period of heavy rainfall and runoff. Following the 2015 approval for expansion of the Quarry, another survey was conducted in November 2015 to update the baseline records. Hy-Tec has committed to annual monitoring under the approved Landscape Management Plan. Niche were engaged to conduct aquatic monitoring in spring 2018.

1.2 Catchment characteristics

The aquatic habitats surrounding the Tinda Creek Quarry include:

- Tinda Creek, a tributary of Wollemi Creek which joins the Colo River approximately 16 km to the west of the project area;
- ephemeral drainage lines that flow to Tinda Creek;
- artificially created diversion channels; and
- farm dam sites.

Tinda Creek is an ephemeral stream which flows to the west away from the Quarry grounds. It has been diverted around the eastern and northern boundaries of the current operation zone via small earth drainage channels.

Tinda Creek is met by ephemeral second order drainage lines on the northern boundary of the Quarry. These lines do not hold water due to the substrate having a high concentration of sand and silt, and as such, are usually dry due to the sandy substrate having such a high permeability.

Two small former farm dams are located within the property to the north of the Quarry. These dams are overgrown with vegetation.

1.3 Aim

The aim of the aquatic monitoring program is to assess the health of Tinda Creek and its tributaries to ensure that the expanded quarry operations do not result in adverse impacts to the health of the downstream creek system. Specifically, in regards to aquatic environment and aquatic habitat health of the Greater Blue Mountains World Heritage Area. The monitoring includes:

- Assessment of stream condition using RCE
- Assessment of habitat condition using AUSRIVAS
- Assessment of water quality against default ANZECC trigger values
- Assessment of the macroinvertebrate community condition using SIGNAL.

2. Methods

2.1 Location of monitoring sites

A total of eight sites were sampled along the Tinda Creek system and its tributaries (Figure 1, Table 1) consistent with the baseline monitoring conducted in 2015. This included sites upstream and sites downstream of operations of the Quarry and therefore provides both reference and test sites for monitoring.

Table 1: Location of monitoring sites

Site	Stream	Location	Easting	Northing
Site 1	Tinda Creek	Tinda Creek Upstream of Quarry	286599	6327354
Site 2	Tinda Creek	Tinda Creek Upstream of Quarry	286400	6328390
Site 3	Tinda Creek Diversion Channel	Tinda Creek Diversion channel within Quarry	286405	6327957
Site 4	Tinda Creek	Tinda Creek Downstream of Quarry	285711	6328427
Site 5	Tributary of Tinda Creek	Tinda Creek Tributary	284913	6328247
Site 6	Tinda Creek	Tinda Creek downstream of Quarry	284048	6328633
Site 7	Tinda Creek	Tinda Creek downstream of Quarry	282998	6328847
Site 8	Tributary of Tinda Creek	Tinda Creek tributary (Outside of Quarry influence)	284476	6329656

2.1.1 Site 1 – Tinda Creek, Upstream of Quarry

Site 1 is situated on the upper reaches of Tinda Creek, upstream and to the southeast of Quarry activities. In this location, Tinda Creek lacks a defined drainage channel, being characterised by an open, sandy floodplain. As Site 1 is located upstream of the quarry, it will be monitored as a reference site.

2.1.2 Site 2 – Tinda Creek, Upstream of Quarry

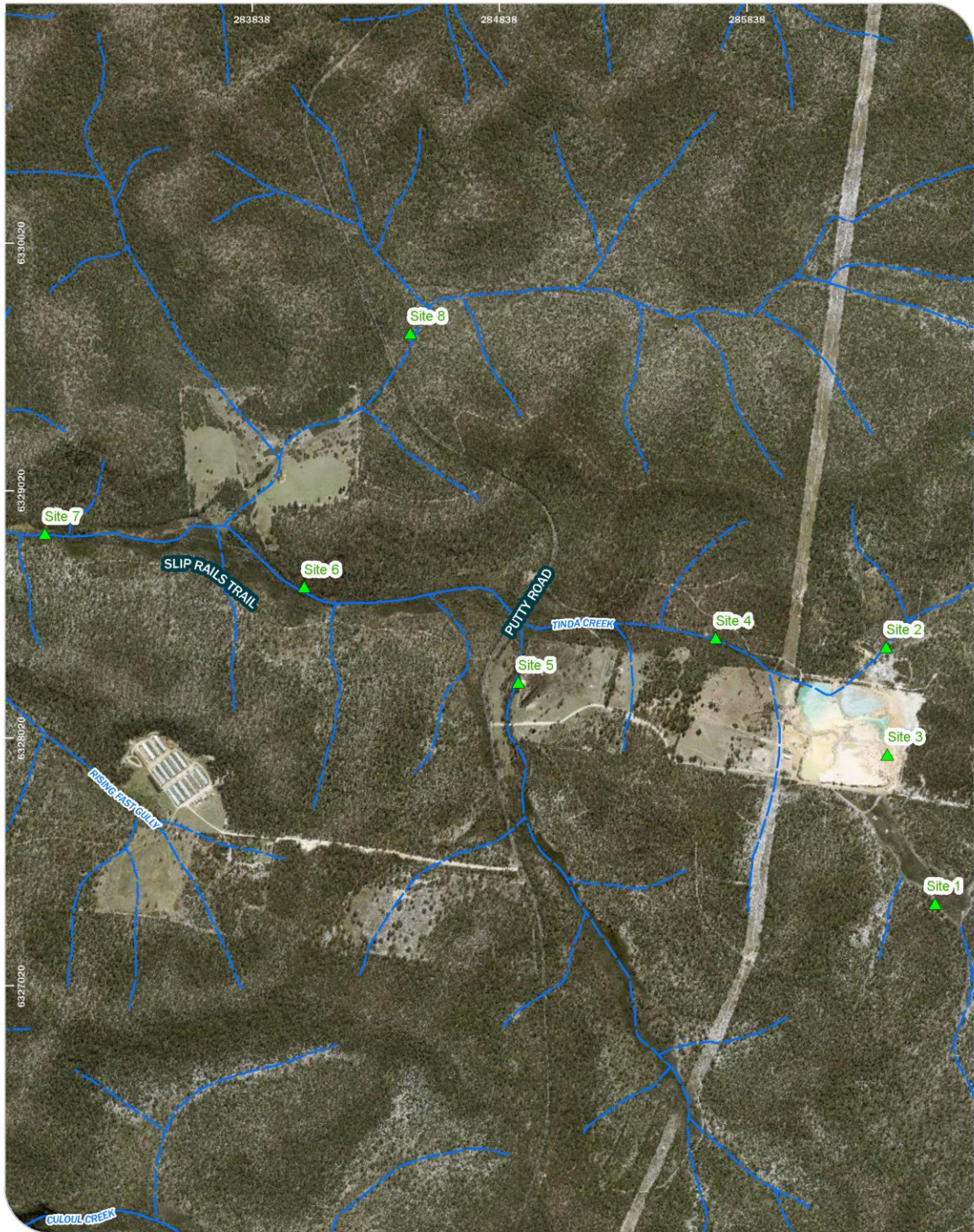
Site 2 is located upstream and to the north of the Quarry and is downstream of a former farm dam. Site 2 is located on a section of an upper tributary of Tinda Creek formed as a constructed drainage channel with an open floodplain. As Site 2 is located upstream of the Quarry, it will be monitored as a reference site.

2.1.3 Site 3 – Tinda Creek Quarry – Clean Water Diversion

Site 3 is situated along a clean water diversion channel that was constructed to divert overland flows around the eastern edge of the Quarry and to the north towards Tinda Creek. The diversion channel is generally less than 2m in width. Site 3 comprises a test site.

2.1.4 Site 4 – Downstream of the Quarry

Site 4 is located downstream of the Quarry along a section of Tinda Creek that occurs just upstream of a small former farm dam. Tinda Creek at Site 4 comprises a defined drainage channel which supports a number of small, isolated pools. As Site 4 is situated downstream of the Quarry, it will be monitored as a test site.



Drawn by: Phung Kafe File: T:\spatial\projects\ba4200\4216_TindaCreek_VegKata_NSWMap\reports\216_Figure_1_Aquatic.mxd Last updated: 3/1/2019 3:38:34 PM

		<p>Location of Monitoring Sites Tinda Creek Aquatic Monitoring</p> <p>Niche PM: Matthew Russell Niche Proj. #: 4216 Client: Hy-Tech</p> <p>Figure 1</p> <p><small>publicNSW_imagery</small></p>
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v2.0



2.1.5 Site 5 – Tinda Creek Tributary

Site 5 comprises a tributary of Tinda Creek that runs generally parallel to the eastern side of Putty Road and joins Tinda Creek just upstream of the road culvert. The tributary at this site comprises a series of wide pools interspersed with narrower sections. Site 5 will be monitored as a reference site.

2.1.6 Site 6 – Tinda Creek, West of Putty Road

Site 6 is situated on Tinda Creek, approximately 0.75km downstream of Putty Road. Site 6, comprises a shallow channel with broad floodplain. As Site 6 is downstream of the quarry, it will be monitored as a test site.

2.1.7 Site 7 – Tinda Creek, Far West of Putty Road

Site 7 is positioned along Tinda Creek, approximately 2km downstream of Putty Road. Site 7 comprises a broad, open channel. As Site 7 is downstream of the Quarry, it will be monitored as a test site.

2.1.8 Site 8 – Tinda Creek, northern territory

Site 8 is located upstream of Putty Road within a tributary of Tinda Creek to the north of the Quarry that is not influenced by Quarry operations. The site is directly above the culvert under Putty Road and comprises a broad open channel. Given that Site 8 occurs in a tributary that could not be affected by the quarry operations it is monitored as a reference site.

2.2 Field methods

The field survey was undertaken on the 24 October 2018. Field methods were consistent with standardised techniques for field sampling as prescribed by AUSRIVAS (Turak *et al.* 2000). The AUSRIVAS methods of sampling both pools and riffles has been modified for this program, as no suitable in-stream riffle features were present. A summary of the survey methods used at each of the eight sites is provided in Table 2.

Application of some methods were limited at some of the sites as the sites were dry at the time of the survey.

Table 2: Summary of methods at each site

Site	Macroinvertebrate sampling	AusRivAS habitat assessment	RCE assessment	Photo monitoring
Site 1			X	X
Site 2			X	X
Site 3			X	X
Site 4	X	X	X	X
Site 5	X	X	X	X
Site 6	X	X	X	X
Site 7	X	X	X	X
Site 8	X	X	X	X

2.2.9 Aquatic habitat and stream condition

Riparian, Channel and Environment inventory assessment (RCE)

The RCE Inventory (Chessman *et al.* 1997) provides a comparative measure of stream condition by assessing both the stream and its riparian environment in terms of habitat diversity, habitat condition and the degree of human-induced disturbance. Thirteen categories each receive a score between one and four



based on their condition, resulting in an accumulated score of between 13 and 52. The maximum score (52) indicates a stream with little or no obvious physical disruption and the lowest score (13) indicates a heavily channelled stream without any riparian vegetation. This assessment provided an assessment of the general condition of the stream and must be interpreted accordingly.

Habitat description

A description of aquatic habitat was also produced using the AUSRIVAS proforma. The survey is a rapid visual assessment used to describe the habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

Macro-invertebrate sampling

Macro-invertebrate sampling was to be undertaken at sites 4-8 in accordance with AusRivAS protocol (Turak et al., 2004), where possible. This is due to the fact that sites 1-3 do not typically hold sufficient water to allow for sampling. The lack of sufficient water in these sites is a result of the ephemeral nature of the streams in the project area and the sandy substrate.

2.2.10 Water quality

Surface water quality was measured *in situ* using a Yeokal 611 water quality probe at each site. The following variables were recorded:

- Temperature (°C)
- Conductivity (µS/cm)
- pH
- Dissolved oxygen (DO)(% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCa₃/L) was measured with a standard titration kit. Water quality data were compared with the ANZECC (2000) default guideline values to physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia.

2.2.11 Macroinvertebrates

Samples of macroinvertebrates were collected from pool edges for a length of 10 metres, either as a continuous line or in disconnected segments. Sampling in segments was often undertaken to ensure the sampling of sub-habitats such as macrophyte beds, bank overhangs, submerged branches and root mats. Segmented sampling was also employed where pool length was short and it was logistically difficult to sample in a continuous line (e.g. in-stream logs). A 250 µm dip net was drawn through the water with short sweeps towards the bank to dislodge benthic fauna while scraping submerged rocks and debris, sides of the stream bank and the bed substrate (Plate 1). Further sweeps in the water column targeted the suspended fauna.



Plate 1: Sampling method

Each sample was rinsed from the net onto a white sorting tray from which animals were picked using forceps, pipettes and or paint brushes. Each tray was picked for a minimum period of 40 minutes, after which they were picked at 10 minute intervals for either a total of one hour or until no new specimens had been found. Care was taken to collect cryptic and fast moving animals, in addition to those that were conspicuous or slow. The animals collected at each site were placed into a labelled jar containing 70% ethanol.

Laboratory methods-invertebrate identification

Macroinvertebrate samples were identified to family level with the exception of Oligochaeta (to class), Polychaeta (to class), Ostracoda (to subclass), Nematoda (to phylum), Nemertea (to phylum), Acarina (to order) and Chironomidae (to subfamily). Keys used to identify taxa included:

- Centre for Freshwater Ecosystems (n.d.) – Identification Key and Ecology of Australian Freshwater Invertebrates. <http://www.mdfrc.org.au/bugguide/>.
- Dean, J., Rosalind, M., St Clair, M., and Cartwright, D. (2004) Identification keys to Australian families and genera of caddis-fly larvae (Trichoptera) Cooperative Research Centre for Freshwater Ecology.
- Gooderham, J. and Tsyrlin, E. (2002) The Waterbug Book: A guide to the Freshwater Macroinvertebrates of Temperate Australia, CSIRO Publishing.
- Hawking and Theischinger (1999) A guide to the identification of larvae of Australian families and to the identification of ecology of larvae from NSW.
- Madden, C. (2010) Key to genera of Australian Chironomidae. Museum Victoria Science Reports 12, 1-31.
- Madden, C. (2011) Draft identification key to families of Diptera larvae of Australian inland waters La Trobe University.
- Smith, B. (1996) Identification keys to the families and genera of bivalve and gastropod molluscs found in Australian inland waters Murray Darling Freshwater Research Centre.



2.3 Data analysis

2.3.1 SIGNAL: (Stream Invertebrate Grade Number Average Level) scores

The revised SIGNAL2 biotic index developed by Chessman (2003a and 2003b) was used to determine the “environmental quality” of sites. This method assigns grade numbers to each macroinvertebrate family or taxa found, based largely on their response to a range of environmental conditions (Table 3). The sum of all grade numbers for that habitat is then divided by the total number of families recorded in each habitat to calculate the SIGNAL2 index. A weighted SIGNAL2 score was also calculated (see Chessman 2003b). The SIGNAL2 index therefore uses the average sensitivity of macroinvertebrate families to present a snapshot of biotic integrity at a site.

Table 4 provides a broad guide for interpreting the health of the site according to the SIGNAL2 score of the site.

Table 3: SIGNAL Grade and the Level of Pollution Tolerance

SIGNAL Grade	Pollution Tolerance
10-8	Indicates a greater sensitivity to pollution
7-5	Indicates a sensitivity to pollution
4-3	Indicates a tolerance to pollution
2-1	Indicates a greater tolerance to pollution

Table 4: Guide to interpreting the SIGNAL2 scores

SIGNAL2 Score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution

(Source: Gooderham and Tsyrlin 2002)

*Note that SIGNAL2 scores are indicative only and that pollution does not refer to just anthropogenic pollution. Environmental stress may result in poor water quality occurring naturally in waterways. Low family richness and the occurrence of pollution tolerant invertebrates can give a low SIGNAL score even when they are in natural condition.

2.3.2 Opportunistic observations

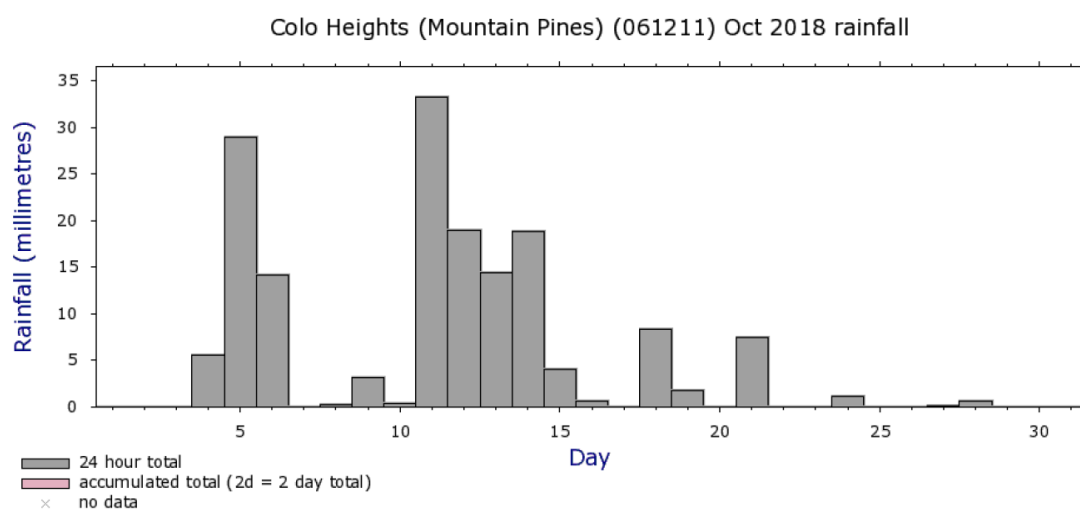
Opportunistic visual observations of aquatic fauna were recorded during the surveys at each site.



3. Results

3.1 Weather conditions

The survey was conducted on 24th October 2018. The weather was mild (approximately 20°C) with light winds. There was low rainfall in early-mid October leading up to the survey date (24th) (Figure 2). Monthly records of rainfall taken at the Quarry indicate that rainfall during 2018 was approximately 40% of the average annual rainfall from preceding years. The Quarry and the surrounding aquatic environment have therefore been impacted by persistent dry conditions.



Note: Data may not have completed quality control.

Climate Data Online, Bureau of Meteorology
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Figure 2: Rainfall data for month of October 2018

3.2 Aquatic habitat/condition

The aquatic habitat of the study area comprised pools with no active riffles. All except two sites had good riparian and channel health (RCE score 40 or above) (Table 5). Most sites exhibited stable banks and native riparian cover however most sites had distinct levels of die back when compared to previous site photographs.

Table 5: RCE inventory scores (2018)

Site	Spring 2018
Site 1	41
Site 2	30 (Constructed diversion channel)
Site 3	17 (Constructed diversion channel)
Site 4	45
Site 5	46
Site 6	46
Site 7	46
Site 8	46

An RCE score greater than 40 indicates a stream considered to be in good condition with potential for higher biodiversity values. RCE Scores of 20-40 indicate a stream is in moderate condition and below 20 indicates that the stream is in very poor condition



3.2.1 Site 1 Tinda Creek upstream of the quarry

The aquatic habitat at Site 1 (Plate 2) at the time of the spring 2018 monitoring surveys is detailed in Table 6.



Site 1 Downstream

Site 1 Upstream

Plate 2: Site 1

Table 6: Site 1 habitat results

	Attribute	Site 1
	Photograph	Plate 2
Riparian	RCE score	41
	Vegetation	Canopy absent. Scattered Parramatta red gum (<i>Eucalyptus parramattensis</i>) regenerating within this location. Mid-story absent. Groundcover dominated by sedge, low shrub, herb and grasses. (<i>Leptocarpus tenax</i> ; <i>juncus species</i> ; <i>lepyrodia scariosa</i> ; <i>Schoenus brevifolius</i> ; <i>Entolasia stricta</i> ; <i>Gonocarpus micranthus</i> ; <i>Melaleuca thymifolia</i> ; <i>kMicromyrtus ciliate</i> and <i>Dampiera stricta</i>).
	Stream shading	Low; <5%
	Exotic vegetation	-
Stream characteristics	Modal width (m)	-
	Substrate	Majority sand and silt
	Flow/depth	No flow
	Macrophytes/algae	Absent
	Water quality observations	Dry
Comments		Lacking defined drainage channel. Open sandy floodplain.

3.2.2 Site 2 Tinda Creek upstream of the quarry

The aquatic habitat at Site 2 (Plate 3) at the time of the spring 2018 monitoring surveys is detailed in Table 7.



Site 2 Downstream

Site 2 Upstream

Plate 3: Site 2

Table 7: Site 2 habitat results

	Attribute	Site 2
	Photograph	Plate 3
Riparian	RCE score	30 (Constructed drainage channel)
	Vegetation	Canopy consisted of sparse Scribbly Gums (<i>Eucalyptus haemastoma</i>), with a scattered grass/shrub land dominated by <i>Chorizandra spaerocephala</i> .
	Stream shading	Low/Moderate
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<1m
	Substrate	Sand 80%, Silt 20%
	Flow/depth	No flow
	Macrophytes/algae	Absent-
	Water quality observations	Dry
Comments		Constructed channel to drain farm dam

3.2.3 Site 3 Tinda Creek Diversion channel within Quarry

The aquatic habitat at Site 3 (Plate 4) at the time of the spring 2018 monitoring surveys is detailed in Table 8.



Site 3 Downstream

Site 3 Upstream

Plate 4: Site 3

Table 8: Site 3 habitat results

	Attribute	Site 3
	Photograph	Plate 4
Riparian	RCE score	7 (Constructed channel)
	Vegetation	Canopy absent. Mid-story absent. Groundcover dominated by <i>Chorizandra spaerocephala</i> .
	Stream shading	Low/none
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<2m
	Substrate	Sand 70%, silt 30%
	Flow/depth	No flow/<1m
	Macrophytes/algae	Absent
	Water quality observations	Clear
Comments		Very low flow. Separate puddles.



3.2.4 Site 4 Tinda Creek Downstream of Quarry

The aquatic habitat at Site 4 (Plate 5) at the time of the spring 2018 monitoring surveys is detailed in Table 9.



Site 4 Downstream

Site 4 Upstream

Plate 5: Site 4

Table 9: Site 4 habitat results

	Attribute	Site 4
	Photograph	Plate 5
Riparian	RCE score	45
	Vegetation	Canopy composed of <i>Eucalyptus haemastoma</i> (<5%). Mid-story dominated by small trees and tall shrubs. Ground cover was sparse with signs of slight die back and dominated by <i>Chorizandra spaerocephala</i> .
	Stream shading	Moderate
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<2m
	Substrate	Pebble 5%, 80% silt, 15% sand
	Flow/depth	No flow/dry
	Macrophytes/algae	Absent
	Water quality observations	Dry
Comments		Signs of erosion of banks

3.2.5 Site 5 Tinda Creek Tributary

The aquatic habitat at Site 5 (Plate 6) at the time of the spring 2018 monitoring surveys is detailed in Table 10.



Site 5 Downstream

Site 5 Upstream

Plate 6: Site 5

Table 10: Site 5 habitat results

	Attribute	Site 5
	Photograph	Plate 6
Riparian	RCE score	46
	Vegetation	Canopy present and comprised of <i>eucalyptus haemastoma</i> , Mid-story supporting dense cover of small trees and tall shrubs (<i>Acacia spp</i> and <i>Cassurina spp</i>). Groundcover suffering from significant die back, but dominated by regenerative Cat-tailed bulrush (<i>Typha</i>), Round headed bristle sedge (<i>Chorizandra spaerocephala</i>).
	Stream shading	Low-Moderate
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<4m
	Substrate	Silt 90%, sand 10%
	Flow/depth	No flow/<1m
	Macrophytes/algae	Regenerating Bulrush (<i>Typha</i>)
	Water quality observations	No flow/dark/turbid
Comments		Stagnant water, dieback of vegetation present.

3.2.6 Site 6 Tinda Creek downstream of Quarry

The aquatic habitat at Site 6 (Plate 7) at the time of the spring 2018 monitoring surveys is detailed in Table 11.



Site 6 Downstream

Site 6 Upstream

Plate 7: Site 6

Table 11: Site 6 habitat results

	Attribute	Site 6
	Photograph	Plate 7
Riparian characteristics	RCE score	46
	Vegetation	Forest Red Gum (<i>Eucalyptus tereticornis</i>), White Stringybark (<i>E. globoidea</i>). The mid-storey was dominated by small trees and tall shrubs. The ground cover consisted of native grasses, herbs and ferns.
	Stream shading	Moderate/High
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<3m
	Substrate	Sand 20%, silt 80%
	Flow/depth	Low flow/<1m
	Macrophytes/algae	Macrophytes regenerating
	Water quality observations	Stained
Comments	No flow, stagnant tannin stained pools.	



3.2.7 Site 7 Tinda Creek downstream of Quarry

The aquatic habitat at Site 7 (Plate 8) at the time of the spring 2018 monitoring surveys is detailed in Table 12.



Site 7 Downstream

Site 7 Upstream

Plate 8: Site 7

Table 12: Site 7 habitat results

	Attribute	Site 7
	Photograph	Plate 8
Riparian characteristics	RCE score	46
	Vegetation	Canopy vegetation included Grey Gums and Scribbly Gums. The mid-storey was absent. The ground cover consisted of by native grasses, herbs and ferns, as well as Macrophytes.
	Stream shading	Low/moderate
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<5m
	Substrate	Silt 100%
	Flow/depth	No flow/ Dry
	Macrophytes/algae	Cattail Bulrush (<i>Typha</i>)
	Water quality observations	No surface pools
Comments		No Surface water. Overgrown creek bed.



3.2.8 Site 8 Tinda Creek tributary (Outside of Quarry influence)

The aquatic habitat at Site 8 (Plate 7) at the time of the spring 2018 monitoring surveys is detailed in Table 13.



Site 8 Downstream

Site 8 Upstream

Plate 9: Site 8

Table 13: Site 8 habitat results

	Attribute	Site 8
	Photograph	Plate 7
Riparian characteristics	RCE score	46
	Vegetation	Canopy vegetation composed of Grey Gums and Scribbly gums. The mid-storey was dominated by tall shrubs. The ground cover consisted of native grasses, herbs and ferns along with Eucalyptus regeneration and casuarina regeneration.
	Stream shading	Moderate/High
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<2m
	Substrate	Pebble 30%, sand 20%, silt 50%
	Flow/depth	Low flow/<1m
	Macrophytes/algae	Absent-
	Water quality observations	Turbid
Comments		No flow, isolated pools.



3.3 Water quality

Water samples were only possible at three of the eight sites.

The results (Table 14) show that temperature ranged between 15.95 – 16.58 °C; the warmest being Site 5. Conductivity ranged between 111-404 µS/cm; the highest recorded in Site 5. All sites except for Site 5 (404 µS/cm) were within the ANZECC trigger values for conductivity (30-350 µS/cm). Turbidity ranged 5.3-78.8 NTU with the highest recorded in Site 8. Dissolved Oxygen (DO) values were generally low (between 14.8-43.2 % sat) and were below ANZECC trigger values (80-110%). All pH readings for this survey were within ANZECC trigger values. Alkalinity ranged between 20-50 CaCa₃/L; with both Site 6 and 8 having the lowest buffering capacity (20 mg CaCa₃/L) and Site 5 having the highest (50 mg CaCa₃/L).

Table 14: Water quality results

Site acronym	Temp (C°)	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCa ₃ /L)
Site 1	-	-	-	-	-	-
Site 2	-	-	-	-	-	-
Site 3	-	-	-	-	-	-
Site 4	-	-	-	-	-	-
Site 5	16.58	404	13.9	14.8	4.7	50
Site 6	15.95	294	5.3	25	6.10	20
Site 7	-	-	-	-	-	-
Site 8	16.5	111	78.8	43.2	7.55	20

ANZECC trigger values for upland streams: Electrical conductivity (30-350 µS/cm), Turbidity (6-50 NTU), pH (6.5-8), Dissolved Oxygen (80-110%). Text in bold indicate those variables that exceed the default trigger values.

Note: For some waterways, default ANZECC trigger values do not reflect typical background water quality and chemistry. Therefore an assessment of water quality monitoring data against default values can suggest the condition of the waterway is outside the normal range, or polluted, when in fact it is 'clean', or vice versa.

3.4 Macroinvertebrates

AUSRIVAS and SIGNAL2 results for the three sampled sites are provided in Table 15. Raw data is provided in Annex 1.

Table 15. Macroinvertebrate results

Site acronym	Number of Taxa	SIGNAL2 weighted score	AUSRIVAS score
Site 1	-	-	
Site 2	-	-	
Site 3	-	-	
Site 4	-	-	
Site 5	6	3.54	D
Site 6	9	2.60	C
Site 7	-	-	-
Site 8	11	3.00	C

The number of taxa at the three sites ranged from 6 to 11, with the most taxa observed at Site 8 within in a tributary located to the north of the site. The least taxa observed were in Site 5, a tributary of Tinda Creek. AUSRIVAS score showed that the stream could be impaired as they are dissimilar to modelled reference



macroinvertebrate communities. However this result can be typical for low flow/ intermittent upland streams. The SIGNAL2 scores indicate that the streams may have a dominance of pollution-tolerant taxa (Table 4). Pollution-sensitive taxa Leptophlebiidae (SIGNAL 8) and Leptoceridae (SIGNAL 6) were observed at Site 8. Other pollution-sensitive taxa (Signal ≥ 6) were Acarina (SIGNAL 6) at Site 5. The SIGNAL biplot (Figure 3), indicates that no sites have favourable aquatic habitat and all locations are exhibiting some form of pollution or natural stress. However, this appears typical for streams in the area as Site 8 also is present in this quadrant. Downstream site SIGNAL2 scores were slightly lower than respective upstream sites (Site 5), however had a slightly higher number of taxa present in the samples.

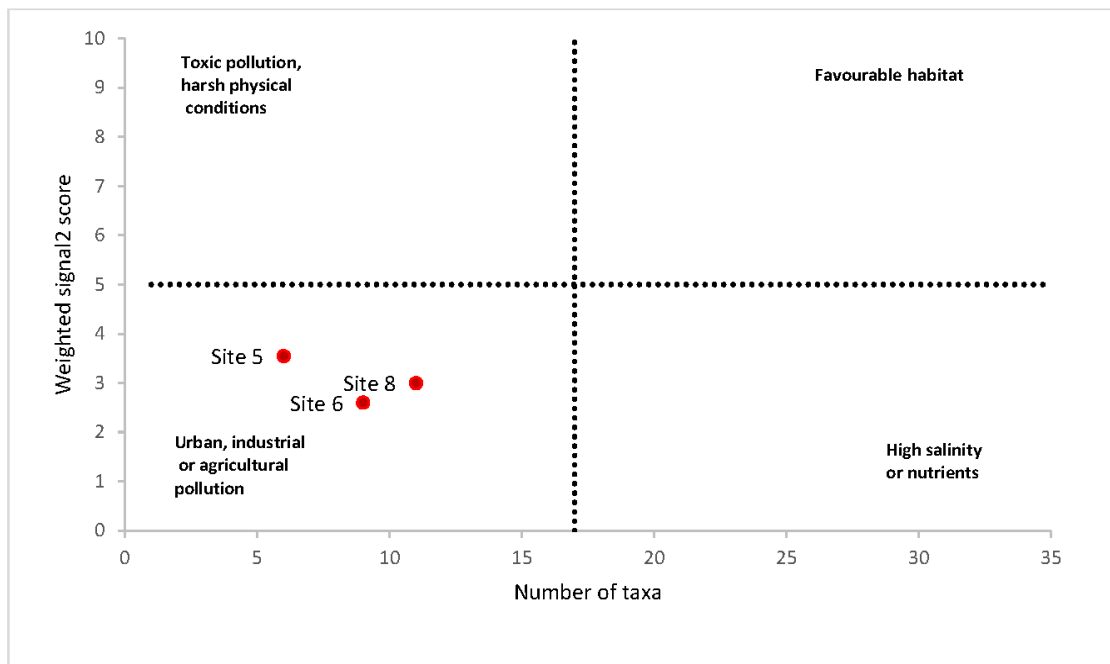


Figure 3. SIGNAL2 Bi-plot

There appears to be no general trend in SIGNAL2 scores in comparison to previous results (Table 16), however there were small site differences at most sites. This included a decrease in SIGNAL2 score at Site 6. Site 8 increased slightly whilst Site 5 increased more significantly (from 2 to 3.54). Most of the scores were similar to previous results, with Site 5 having the largest difference. Site 4 and 7 were not sampled in 2018 due to insufficient surface water.

Table 16. Weighted SIGNAL2 scores (2015 and 2018)

Site	SIGNAL2 weighted Spring 2015	SIGNAL2 weighted Spring 2018
Site 4	2.25	DRY
Site 5	2	3.54
Site 6	3.5	2.6
Site 7	4.66	DRY
Site 8	2.5	3

3.5 Other fauna

No fish species were observed during field surveys, however Sites 5 and 8 both had tadpoles present.



4. Discussion

4.1 RCE scores

The findings from spring 2018 monitoring are relatively similar to the results from previous assessment (Umwelt 2015) showing moderate to good channel and riparian health at most sites. RCE scores were all approximately 40 or above indicating good or near good condition, with the exception of two sites (Sites 2 and 3). The low scores are due to the nature of these sites as they have been modified by human activity. Site 3 in particular is a constructed channel and is located within the quarry and such it is recommended to be omitted from the monitoring program.

4.2 SIGNALs scores and macroinvertebrate communities

Despite poor AUSRIVAS and low-moderate SIGNAL2 scores, the streams are in reasonable health as they exhibit vegetative characteristics, macroinvertebrate fauna, and stream condition that are typical of ephemeral streams which are under natural low flow stress. There appears to be no obvious impairment or disturbance resulting from the Tinda Creek Quarry operations. Furthermore downstream SIGNAL2 scores showed no ecological differences to sites above Tinda Creek Quarry.

The results in general are consistent with macroinvertebrate communities representative of ephemeral streams, the fauna of which are generally pollution-tolerant organisms resulting in the streams having low SIGNAL2 and AUSRIVAS scores.

4.3 Water quality

Field parameters measured continue to be relatively consistent and are within the expected range typical for disturbed ephemeral streams. The measured parameters are characteristic of the low flow environment in these streams e.g. low dissolved oxygen.



5. Conclusion and recommendations

5.1 Conclusions

The general health of the vegetation and waterways of the eight sites was found to be in moderate to good health. All sites but two had RCE scores above 40. Site 3 particularly is highly disturbed and unnatural and is recommended to be removed from the monitoring program. As the majority of the sites were mostly dry only sites 5, 6 and 8 were able to have AUSRIVAS macroinvertebrate samples taken.

Sites downstream of Tinda Creek Quarry operations continue to exhibit good riparian and channel morphology. The macroinvertebrate community is in reasonable health despite some poor AUSRIVAS and low to moderate SIGNAL2 scores. Water quality was consistent with what would be expected for ephemeral/intermittent streams in the area. There appears to be no further changes in stream health since previous monitoring apart from some slight level of die back at one site likely to be the result of naturally dry conditions. As such, these results indicate that Tinda Creek Quarry's operations do not appear to be having an impact on the health of the ephemeral streams in the project area.



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Websites

<http://ausrivas.ewater.com.au/>

<http://www.mdfrc.org.au/bugguide/>



Annex 1. Macroinvertebrate survey results

Site	Site 5	Site 6	Site 8
Acarina	8		
Aeshnidae			1
Ceratopogonidae	7		
Chironominae			5
Culicidae	3	1	
curculionidae		1	
Dytiscidae		1	
Elmidae		1	
Hydraenidae		1	
Hydrochidae		1	4
Leptoceridae			2
Leptophlebiidae			2
Naucoridae	1		
Noteridae	1		
Notonectidae	1		1
Oligochaeta		3	4
Physidae		1	5
Planorbidae		1	1
Synthemistidae			5
Veliidae			1

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Appendix 8

Grevillea Parviflora subsp. *Parviflora* Monitoring at Tinda Creek Offset Area – March 2018 and September 2018

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5 July 2017

Darryl Thiedeke
Adelaide Brighton Ltd
Darryl.Thiedeke@adbri.com.au

Dear Darryl

Re: Establishment of permanent monitoring plots for *Grevillea parviflora* at Tinda Creek offset area

On 20th March 2018 Niche performed a survey and established a series of permanent monitoring plots for *Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea) on the offset area adjacent to the Tinda Creek sand quarry, Putty Road, Mellong, NSW.

As a guideline for this survey Niche used three conditions set-out in section 7.2.5 of the May 2017 management plan for the site:

- stem counts in permanent plots
- photo monitoring to assist in recording observable changes over time
- habitat quality and evidence or not of adverse impacts

The minimum suggested number of plots was exceeded in this study (nine plots as opposed to “two of the four transects/plots”). The time of year made it more difficult to rapidly recognise plants, including the *Grevillea*. It is recommended that future surveys are undertaken during the species known flowering period (July to December).

While this is the baseline data for monitoring, *Grevillea parviflora* was observed to remain common through the offset area with a median measured density of 1800 stems per hectare.

I have included the methods and results of the survey in the following attached document.

Yours sincerely

A handwritten signature in black ink that reads "Matthew Stanton".

Matthew Stanton
Niche Environment and Heritage



Scope of the survey for *Grevillea parviflora* subsp. *parviflora*

The following statement has guided the establishment of the permanent monitoring plots. “The goal of the monitoring is to ensure that the expansion of quarry activities does not have an adverse effect on the habitat of *Grevillea parviflora* and that the habitat for the species is maintained or improved over the life of the operation”.

Because the surveys were done out of flowering season, the numbers recorded may be expected to be an under estimate.

Methods

Plot establishment.

The two areas mapped as containing *Grevillea parviflora* (Umwelt 2017) measure approximately 5.4 hectares for the southern group and approximately 4.4 hectares for the northern group although this depends on how one defines the area. It was decided that a sampling ratio of around 1:100 would be appropriate. Nine 10x10 metre plots were randomly located in the two areas, five in the southern area and four plots in the northern area. Plot location conditions were that there was to be a minimum distance of 50 metres between plot centres and that there must be a confirmed presence of *Grevillea parviflora* within sight of the plot (even if there were none within the plot).

10x10 metre plots were chosen as these will form a component of general flora surveys for other monitoring requirements. The established plots may become part of the future flora survey plots.

Each plot was aligned to the UTM grid. The corner co-ordinates are given in Table 1 and plot locations shown in Figure 1. All plots contained at least one tree trunk and these were marked with paint to aid relocating the plots. Each corner of the plot was marked with a painted marker.

***Grevillea* counts**

Grevilleas were counted by individual stem except where the stems were clearly radiating from the same base, i.e. where stems were issuing from within a few centimetres of each other at ground height. To minimise trampling, counting was first performed around the perimeter of the plot, then transiting a smaller square within the plot about three metres inside the boundary. This method was varied depending on the density and height of vegetation within the plot which sometimes meant that individual stems were obscured until the observer was almost on top of them. Approximately 10 to 15 minutes was taken for each search by a single observer. This time may be able to be reduced for spring searches where the *Grevilleas* are flowering.

Plot photographs

A photograph was taken from the north-east corner of each plot looking directly towards the south west corner. The camera was located at 1.5 m high with the top edge of the photograph keeping some sky present but the camera angled down by about 10°. The images were in a 3:4 ratio in landscape orientation with a 64° field of view (broadly equivalent to a 28 mm lens on a 35mm camera). Photographs should be representative enough of the site to allow for an assessment of reasons for dramatic changes in the *grevillea* count.



Table 1: Corner point co-ordinates for Grevillea parviflora stem count plots

Point Name	Zone (GDA)	Easting	Northing
Gp01ne	56H	286483	6327773
Gp01nw	56H	286473	6327773
Gp01se	56H	286483	6327763
Gp01sw	56H	286473	6327763
Gp02ne	56H	286491	6327702
Gp02nw	56H	286481	6327702
Gp02se	56H	286491	6327692
Gp02sw	56H	286481	6327692
Gp03ne	56H	286594	6327597
Gp03nw	56H	286584	6327597
Gp03se	56H	286594	6327587
Gp03sw	56H	286584	6327587
Gp04ne	56H	286591	6327545
Gp04nw	56H	286581	6327545
Gp04se	56H	286591	6327535
Gp04sw	56H	286581	6327535
Gp05ne	56H	286696	6327526
Gp05nw	56H	286686	6327526
Gp05se	56H	286696	6327516
Gp05sw	56H	286686	6327516
Gp06ne	56H	286687	6328520
Gp06nw	56H	286677	6328520
Gp06se	56H	286687	6328510
Gp06sw	56H	286677	6328510
Gp07ne	56H	286733	6328462
Gp07nw	56H	286723	6328462
Gp07se	56H	286733	6328452
Gp07sw	56H	286723	6328452
Gp08ne	56H	286745	6328561
Gp08nw	56H	286735	6328561
Gp08se	56H	286745	6328551
Gp08sw	56H	286735	6328551
Gp09ne	56H	286784	6328238
Gp09nw	56H	286774	6328238
Gp09se	56H	286784	6328228
Gp09sw	56H	286774	6328228
Photo point ()	56H	286474	6327780

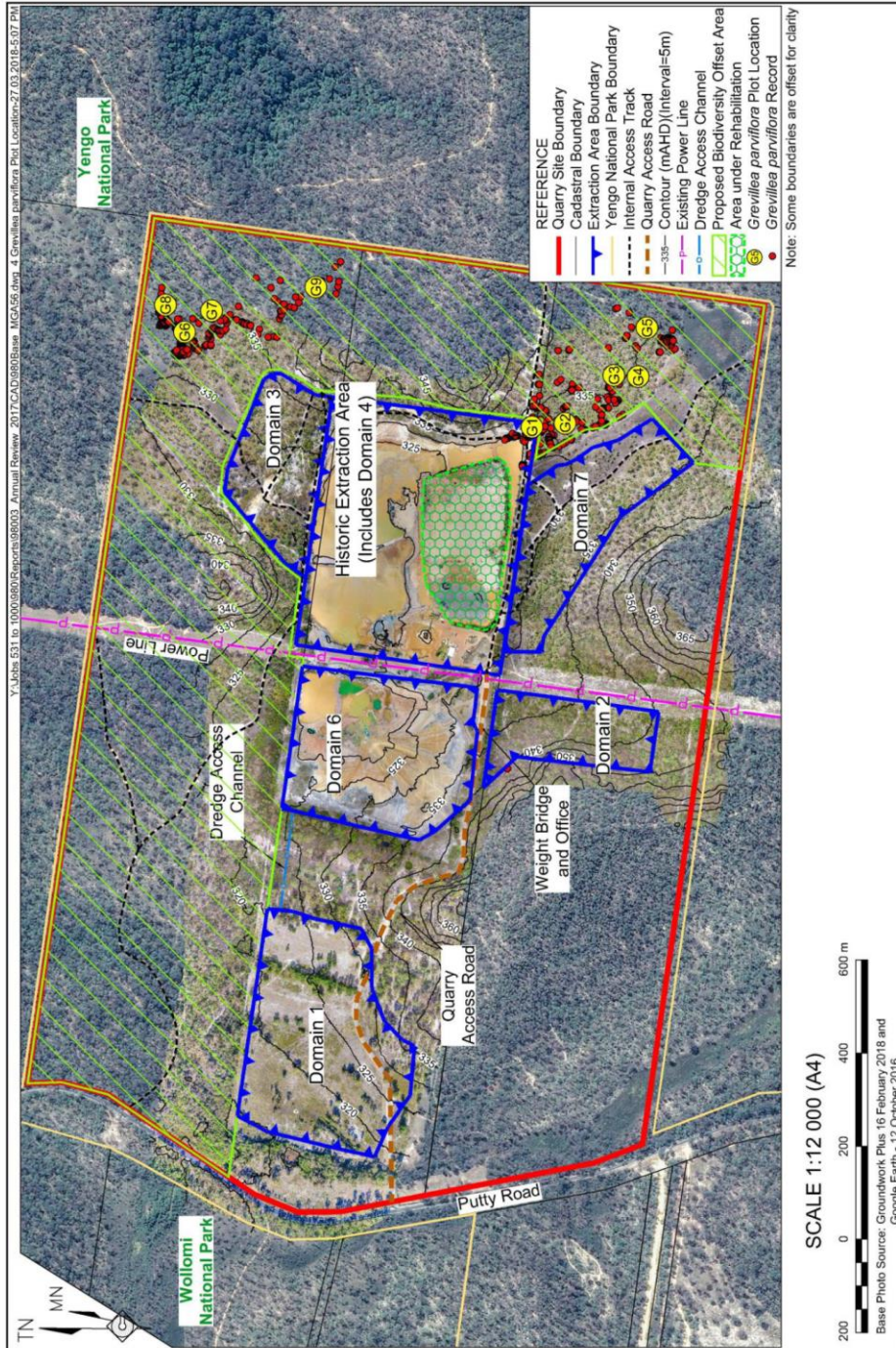


Figure 1: Map of Tinda Creek operations areas including the *Grevillea parviflora* records and permanent monitoring plots.

Area search

A walk was undertaken around the approximate boundary of the two population areas searching for additional and continued occurrences of *Grevillea parviflora*. Plants that were clearly additional to those already mapped were recorded.

Results

Plot stem counts

Table 2 presents the stem counts in each of the nine plots. Each plot had some stems of *Grevillea parviflora*. The plots with the highest density were all in the southern group of plots. There were a total of 212 stems counted which represents approximately a quarter of all the previous records. This gives an average density of 2356 stems/ha. There was a median density of 1800 stems/ha. Based on the plot with the lowest stem count, we might expect that there are a minimum of 1800 *Grevillea parviflora* stems on the site. It is not clear if earlier records (2011/2012) were made on all stems or larger groups of stems representing a single plant.



Plate 1: Small specimens of *Grevillea parviflora* without flowers and standing less than 300 mm high. Easily overlooked.



Table 2: *Grevillea parviflora* stem counts for nine 10x10 m plots at Tinda Creek offset area

Group	Name	<i>Grevillea parviflora</i> count	Notes
South	Gp01	18	Significant numbers of <i>Grevillea parviflora</i> to south of plot. Substantial tree regeneration on the NW side of the plot
South	Gp02	51	More <i>Grevillea parviflora</i> to the south.
South	Gp03	33	Heath reverting to forest
South	Gp04	47	Larger shrubs dominate plot
South	Gp05	20	<i>Grevillea parviflora</i> evenly spread around plot
North	Gp06	16	Sedge heath
North	Gp07	11	Dense <i>Angophora bakeri</i> regeneration
North	Gp08	14	<i>Grevillea parviflora</i> mostly very small
North	Gp09	2	Diverse (floristic and structural) heath

Plot photo monitoring

The plot photos are presented below. As with the permanent plot stem counts, these will become valuable in following years of monitoring.



Gp01





Gp02



Gp03





Gp04



Gp05





Gp06



Gp07





Gp08



Gp09



Area search observations

The general area search did not reveal any additional stands of *Grevillea parviflora* more than 15 m (the approximate reliability of non-differential GPS) from already mapped plants although there were substantial numbers of plants encountered, particularly in woodland more than in open “swamp” environments. There seemed to be a notable absence of *Grevillea parviflora* immediately adjacent to tracks or other disturbance. However, they were present after about one meter into undisturbed vegetation. Some of the densest areas of *Grevillea parviflora* stems were in areas that appeared to have been old tracks, now revegetated with a range of sedges and small heath plants including the grevillea.

Judging from imagery available through Google Earth, there has been no recent disturbance of the *Grevillea parviflora* habitat in the offset area, since the current management plan was implemented.

An additional photo point was established at the edge of the approved disturbance area (about 7 metres north of plot 1) with photos taken looking south-east (Plate 2) and south west (Plate 3).



Plate 2: Additional photo point looking south-east



Plate 3: Additional photo point looking south-west

Because the photo point is at the edge of the disturbance, any continuing encroachment of the pit into the *Grevillea parviflora* habitat will be relatively obvious



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26 September 2018

Darryl Thiedeke
Adelaide Brighton Ltd
Darryl.Thiedeke@adbri.com.au

Dear Darryl

Re: *Grevillea parviflora* subsp. *parviflora* monitoring at Tinda Creek offset area

On 11th September 2018, Niche performed a survey on an already established series of permanent monitoring plots for *Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea) on the offset area adjacent to the Tinda Creek sand quarry, Putty Road, Mellong, NSW.

As a guideline for this survey, Niche used the methods set-out in section 7.2.5 of the May 2017 management plan for the site:

- stem counts in permanent plots
- photo monitoring to assist in recording observable changes over time
- habitat quality and evidence or not of adverse impacts.

The minimum suggested number of plots was exceeded in this study (nine plots as opposed to “two of the four transects/plots”). The time of year that the monitoring was undertaken was within the *Grevillea parviflora* subsp. *parviflora* known flowering period (July to December). However, flowering was not occurring at the time of monitoring. Most plants did not have any buds or signs of recent flowering. Approximately 5% of observed plants had some buds present. Typically these were the larger specimens.

This survey represents the second baseline survey for ongoing monitoring. *Grevillea parviflora* subsp. *parviflora* was observed to remain common through the offset area with a median measured density of 1800 stems per hectare, similar densities to the autumn monitoring.

I have included the methods and results of the survey in the following attached document.

Yours sincerely

A handwritten signature in black ink that reads "Matthew Stanton". The signature is written in a cursive, slightly slanted style.

Matthew Stanton
Niche Environment and Heritage



Scope of the survey for *Grevillea parviflora* subsp. *parviflora*

The following statement has guided the establishment of the permanent monitoring plots. “The goal of the monitoring is to ensure that the expansion of quarry activities does not have an adverse effect on the habitat of *Grevillea parviflora* and that the habitat for the species is maintained or improved over the life of the operation”.

Because the original March 2018 surveys were done out of flowering season, the numbers recorded may be expected to be an under estimate. However, when revisited in September 2018 within the known flowering period for the species, there was still little sign of flowering.

Methods

Plot establishment

The two areas mapped as containing *Grevillea parviflora* subsp. *parviflora* (Umwelt 2017) measure approximately 5.4 hectares for the southern group and approximately 4.4 hectares for the northern group although this depends on how one defines the area. It was decided that a sampling ratio of around 1:100 would be appropriate. Nine 10x10 metre plots were randomly located in the two areas, five in the southern area and four plots in the northern area. Plot location requirements were that there was to be a minimum distance of 50 metres between plot centres and that there must be a confirmed presence of *Grevillea parviflora* subsp. *parviflora* within sight of the plot (even if there were none within the plot).

10x10 metre plots were chosen as these will form a component of general flora surveys for other monitoring requirements. The established plots may become part of the future flora survey plots.

Each plot was aligned to the UTM grid. The corner co-ordinates are given in Table 1 and plot locations shown in Figure 1. All plots contained at least one tree trunk and these were marked with paint to aid relocating the plots. Each corner of the plot was marked with a painted marker.

Grevillea counts

Grevilleas were counted by individual stem except where the stems were clearly radiating from the same base, i.e. where stems were issuing from within a few centimetres of each other at ground height. To minimise trampling, counting was first performed around the perimeter of the plot, then transiting a smaller square within the plot about three metres inside the boundary. This method was varied depending on the density and height of vegetation within the plot which sometimes meant that individual stems were obscured until the observer was almost on top of them. Approximately 10 to 15 minutes was taken for each search by a single observer. This time may be able to be reduced for spring searches where the Grevilleas are flowering.

Plot photographs

A photograph was taken from the north-east corner of each plot looking directly towards the south west corner. The camera was located at 1.5 m high with the top edge of the photograph keeping some sky present but the camera angled down by about 10°. The images were in a 3:4 ratio in landscape orientation with a 64° field of view (broadly equivalent to a 28 mm lens on a 35mm camera). Photographs should be representative enough of the site to allow for an assessment of reasons for dramatic changes in the grevillea count.



Table 1: Corner point co-ordinates for *Grevillea parviflora* subsp. *parviflora* stem count plots

Point Name	Zone (GDA)	Easting	Northing
Gp01ne	56H	286483	6327773
Gp01nw	56H	286473	6327773
Gp01se	56H	286483	6327763
Gp01sw	56H	286473	6327763
Gp02ne	56H	286491	6327702
Gp02nw	56H	286481	6327702
Gp02se	56H	286491	6327692
Gp02sw	56H	286481	6327692
Gp03ne	56H	286594	6327597
Gp03nw	56H	286584	6327597
Gp03se	56H	286594	6327587
Gp03sw	56H	286584	6327587
Gp04ne	56H	286591	6327545
Gp04nw	56H	286581	6327545
Gp04se	56H	286591	6327535
Gp04sw	56H	286581	6327535
Gp05ne	56H	286696	6327526
Gp05nw	56H	286686	6327526
Gp05se	56H	286696	6327516
Gp05sw	56H	286686	6327516
Gp06ne	56H	286687	6328520
Gp06nw	56H	286677	6328520
Gp06se	56H	286687	6328510
Gp06sw	56H	286677	6328510
Gp07ne	56H	286733	6328462
Gp07nw	56H	286723	6328462
Gp07se	56H	286733	6328452
Gp07sw	56H	286723	6328452
Gp08ne	56H	286745	6328561
Gp08nw	56H	286735	6328561
Gp08se	56H	286745	6328551
Gp08sw	56H	286735	6328551
Gp09ne	56H	286784	6328238
Gp09nw	56H	286774	6328238
Gp09se	56H	286784	6328228
Gp09sw	56H	286774	6328228
Photo point ()	56H	286474	6327780

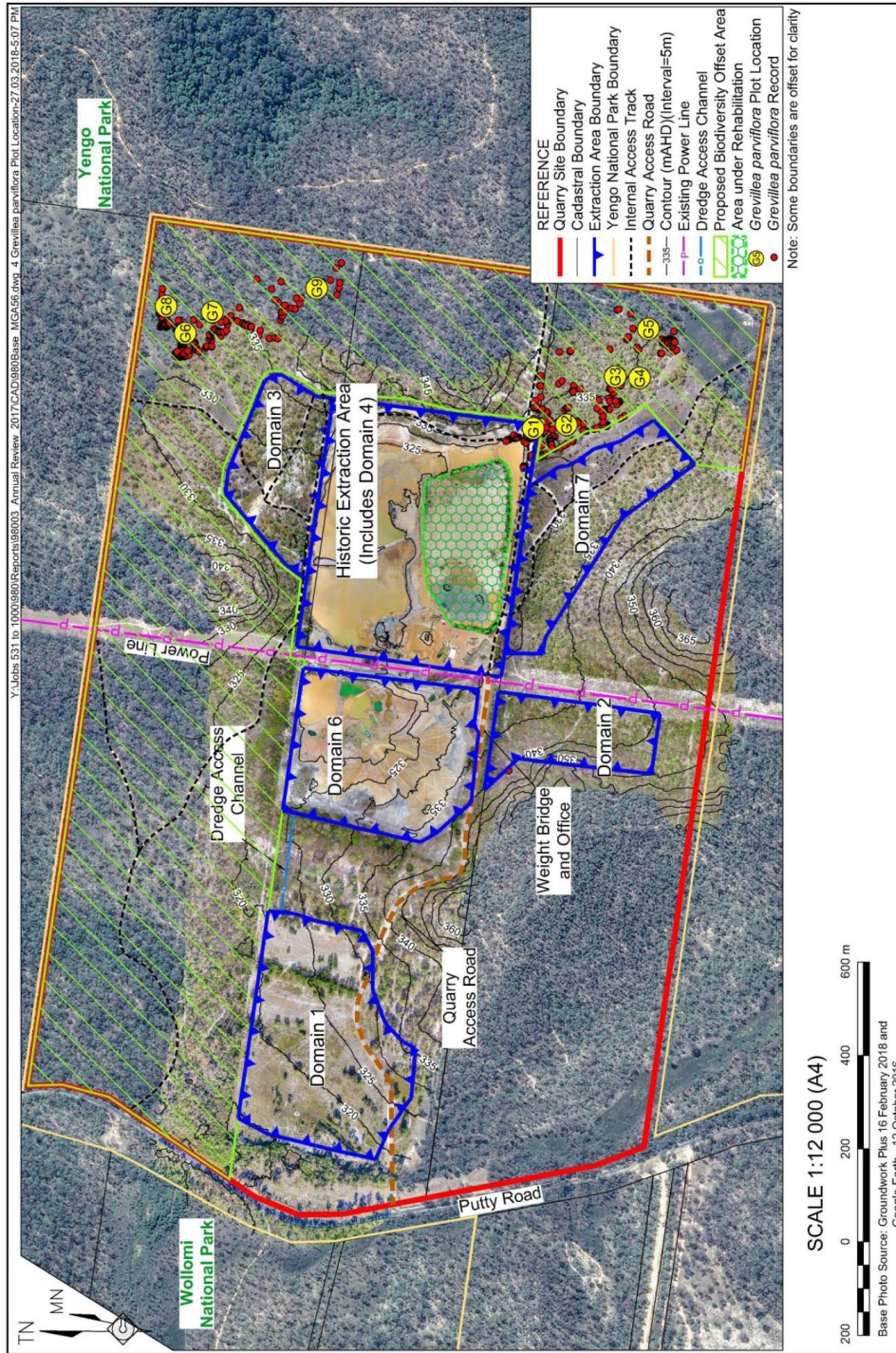


Figure 1: Map of Tinda Creek operations areas including the *Grevillea parviflora* subsp. *parviflora* records and permanent monitoring plots

Area search

A walk was undertaken around the approximate boundary of the two population areas searching for additional and continued occurrences of *Grevillea parviflora* subsp. *parviflora*. Plants that were clearly additional to those already mapped were recorded. A second walk was planned for spring, however, this has been delayed until there is a flowering event.

Results

Plot stem counts

Table 2 presents the stem counts in each of the nine plots. Each plot contained some stems of *Grevillea parviflora* subsp. *parviflora* (Plate 1). The plots with the highest density were all in the southern group of plots. For the March 2018 count, there were a total of 212 stems counted which represents approximately a quarter of all the previous records. The September 2018 count had a total of 208 stems. This gives an average density of 2356 and 2311 stems/ha. There was a median density of 1800 and 2000 stems/ha. Based on the plot with the lowest stem count, we might expect that there are a minimum of 1800 *Grevillea parviflora* subsp. *parviflora* stems on the site. It is not clear if earlier records (2011/2012) were made on all stems or larger groups of stems representing a single plant.



Plate 1: Small specimens of *Grevillea parviflora* subsp. *parviflora* without flowers and standing less than 300 mm high. Easily overlooked.



Table 2: *Grevillea parviflora* subsp. *parviflora* stem counts for nine 10x10 m plots at Tinda Creek offset area

Group	Name	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> March	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> September	Notes
South	Gp01	18	18	Significant numbers of <i>Grevillea parviflora</i> subsp. <i>parviflora</i> to south of plot. Substantial tree regeneration on the NW side of the plot
South	Gp02	51	48	More <i>Grevillea parviflora</i> subsp. <i>parviflora</i> to the south.
South	Gp03	33	30	Heath reverting to forest
South	Gp04	47	41	Larger shrubs dominate plot
South	Gp05	20	20	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> evenly spread around plot
North	Gp06	16	13	Sedge heath
North	Gp07	11	21	Dense <i>Angophora bakeri</i> regeneration
North	Gp08	14	14	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> mostly very small
North	Gp09	2	3	Diverse (floristic and structural) heath

Plot photo monitoring

The plot photos are presented below. As with the permanent plot stem counts, these will become valuable in following years of monitoring.



Gp01





Gp02





Gp03





Gp04





Gp05





Gp06





Gp07





Gp08





Gp09





Area search observations

The general area search did not reveal any additional stands of *Grevillea parviflora* subsp. *parviflora* more than 15 m (the approximate reliability of non-differential GPS) from already mapped plants although there were substantial numbers of plants encountered, particularly in woodland more than in open “swamp” environments. There seemed to be a notable absence of *Grevillea parviflora* subsp. *parviflora* immediately adjacent to tracks or other disturbance. However, they were present after about one meter into undisturbed vegetation. Some of the densest areas of *Grevillea parviflora* subsp. *parviflora* stems were in areas that appeared to have been old tracks, now revegetated with a range of sedges and small heath plants including the grevillea.

Judging from imagery available through Google Earth, there has been no recent disturbance of the *Grevillea parviflora* subsp. *parviflora* habitat in the offset area, since the current management plan was implemented.

An additional photo point was established at the edge of the approved disturbance area (about 7 metres north of plot 1) with photos taken looking south-east (Plate 2) and south west (Plate 3).



Plate 2: Additional photo point looking south-east



Plate 3: Additional photo point looking south-west

Because the photo point is at the edge of the disturbance, any continuing encroachment of the pit into the *Grevillea parviflora* subsp. *parviflora* habitat will be relatively obvious.

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Appendix 9

Minutes of Tinda Creek Quarry Community Consultative Committee

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**TINDA CREEK SAND PROJECT
COMMUNITY CONSULTATIVE COMMITTEE
MINUTES OF MEETING HELD MONDAY 14TH MAY 2018
ON SITE AT MELLONG**

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Ray Campbell (RC)	Community Representative
	David Cilento (DC)	Hy-Tec
	Darryl Thiedeke (DT)	Hy-Tec
	Lee Attard (LA _t)	Hy-Tec
	Michael Walton (MW)	Hy-Tec
APOLOGIES	Bruce Mansell (BM)	Community Representative
	Brigitte Lewis (BL)	Community Representative
	John Pine (JP)	Community Representative

The CCC Meeting was opened at 9.15am

WELCOME & INTRODUCTIONS	The chair welcomed all present and thanked them for their attendance.													
APOLOGIES	As above.													
DECLARATION OF INTEREST	LA declared that she is approved by the Department of Planning and Environment to chair the meeting and engaged by Hy-Tec.	No changes to members declarations												
BUSINESS ARISING	<p>In accordance with the guidelines, the minutes from the previous meeting held on 16th October 2018 were finalised on 10th November 2017.</p> <p>Action Items:</p> <table border="1"> <thead> <tr> <th>ITEM</th> <th>ISSUE</th> <th>RESPONSIBILITY</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Topography map to show water courses</td> <td>DT</td> </tr> <tr> <td>2</td> <td>Presentation by DPE to be included</td> <td>EW/LA</td> </tr> <tr> <td>3</td> <td>1300 number to be provided to CCC members</td> <td>EW/LA</td> </tr> </tbody> </table>	ITEM	ISSUE	RESPONSIBILITY	1	Topography map to show water courses	DT	2	Presentation by DPE to be included	EW/LA	3	1300 number to be provided to CCC members	EW/LA	<p>Held over.</p> <p>Sent with finalised minutes 10/11/17.</p> <p>Sent with finalised minutes 20/11/17.</p>
ITEM	ISSUE	RESPONSIBILITY												
1	Topography map to show water courses	DT												
2	Presentation by DPE to be included	EW/LA												
3	1300 number to be provided to CCC members	EW/LA												
CORRESPONDENCE	<ul style="list-style-type: none"> 3/11/17 – Email to CCC members with the draft minutes from 16/10/17 for review. 10/11/17 – Email to CCC members with the finalised minutes from 16/10/17 including the DPE’s presentation and contact phone number 13/11/17 – Email to Neville Diamond with a copy of the minutes. 28/4/18 – Email to members with a Meeting Notice and Agenda for this meeting. 13/5/18 – Email reminder for this meeting. 	Moved: LA Seconded: RC												
REPORT/PROJECT UPDATE	<ul style="list-style-type: none"> Work is being carried out on the other side of the creek with the National Parks and Wildlife Services soon to become the managers of 106 hectares. Hy Tec will still remain the owner of the off-set land, for all intents and purposes; however, an 88B Instrument is likely to be 													

	<p>registered on the title for management of the land in perpetuity by the Office of Environment & Heritage and NP&WS.</p> <ul style="list-style-type: none"> • Currently cleaning up rubbish on Lot 1 (burnt out cars, old houses to be removed, etc). • The Water Management Plan (submitted in November 2015) is still awaiting approval and is currently waiting on response from Office of Water. • The Annual Review was submitted to DP&E on the 6th of April 2018. Once acknowledged as being acceptable to the Department, it will be placed on the project website. • Compliance Officers with DP&E, continue to investigate, review and enforce approvals, management plans, policies and legislation. • Working with the Wild Dog Association to plan for baiting. • No complaints have been received. • Drivers are operating in accordance with the code of conduct. • It was noted that there are a number of trucks coming loaded to the area (near the dog kennels), however they are not Hy-Tec or its contractors. • Extremely low rainfall has been recorded, which has caused activities to be modified on site. • Hy-Tec entered into an enforcement undertaking with the Department for cleaning up the rehabilitation area. Regular reports (6 monthly) will be provided to DP&E. 	<p>DT explained how the bio-banking system works and how off-set areas are managed.</p>
GENERAL BUSINESS	<ul style="list-style-type: none"> • RC raised the Putty People publication as an excellent source of information for the residents of the area. 	<p>Link: http://putty.nsw.au/putty-people/</p>
NEXT MEETING	<p>The next meeting will be held: <u>Monday 15th October 2018</u> commencing at 9am (on site).</p>	

Meeting closed at 10.07am with LA thanking all for their attendance.

ACTION ITEMS

ITEM	ISSUE	RESPONSIBILITY
1	Topography map to show water courses	DT



**TINDA CREEK SAND PROJECT
COMMUNITY CONSULTATIVE COMMITTEE
MINUTES OF MEETING HELD MONDAY 15TH OCTOBER 2018
ON SITE AT MELLONG**

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Ray Campbell (RC)	Community Representative
	Darryl Thiedeke (DT)	Hy-Tec
	Lee Attard (LA _t)	Hy-Tec
	Michael Walton (MW)	Hy-Tec
APOLOGIES	Bruce Mansell (BM)	Community Representative
	Brigitte Lewis (BL)	Community Representative
	David Cilento (DC)	Hy-Tec

The CCC Meeting was opened at 9.11am

WELCOME & INTRODUCTIONS	The chair welcomed all present and thanked them for their attendance.							
APOLOGIES	As above. LA advised that John Pine has resigned from the CCC due to personal reasons.	LA to write to stakeholder groups to seek representation on the CCC.						
DECLARATION OF INTEREST	LA declared that she is an approved Independent Chairperson with the Department of Planning and Environment, appointed by the Secretary to chair this CCC and engaged by Hy-Tec.	No changes to members declarations						
BUSINESS ARISING	<p>In accordance with the guidelines, the minutes from the previous meeting held on 14th May 2018 were finalised on 22nd June 2018.</p> <p>Action Items:</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>ITEM</th> <th>ISSUE</th> <th>RESPONSIBILITY</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Topography map to show water courses</td> <td>DT</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • DT advised that the Annual Review has been signed off by DPE and has been posted on the website. Link provided below: • https://www.hy-tec.com.au/sites/hytec/media/pdf/tinda-creek-development-approval-docs/annual-reviews/tinda-creek-2017-annual-review.pdf 	ITEM	ISSUE	RESPONSIBILITY	1	Topography map to show water courses	DT	Presented by DT. (Hard copy provided to RC). Link provided below for Water Management Plan.
ITEM	ISSUE	RESPONSIBILITY						
1	Topography map to show water courses	DT						
CORRESPONDENCE	<ul style="list-style-type: none"> • 20/5/18 – Email to CCC members with the draft minutes from 14/5/18 for review • 2/6/18 – Letter to Ray Campbell with the same information • 22/6/18 – Email to CCC members with the finalised minutes • 22/6/18 – Email to Ray Campbell with the same information • 3/10/18 – Email to members with a Meeting Notice and Agenda for this meeting • 3/10/18 – Letter to Ray Campbell with the same information. • 14/10/18 – Email to members with a reminder for this meeting. 	Moved: LA Seconded: RC						

<p>REPORT/PROJECT UPDATE</p>	<ul style="list-style-type: none"> • DT advised of the demolition and removal from the Lot 1 site at a significant cost to Hy-Tec of buildings (2 x old houses & sheds) 6 bins of recyclable material (metal) were removed, 2-3 truck & trailer loads of building waste, as well as 1,600 lts of oil recovered from drums and storage tanks to be recycled, with approximately 10t asbestos waste recovered from the old houses and an oil storage tank. All demolition waste and recovered waste was disposed of at approved EPA facilities. Certificates of disposal have been provided by the EPA registered waste removal contractor to Hy-Tec. • MW & RC discussed a local property that is the subject of Land & Environment Court NSW action for tree clearing. see link: https://www.caselaw.nsw.gov.au/decision/5b838f82e4b06629b6c61759 • DT explained the conceptual final landform and biodiversity areas. • Hy-Tec are still working through 106 hectares of off-set area with Office of Environment & Heritage (OEH), Department of Planning & Environment (DPE) and National Parks & Wildlife Service (NPWS). The department are still considering an 88B instrument being placed on the title, so it is only used for rehabilitation. • In the event of a fire, the Rural Fire Services (RFS) have permission for a standing area in Extraction Area 1 (near the road). • The lack of rain has been causing difficulty and severely limiting production from an operational perspective, as the quarry can only use water collected within the disturbed area of the site. Rainfall is the lowest it has been in 50 years. (Graphs provided.) • Unfortunately, due to low production output Tinda Creek has been unable to supply all of its customers' requirements. As such product is coming out of Port Stephens (Mackas Sand at Salt Ash) to meet demand. • RC enquired whether the low water levels in the dams would allow them to be cleaned out. • LA advised that there were levels and guidelines that they had to meet. • DPE have been satisfied with Hy-Tec's actions to date regarding the enforceable undertaking. MW is taking photographs of the rehabilitation areas on a regular 3 monthly basis and recording the progress for reporting to the DPE. • Discussions on another proposed sand mine in the area (near Monastery) and another at Freemans Reach, near Windsor. See link: https://www.hawkesburygazette.com.au/story/5652361/sand-quarry-to-be-proposed-for-freemans-reach/ • RC enquired about clay in the sand, which he has been using for concreting on his property. DT advised that clay was detrimental to the concrete strength, though does aid with the workability of mortar mixes. • MW advised that he has been working with NSW Govt. Local Land Services in regards to baiting wild dogs. Baiting is scheduled in the near future to be placed along the power transmission lines in co-ordination with LLS. • MW advised that there is a new shooting range (Colo Bench-rest Rifle Club) located at 6013 Putty Rd, Mellong under construction in close proximity to the Quarry—The proponent has gained all the relevant Council approvals and are currently importing fill material for the berm. Contact being: Peter 0417 064 478 email: cbrc@bigpond.com 	
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	<ul style="list-style-type: none"> DT explained VENM (virgin extracted natural material) and ENM (extracted natural material). Tinda Creek Quarry has planning approval to accept VENM & ENM. DT was pleased to inform that there have been no complaints received in the past 6 months. Drivers are operating in accordance with the Code of Conduct. DT advised that Tinda Creek has an open door policy - nothing to hide. Hy-Tec have historically been supporting the local primary school with its playground and the local RFS 	
GENERAL BUSINESS	<ul style="list-style-type: none"> The new Windsor Bridge is commencing construction in September.2018.- Detailed information can be found on the RMS website at : https://www.rms.nsw.gov.au/projects/sydney-west/windsor-bridge-replacement/index.html 	
MEETING SCHEDULE FOR 2019	It was agreed that the meeting schedule for 2019 would be along the same lines of the 2018 dates, being: <u>Monday 13th May 2019 and Monday 14th October 2019</u> commencing at 9am (on site).	Next meeting 13th May 2019 at 9am.

Meeting closed at 10.08am with LA thanking all for their attendance.

Link to approved Annual Review

<https://www.hy-tec.com.au/sites/hytec/media/pdf/tinda-creek-development-approval-docs/annual-reviews/tinda-creek-2017-annual-review.pdf>

Link to Water Management Plan:

<https://www.hy-tec.com.au/sites/hytec/media/pdf/tinda-creek-development-approval-docs/WaterManagementPlan.pdf>

ACTION ITEMS

ITEM	ISSUE	RESPONSIBILITY
1	Write to stakeholder groups (Putty Community Association, Rural Fire Service, Colo Heights School P&C) seeking potential representation on the CCC.	LA

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Appendix 10

Photos for Voluntary Undertaking

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SEPTEMBER 2017



MARCH 2018

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