Yara Pilbara Nitrates

2016 Compliance Assessment Report

Ministerial Statement 870

Technical Ammonium Nitrate Plant

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Document Custodian	Environmental Superintendent, Susan Giles.
Document Approver	Plant Manager, Rob Stevens.

Proponent Declaration

Yara Pilbara Nitrates Pty Ltd is pleased to submit this Compliance Assessment Report as per condition 4-6 of Ministerial Statement 870.

I, Rob Stevens, Plant Manager declare that I am authorised on behalf of Yara Pilbara Nitrates Pty Ltd (being the person responsible for the proposal) to submit this form and that the information contained in this form is true and not misleading.

Signature:.. Date: 6/10/16

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1 Introduction

1.1 Purpose

The purpose of the Compliance Assessment Report (CAR) is to annually assess compliance with all conditions of Ministerial Statement 870 (MS 870), issued on 7 July 2011, as per conditions 4-3, 4-4 and 4-6 of MS 870:

> *"4-3 The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.*
>
> *4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO.*
>
> *4-6 The proponent shall submit to the CEO the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance report. The compliance assessment report shall:*
>
> 1. *be endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf;*
> 2. *include a statement as to whether the proponent has complied with the conditions;*
> 3. *identify all potential non-compliances and describe corrective and preventative actions taken;*
> 4. *be made publicly available in accordance with the approved compliance assessment plan; and*
> 5. *indicate any proposed changes to the compliance assessment plan required by condition 4-1."*

The annual CAR is prepared in accordance with the Compliance Assessment Plan (CAP) approved 23 August 2012; and is due to be submitted to OEPA annually by 8 October.

1.2 Scope

This CAR (hereinafter referred as "2016 CAR" applies to the Project being developed by Yara Pilbara Nitrates Pty Ltd (YPN) to construct and operate a Technical Ammonium Nitrate (TAN) plant located on Lot 3017 within the Burrup Strategic Industrial Area on the Burrup Peninsula, Western Australia. The TAN plant is located approximately 13 kilometres (km) north-west of Karratha.

Implementation of the Project is subject to the conditions of MS 870. YPN as the proponent must ensure implementation of MS 870 conditions. The 2016 CAR assesses compliance against the conditions for works carried out during the reporting period 8 July 2015 to 7 July 2016. The 2016 CAR is to be submitted to the Office of the Environmental Protection Authority (OEPA) by 8 October 2016. This is the fifth CAR to be submitted for the TAN plant.

1.3 Project Details

The TAN plant will have a production capacity of 350,000 tonnes per annum (TPA) or 915 tonnes per day (TPD) of Technical Ammonium Nitrate (TAN). The project comprises three major process units, each producing a separate product in the manufacturing process:

1. Nitric Acid plant to convert ammonia and atmospheric air into Nitric Acid (NA). The NA unit has a capacity of 760 TPD as 100% weight. The main feedstock, ammonia, shall be delivered from the adjacent ammonia plant.
2. Ammonium Nitrate (AN) Solution plant to convert ammonia and NA into AN solution. This AN wet section has a capacity of 965 TPD in balance with nitric acid production capacity.
3. TAN plant to convert AN solution into TAN prills (final product). This is a dry section for production of TAN prills (0.7 and 0.8 kg/l density) with a capacity of 915 TPD. Surplus ammonium nitrate solution shall be sold as liquid.

The project also has storage, loading and transport facilities, including an incoming liquid ammonia pipeline, bulk and bagged TAN storage, bulk loading system, bagging unit and truck loading.

1.4 CAR Public Availability

This 2016 CAR is to be placed on the yara.com.au website, or an equivalent website, for the life of the Project. Within 7 days of submission of the 2016 CAR to OEPA it shall be publically available at:

http://yara.com.au/about-yara/about-yara-local/yara-pilbara/nitrates/

A URL link to the report uploaded will be sent to the Compliance Branch through the compliance@epa.wa.gov.au email address.

1.5 CAP Changes

There have been no changes to the CAP during this reporting period. During the process of preparing this CAR YPN has identified that as the TAN plant moves into operational phase it is be appropriate to review the existing CAP. YPN has commenced an initial review and will submit to OEPA proposed changes to the CAP once the review is complete.

2 Current Status

During the reporting period construction of the Project has been completed and commissioning has commenced. At the end of the reporting period commissioning is continuing as facilities and production processes are tested and started.

Significant milestones achieved during the period include mechanical completion of plant and facilities and initial start-up of the nitric acid plant. While some defects in the performance and start-up of some facilities have been identified and are being corrected, these do not specifically affect the environmental performance of the plant.

A Commissioning Environmental Management Plan (EMP) has been approved by DER (as a requirement of Works Approval 4701-2010-1) and is in effect along with the Construction EMP. An Operational EMP for the TAN plant has been drafted and submitted to DER for review.

Environmental monitoring and reporting has continued during the reporting period, as YPN has commenced transitioning the TAN plant site from the Engineering Procurement Construction (EPC) contractor to YPN operational control. Under the terms of the EPC contract resourcing environmental management and reporting are the responsibility of the contractor. Due to deficiencies in this arrangement Yara Pilbara assumed responsibility for these functions in mid-2016.

YPN has held preliminary discussions with OEPA to request a Section 45(c) non-substantial change to the TAN plant to enable additional storage of bagged TAN on site. YPN proposes that during this process the Schedule 1 of MS870 will be updated to be made consistent with contemporary EPA policy (specifically, *Environmental Assessment Guideline No. 1 - Defining the Key Characteristics of a Proposal*).

During the period YPN continued to financially contribute through the Burrup Rock Art Technical Working Group (BRATWG) to the Department of Environment Regulation’s (DER) rock art monitoring program. YPN understands the 2015 monitoring was completed in August 2015 with a report subsequently provided to BRATWG. This monitoring report is yet to be published on the DER website and YPN has not been provided a copy, however draft copies of the report have been made available to third parties.

YPN has a requirement under the TAN plant’s commonwealth environmental approval (EPBC 2008/4546 Condition 10(d)) to provide the DER-managed Monitoring Program results to the Department of the Environment & Energy within two months of the monitoring report being completed. At the time of preparing this 2016 CAR, YPN has not been provided with a copy of the report and therefore has not been able to submit the report to the Department, the Murujuga Aboriginal Corporation nor publish the report on YPN’s website as required by EPBC 2008/4546 Condition 10.

The term of appointment for BRATWG expired on 30 June 2016, with the extension dependent on a review of the outcomes of the rock art monitoring program undertaken by the group. At this stage YPN are unaware of the status of the extension process. Following from contact made with representatives from DER, Yara Pilbara has written to the Minister for the Environment stating that Yara Pilbara supports the continuation of BRATWG in its role of overseeing the Burrup rock art monitoring program to assist in the ongoing protection and preservation of petroglyphs on the Burrup Peninsula. Furthermore Yara Pilbara has requested membership to BRATWG.

3 Compliance

3.1 Statement of Compliance

The results of the assessment of compliance with MS870 are shown in Table 1.

A total of 27 items were assessed. The assessment found the following:

- 10 items were found as compliant;
- 7 items were found as completed;
- 4 items were found as not required at this stage;
- 3 items were found as potentially non-compliant; and
- 3 items was assessed as non-compliant.

Details of the following events which lead to the potential non-compliant and non-compliant items are contained within Section 3.4:

- Non-compliance #1 - Failure to report groundwater results within 7 days (items M4.5 and M8.5);
- Non-compliance #2 – Failure to fully implement air quality monitoring requirements (item M5.2);
- Potential non-compliance #3 – Failure to submit found fauna report (item M7.2); and
- Potential non-compliance #4 – Failure to be able to demonstrate groundwater monitoring reports were publically available (item M8.6).
- Potential non-compliance #5 – Failure to be able to demonstrate that no new species of weeds are present on site (item M6.1(5)).

Through inclusion within this 2016 CAR, YPN requests that the six (6) items assessed as completed are acknowledged by OEPA as satisfactorily completed.

In preparation of this 2016 CAR YPN has identified some gaps in evidence, specifically with reference to historic correspondence between YPN and various regulators that have been cited as evidence in previous CAR's. Where YPN does not currently have the original or a copy of the evidence, but reference to the evidence has been previously made, the evidence has been flagged as "not sighted". A full list of "not sighted" evidence is provided within Section 5.

3.1.1 Proposal and Proponent Details

Proposal Title	*Burrup Technical Ammonium Nitrate Production Facility*
Statement Number	*Statement Number 870*
Proponent Name	*Yara Pilbara Nitrates Pty Ltd*
Proponent's Australian Company Number (where relevant)	127 391 422

3.1.2 Statement of Compliance Details

Reporting Period				*8/07/15* to *7/07/16*			
Implementation phase(s) during reporting period (please tick ✓ relevant phase(s))							
Pre-construction		Construction	✓	Operation		Decommissioning	
Audit Table for Statement addressed in this Statement of Compliance is provided at:						Section 3.2	
Were all implementation conditions and/or procedures of the Statement complied with within the reporting period? (please tick ✓ the appropriate box)							
No			✓	Yes			

3.2 MS 870 Compliance Assessment

In assessing compliance the following definitions have been used:

Compliance Status Terms	Abbrev	Definition
Compliant	C	Implementation of the proposal has been carried out in accordance with the requirements of the audit element.
Completed	CLD	A requirement with a finite period of application has been satisfactorily completed.
Not required at this stage	NR	The requirements of the audit element were not triggered during the reporting period.
Potentially non-compliant	PNC	Possible or likely failure to meet the requirements of the audit element.
Non-compliant	NC	Implementation of the proposal has not been carried out in accordance with the requirements of the audit element.

Table 1 MS870 Compliance Assessment Audit Table

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M1.1	Proposal Implementation	The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the conditions and procedures of this statement.	Implement the proposal according with Schedule 1 of Statement No. 870, including the key proposal characteristics.	CAR.	Min for Env		Overall	Ongoing	C	The Proposal has been implemented in accordance with all elements in Schedule 1 (see Table 2)
870: M2.1	Proponent Nomination and Contact Details	The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the Environmental Protection Act 1986 is responsible for the implementation of the proposal.	Notify in writing a letter that provides details of the name and address of the new proponent.	Proponent details as listed on MS 870.	Min for Env		Overall	Ongoing	C	The proponent contact details are Yara Pilbara Nitrates Pty Ltd (ACN 127 391 422) Level 5, 182 St Georges Terrace, Perth, WA 6000. As advised to OEPA and acknowledged on 15 November 2012 and 17 December 2012 respectively (not sighted)
870: M2.2	Proponent Nomination and Contact Details	The proponent shall notify the Chief Executive Officer of the Office of the Environmental Protection Authority (CEO) of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.	Notify in writing.	Letter of notification.	CEO		Overall	Within 30 days of such change	NR	No change within reporting period.
870: M3.1	Time Limit of Authorisation	The authorization to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced	Notify in writing.	Letter of notification.	CEO		Overall	Before 7 July 2016	CLD	Project commenced construction during November 2012. (Letter notifying EPA of substantial commencement not sighted).
870: M3.2	Time Limit of Authorisation	The proponent shall provide the CEO with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.	Notify in writing.	Letter of notification.	CEO		Overall	Before 7 July 2016	CLD	Project commenced construction during November 2012. (Letter notifying EPA of substantial commencement not sighted).
870: M4.1	Compliance Reporting	The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the CEO.	Prepare and maintain a CAP and an audit table in accordance with the 'Post Assessment Guideline for Preparing an Audit Table'. Written Correspondence.	Approved CAP. Approved Audit Table- A copy of Correspondence to CEO.	CEO		Overall	Ongoing	C	TAN plant Compliance Assessment Plan (MS 870) (CAP) rev. 01 was submitted on 9 August 2012. The OEPA approved the CAP in a letter dated 23 August 2012 (Attachment 4A). As part of maintaining the CAP YPN has initiated a review of the CAP.
870: M4.2	Compliance Reporting	The proponent shall submit to the CEO the compliance assessment plan required by condition 4-1 at least 6 months prior to the first compliance report required by condition 4-6, or prior to implementation, whichever is sooner. The compliance assessment plan shall indicate: 1. the frequency of compliance reporting; 2. the approach and timing of compliance assessments; 3. the retention of compliance assessments; 4. the method of reporting of potential non-compliances and corrective actions taken; 5. the table of contents of compliance assessment reports; and 6. public availability of compliance assessment reports.	Submit the CAP to CEO. The CAP includes: 1. frequency of CAR, 2.approach and timing, 3.retention, methods of non-compliances and corrective actions reporting, 5. Table of contents of CAR and 6. Public availability of CAR.	Approved CAP. A copy of Correspondence to CEO. Available on proponent's website.	CEO		Pre-construction	Six (6) months prior to the first CAR by condition 4-6 (by 8 April 2012) or prior to implementation, whichever is sooner	C	TAN plant Compliance Assessment Plan (MS 870) (CAP) rev. 01 was submitted on 9 August 2012. The OEPA approved the CAP in a letter dated 23 August 2012 (Attachment 4A). As part of maintaining the CAP YPN has initiated a review of the CAP.
870: M4.3	Compliance Reporting	The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.	Undertake assessment according to the approved CAP.	CAR.	Min for Env		Overall	CAR annually by 8 October	C	Compliance has been assessed annually, as evidenced by annual CARs.

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M4.4	Compliance Reporting	The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO.	Retain electronic and hardcopies of Compliance Assessment Reports for the life of the Project, maintained as per PROPOSAL´s Document Control Management System requirements being retrieved if required.	CAR and records availability at the request of CEO	CEO		Overall	When required by CEO	C	Annual CARs are retained by YPN and are available on www.yara.com.au.
870: M4.5	Compliance Reporting	The proponent shall advise the CEO of any potential non-compliance within seven days of that non-compliance being known.	Notify in writing.	A copy of Correspondence to CEO.	CEO		Overall	Within 7 days of non-compliance being known	NC	YPN advised OEPA of an exceedance of groundwater trigger values on 21 December 2015 (Attachment 4B) YPN advised OEPA on 1 September 2016 that groundwater monitoring undertaken in June 2016 identified some samples that exceeded the groundwater trigger values and were not reported within 7 days. These bores have been resampled and the cause of the exceedance being investigated (Attachment 4C)
870: M4.6	Compliance Reporting	The proponent shall submit to the CEO the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance report. The compliance assessment report shall: 1. be endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf; 2. include a statement as to whether the proponent has complied with the conditions; 3. identify all potential non-compliances and describe corrective and preventative actions taken; 4. be made publicly available in accordance with the approved compliance assessment plan; and 5. indicate any proposed changes to the compliance assessment plan required by condition 4-1.	Submit the CAR to CEO in accordance with CAP. The CAR shall: 1. be endorsed by the proponent's Managing Director or a person delegated; 2. include a statement of compliance with conditions; 3. identify all potential non-compliances and describe corrective measures; 4. Be made publicly available; and 5. Proposed changes.	CAR. Uploaded on to proponent's website. A copy of Correspondence to CEO.	CEO		Overall	The first CAR submitted due by 8 October 2012 Then, annually by 8 October	C	During construction phase CARs were prepared by the EPC contractor and have been submitted annually on behalf of YPN; CAR 2012 was submitted to OEPA on 10 October 2012, (not sighted) CAR 2013 was submitted on 13 November 2013 (Attachment 4D) CAR 2014 was submitted on 26 September 2014 (Attachment 4E) and CAR 2015 was submitted on 4 March 2016 (Attachment 4F). As the TAN plant has been constructed and is in transition to operations this and future CAR's are prepared and will be submitted by YPN. The 2016 CAR will be submitted to the OEPA by 8 October 2016. CARs are endorsed by the YPN Plant Manager, include a statement of compliance, are retained by YPN and are available on www.yara.com.au.

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M5.1	Air Quality	The proponent shall adopt and implement best practice pollution control technology as determined by the Chief Executive Officer of the Department of Environment and Conservation (DEC) on advice of the CEO to minimise all relevant emissions from the TAN plant ammonium nitrate pilling plant	Adopt and implement EFMA - Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry, Booklet No. 6 of 8: Production of Ammonium Nitrate and Calcium Ammonium Nitrate, 2000 (EFMA, 2000b) from the Common Stack (other sources) for the AN plant. DEC to incorporate stack emission concentration figures in the Works Approval and Licence that are commensurate with the use of best practice pollution control technology. Air Dispersion Modeling Study. Operation Air Quality and Monitoring Management (OAQMM) Plan for MINISTER approval. Written correspondence.	CAR. Air Dispersion Modeling Study. Air Quality reports, monitoring records. A copy of Correspondence to CEO/DEC	DEC	CEO	Overall	Ongoing	C	TAN plant Air Quality Management Plan Doc. No. 0086269 February 2013 and submission on best practice pollution technology was reviewed by the OEPA and is considered to address relevant conditions (Attachment 5A).
870: M5.2	Air Quality	Prior to construction, the proponent shall prepare and implement an ambient air monitoring programme to the satisfaction of the CEO on the advice of the Chief Executive Officer of the DEC	Prepare a Construction/Operation Air Quality and Monitoring Management (AQMM) Plan for MINISTER approval. Implement the AQMM Plan. Written correspondence.	CAR. Air Quality report. A copy of Correspondence to CEO/DEC.	CEO	DEC	Overall	Ongoing	NC	TAN plant Air Quality Management Plan Doc. No. 0086269 February 2013 was reviewed by the OEPA and is considered to address relevant conditions (Attachment 5A) Ambient air quality monitoring was not effectively implemented during the reporting period, as described in Section 4.

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M6.1	Rehabilitation	The proponent shall undertake rehabilitation to achieve the following outcomes: 1. The project area shall be non-polluting and shall be constructed so that its final shape, stability, surface drainage, resistance to erosion and ability to support local native vegetation are comparable to natural landforms within the local area, as demonstrated by a methodology acceptable to the CEO; 2. Native vegetation areas disturbed through implementation of the proposal, shall be progressively rehabilitated with vegetation composed of plant species native to the Burrup Peninsula from propagating material of local provenance (as agreed by the CEO in consultation with the DEC); 3. Areas not currently supporting native vegetation shall be rehabilitated to the original land use or a use approved by the CEO; 4. The percentage cover of living vegetation in all rehabilitation areas shall be comparable with that of nearby undisturbed land as demonstrated by a methodology acceptable to the CEO; 5. No new species of weeds (including both declared weeds and environmental weeds) shall be introduced into the area as a result of the implementation of the proposal; and 6. The coverage of weeds (including both declared weeds and environmental weeds) within the rehabilitation areas shall not exceed that identified in baseline monitoring undertaken prior to the commencement of operations, or exceed that existent on comparable, nearby land which has not been disturbed during implementation of the proposal.	Prepare a Construction Terrestrial Vegetation and Flora Management (CTVFM) Plan for MINISTER approval. Implement the CTVFM Plan. Prepare a Construction Weed Management (CWM) Plan for MINISTER approval. Implement the CWM Plan. Written correspondence.	CAR. Construction rehabilitation reports and inspection records. A copy of Correspondence to CEO/DEC.	CEO	DEC	Overall	Ongoing	PNC	No rehabilitation activities have been undertaken at the TAN plant to date. Preventative weed controls have been implemented in accordance with the Construction weed Management Plan. At the end of the reporting period YPN is unable to demonstrate no new species of weeds (including both declared weeds and environmental weeds) have been introduced into the plant site. YPN plans to engage a suitable qualified botanist to inspect the plant site to document what weed species are present on site.
870: M6.2	Rehabilitation	Rehabilitation activities shall continue until such time as the requirements of condition 6-1 are demonstrated by inspections and reports to have been met for a minimum of five years, to the satisfaction of the CEO on advice of the DEC.	Prepare an Operation Terrestrial Vegetation and Flora Management (OTVFM) Plan for MINISTER approval. Implement the OCTVFM Plan. Prepare an Operation Weed Management (OWMP) Plan for MINISTER approval. Implement the OWM Plan. Written Correspondence.	CAR. Operation rehabilitation reports and inspection records. A copy of Correspondence to CEO/DEC.	CEO	DEC	Post-decommissioning	Until such time as the requirements of condition 6-1 are demonstrated by inspections and reports to have been met for a minimum of five years.	NR	Rehabilitation activities will commence after decommissioning.
870: M7.1	Fauna	The proponent shall employ such structures and apparatus as are necessary and agreed by the DEC to deter birds from entering the contaminated water pond, clean water pond, and sewage wastewater treatment station evaporation pond	Employ structures and apparatus to deter birds from entering the contaminated and clean ponds. Seek advice from DEC.	CAR. A copy of Correspondence to DEC/CEO.	CEO	DEC	Overall	Ongoing	C	Bird deterrent systems were assessed and the preferred option agreed by Department of Parks and Wildlife as appropriate for the site (Attachment 7A). Bird deterrent wires have been installed over contaminated water ponds, clean water ponds, and sewage wastewater treatment evaporation pond, as described in the Bird Deterrent Systems Assessment Report (Attachment 7B). (see also photograph – Attachment 7C)

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M7.2	Fauna	During construction of the TAN plant the proponent shall ensure that the following requirements are met: 1. Fauna refuges are to be placed in the trenches and other construction related voids at intervals not exceeding 50 metres; 2. The proponent shall employ at least two "fauna-clearing people" that are appropriately licensed by the DEC to remove fauna from the trenches and other construction related voids; 3. Inspection and clearing of fauna from trenches and other construction related voids by fauna clearing people shall occur at least twice daily and not more than half an hour prior to backfilling of trenches and other construction related voids, with the first daily inspection and clearing to be completed no later than 3.5 hours after sunrise, and the second inspection and clearing to undertaken daily between the hours of 3:00 pm and 6:00 pm; 4. In the event of rainfall, the proponent shall, following the clearing of fauna from the trenches and other construction related voids, pump out any pooled water in the open trenches and other construction related voids (with the exception of groundwater) and discharge it via a mesh (to dissipate energy) to adjacent vegetated area, having regard for the DEC's draft guideline on the treatment and management of acid sulfate soils and water in acid sulfate soil landscapes (DEC, 2009) and any subsequent revisions; and 5. Within 14 days following completion of the construction activities requiring the use of open trenches and other construction related voids, the proponent shall provide a report on fauna found, both dead and alive, within the TAN plant site boundary to the CEO.	Implement the Construction Terrestrial Fauna Management (CTFM) Plan for MINISTER approval. Report on Fauna Found.	CAR. Construction Fauna Found reports. Trench Inspections reports.	CEO	DEC	Pre-construction Construction	Ongoing Fauna Found Report Within 14 days	PNC	During the reporting period no open trenches or other construction related voids were in place, as construction had progressed such that footings were complete and modules were on site. YPN can find no evidence that within 14 days following completion of the construction activities requiring the use of open trenches and other construction related voids, YPN shall provide a report on fauna found, both dead and alive, within the TAN plant site boundary to the CEO.
870: M8.1	Groundwater	The proponent shall undertake detailed hydrogeological studies commencing at least 12 months prior to the commencement of construction to quantify groundwater quality, groundwater flow directions, and the depth to groundwater beneath the TAN plant site and in surrounding areas.	Undertake Hydrogeological Studies.	Hydrogeological studies Report.	CEO		Pre-construction	Ongoing	CLD	Hydrogelogical and Hydrological Investigation was prepared by Environmental Resources Management (ERM) and issued in September 2011 (not sighted). Attachment 8A is a copy of the Hydrogelogical and Hydrological Investigation report dated June 2012.
870: M8.2	Groundwater	The proponent shall develop appropriate management measures for dewatering to the satisfaction of the CEO on advice of the DEC and the Department of Water in the event that the information gathered from the hydrogeological studies required by condition 8-1 indicates that dewatering would be required during construction	Prepare the Construction Water Quality Management Plan for MINISTER approval, including if required, dewatering management. Written correspondence.	CAR. Groundwater reports. A copy of correspondence.	CEO	DEC DoW	Pre-construction	Ongoing	CLD	During the reporting period there were no construction activities that required dewatering and there are no further construction activities planned which would required groundwater dewatering.

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M8.3	Groundwater	The proponent shall design, construct, and locate groundwater monitoring bores to the satisfaction of the CEO on advice of the DEC and the Department of Water, having regard for the outcomes of the hydrogeological studies required by condition 8-1 and the Department of Water's Water Quality Protection Note 30 on Groundwater Monitoring Bores.	Prepare and implement Water Quality Management Plan for MINISTER approval, including groundwater monitoring. Written correspondence.	CAR. Groundwater monitoring report.	CEO	DEC DoW	Overall	After outcomes of the hydrogeological studies	CLD	The Hydrogeological and Hydrological Investigation report contains the original bore installation records (Attachment 8A). Due to Construction and decommissioning activities, wells MW1 and MW4 were affected and two replacement bores were drilled on the 7 September 2013 by GHD. The rationale for the location of the new bores is explained in the Groundwater Monitoring Well Re-location Report provided by ERM, 14 February 2014 (Attachment 8B).
870: M8.4	Groundwater	The proponent shall sample/monitor all groundwater bores required by Condition 8-3 every six months and shall set groundwater monitoring trigger values at a value of 10% above the baseline contaminant concentrations obtained from the hydrogeological studies required by condition 8-1.	Implement Water Quality Management Plan, including groundwater monitoring.	CAR. Groundwater reports, records.	CEO		Overall	Every six months	C	During the reporting period groundwater monitoring was conducted twice, in November 2015 and June 2016. The November 2015 sampling results were reported to the OEPA on 21 December 2015 (Attachment 8C.1 and 8C.2). Groundwater monitoring bores MW1, MW3 and MW5 were sampled on 1 June 2016, and bore MW2 was sampled on 14 June 2016. Groundwater monitoring bore MW4 was not sampled in June 2016 because the PVC pipe was bent, which prevented access.
870: M8.5	Groundwater	In the event that monitoring required by condition 8-4 indicates an exceedance of trigger levels: 1. The proponent shall report such findings to the CEO within 7 days of the exceedance being identified; 2. The proponent shall provide evidence which allows determination of the cause of the exceedance; 3. If determined by the CEO to be project attributable, the proponent shall submit actions to be taken to address the exceedance within 7 days of the determination being made to the CEO; 4. The proponent shall implement actions to address the exceedance and shall continue until such time as the CEO determines that the remedial actions may cease; and 5. The proponent shall submit bi-annually, or at a frequency defined to the satisfaction of the CEO, the results of monitoring required by condition 8-4 to the CEO, until such time as the CEO determines that reporting may cease.	Implement Water Quality Management Plan, including groundwater monitoring. Written correspondence.	CAR. Groundwater monitoring report, records. A copy of correspondence to CEO advising of any exceedance. A copy of correspondence to CEO submitting remedial action taken.	CEO		Overall	Within 7 days of the exceedance. Monitoring results binually, or a frequency defined by CEO	NC	Groundwater monitoring was conducted on 23 November 2015 by ERM, and reported to the OEPA on 21 December 2015 (see Attachment 8C.1 and 8C.2). Groundwater monitoring bores MW1, MW3 and MW5 were sampled on 1 June 2016, and bore MW2 was sampled on 14 June 2016. OEPA was notified in letter dated 1 September 2016 (Attachment 8D) that some samples exceeded trigger criteria for this monitoring event, and as outlined in Section 3.4.1 this was not reported within 7 days of the exceedance being identified.
870: M8.6	Groundwater	The proponent shall make the monitoring reports required by condition 8-5(5) publicly available in a manner approved by the CEO	Seek approval from CEO for the monitoring reports.	Monitoring reports publicly available as indicated by CEO. A copy of correspondence to CEO.	CEO		Overall	Binually, or a frequency defined by CEO	PNC	YPN is unable to demonstrate that monitoring reports required by condition 8-5(5) were publically available during the reporting period. At time of publication of this report available reports for the monitoring period are publically available at http://yara.com.au/about-yara/about-yara-local/yara-pilbara/nitrates/.
870: M9.1	Acid Sulphate Soils	The proponent shall undertake intrusive acid sulphate soils investigations prior to the commencement of construction	Undertake intrusive acid sulphate investigations.	Acid Sulphate Investigation Report.	CEO		Pre-construction	Ongoing	CLD	A Preliminary Acid Sulfate Soil Investigation Report was issued in August 2011 (Attachment 9A). DEC Contaminated Sites Branch reviewed this report and deemed that it met the requirements of M9.1 (Attachment 9B).

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status	Further Information / Verification October 2016
870: M9.2	Acid Sulphate Soils	In the event that acid sulphate soils are disturbed during construction of the TAN plant, the proponent shall treat and manage acid sulphate soils in accordance with the requirements of the DEC's draft guideline on the treatment and management of acid sulfate soils and water in acid sulfate soil landscapes (DEC, 2009) and any subsequent revisions.	Preparation of Acid Sulphate Soils (ASS) Management Plan, if required.	ASS Reports.	CEO	DEC	Construction	After ASS are disturbed	NR	Field investigations undertaken indicate the absence of Acid Sulphate soils within or adjacent to the proposed construction area and as such there was no requirement to develop an Acid Sulphate soils Management Plan. This was supported by DEC Contaminated Sites Branch (Attachment 9B).
870: M10.	Decommissioning	Prior to undertaking ground-disturbing activities, the proponent shall: 1. describe the rationale for the siting and design of plant and infrastructure as relevant to environmental protection; 2. prepare a conceptual plan of the final landform at closure; 3. prepare a plan for a care and maintenance phase; and 4. prepare an initial plan for the management of noxious materials following closure.	Preparation of Decommissioning Plan.	Decommissioning Report.	CEO		De-commissioning	Prior to undertaking ground-disturbing activities	CLD	The Decommissioning Environmental Management Plan (DEMP) has been prepared by YPN and submitted to OEPA (Attachment 10A). The DEMP was approved by the OEPA 23 October 2015 (Attachment 10B).
870: M10. 2	Decommissioning	At least six months prior to the anticipated date of closure, the proponent shall meet the following decommissioning criteria: 1. removal or, if agreed in writing by the appropriate regulatory authority, retention of plant and infrastructure agreed in consultation with relevant stakeholders; and 2. identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities. Note: Closure is defined as production has ceased and, plant and infrastructure removed, and contaminated areas remediated.	Implementation of Decommissioning Plan.	Decommissioning reports. A copy of correspondence.	Min for Env		De-commissioning	At least six months prior to date of closure	NR	Once commissioned the TAN plant is anticipated to operate for at least 20 years.

3.3 Schedule 1 Compliance Assessment

Schedule 1 of MS870 provides a description of the approved TAN plant and includes a summary of key proposal characteristics. The Schedule was modified via a Section 45C change to the proposal on 9 July 2013.

Condition 1.1 of MS870 (Audit Code, 870:M1.1) requires that the TAN plant shall be implemented as documented and described in Schedule 1 of MS870. Table 2 documents the assessment of compliance against the key characteristics of the TAN plant.

Table 2 Compliance Assessment of Key Characteristics

Requirement		**Status**	**Further Information**
The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the conditions and procedures of this statement.		C	The proposal has been implemented in accordance with all elements of Schedule 1.
Element	Description		
General			
Project life	20+ years.	C	
Technical ammonium nitrate production facility (TAN plant) capacity	350,000 tonnes of technical ammonium nitrate (TAN) per annum.	C	
Area of Project lease	Site D – 79 hectares.	C	Area of Project lease has been reduced since MS870 issued and is now 49 Ha (Lot 3017 within the Burrup Industrial Estate).
Area of disturbance	35 hectares.	C	Area disturbed within the Project lease is less than 33.5ha.
Main Process Units			
Nitric acid plant	Capacity – 760 tonnes per day.	C	
Ammonium nitrate solution plant	Capacity – 965 tonnes per day.	C	
TAN prilling plant	Capacity – 915 tonnes per day.	C	
Storage, loading, and transport			
Liquid ammonia pipeline between the TAN plant and the adjacent YARA Pilbara Fertilisers Pty Ltd (YPFPL)	710 meters long.	C	
Baggage TAN storage building	Capacity of 1,800 tonnes.	C	
Bulk TAN storage building	Capacity of 12,000 tonnes.	C	
TAN bagging facility	In bagged TAN storage building	C	
Truck bulk loading	Bulk TAN storage building	C	

Requirement		Status	Further Information
system			
Nitric acid buffer storage	Two tanks with total capacity of 3,000 cubic meters.	C	
Ammonium nitrate solution storage	One tank with a capacity of 500 tonnes	C	
Wastewater discharge pipeline	Connecting the TAN plant to the Water Corporation facility	C	
Inputs			
Power Requirement	8.5 MW of which 5 MW will be sourced from the adjacent YPFPL ammonia plant and approximately 3.5 MW will be generated by excess steam from the nitric acid plant.	C	
Potable water	2 cubic metres per hour from the Water Corporation.	C	
Seawater	456 cubic metres per hour from the Water Corporation.	C	
Outputs			
Nitrogen oxides (NOX)	Up to 135 t/yr. Nitric acid plant stack - up to 4.2 g/s. Nitric acid plant storage tanks - Vents A & B - up to 0.04 g/s each vent.	C	Performance will be verified during commissioning and operations phases.
Nitrous oxide (N2O)	Up to 163.7 t/yr, 5.5 g/s.	C	
Carbon monoxide (CO)	Up to 41 t/yr, 1.3 g/s.	C	
Methane (CH4)	Up to 17.8 t/yr, 0.6 g/s.	C	
Ammonia (NH3)	Ammonium nitrate prilling plant “common stack” - Refer to Condition 5. Nitric acid plant stack - up to 0.02 g/s.	C	
Particulate matter [as total suspended particulates (TSP)]	Ammonium nitrate prilling plant “common stack” - Refer to Condition 5.	C	
Sulphur dioxide (SO2)	Trace.	C	
Carbon dioxide (CO2) [produced]	Up to 532.6 t/yr, 17.8 g/s.	C	
Total greenhouse gas emissions	Approximately 84,451 tonnes of CO2-e per year.	C	
Greenhouse gas intensity	Approximately 0.241 tonnes of CO2-e per tonne of TAN.	C	
Solid waste	Up to 120 kilograms per day (organic matter from the off-specification prills).	C	

3.4 Details of Non-Compliance(s) and/or Potential Non-Compliance(s)

3.4.1 Non-compliance / potential non-compliance # 1

Which implementation condition or procedure was non-compliant or potentially non-compliant?	
870:M4.5 – "The proponent shall advise the CEO of any potential non-compliance within seven days of that non-compliance being known" and 870:M8.5 – "In the event that monitoring required by condition 8-4 indicates an exceedance of trigger levels: 1. The proponent shall report such findings to the CEO within 7 days of the exceedance being identified"	
Was the implementation condition or procedure non-compliant or potentially non-compliant?	
Non-compliant	
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?	
29 June 2016	
Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?	
☑ Yes ☐ Reported to OEPA verbally Date ___________ ☒ Reported to OEPA in writing Date __1 Sept 2016_____	☐ No
What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?	
In accordance with condition 8.4 YPN undertook groundwater monitoring on 1 June 2016. On 22 June 2016 results were returned from the analysing laboratory reporting that the results for a few analytes at some monitoring wells were above the groundwater monitoring trigger values set for the TAN plant. These results were not reported to the OEPA within 7 days (by 29 June 2016) as required conditions 4.5 and 8.5(1). In August 2016 the monitoring wells were resampled. YPN wrote to the OEPA on 1 September 2016 advising of the potential non-compliance.	
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)	
Not applicable	
What was the cause(s) of the non-compliance or potential non-compliance?	
Failure to notify the OEPA within 7 days of receiving the groundwater results.	
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?	
YPN is undertaking an investigation to identify the cause of the elevated levels of the analytes. The outcome of this will be reported to OEPA once complete.	

What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?
This will be an outcome of the investigation that is currently underway. The outcomes of this will be reported to OEPA once complete.
Please provide information/documentation collected and recorded in relation to this implementation condition or procedure: • in the reporting period addressed in this Statement of Compliance; and • as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance. (the above inform ation may be provided as an attachment to this Statement of Compliance)

3.4.2 Non-compliance / potential non-compliance # 2

Which implementation condition or procedure was non-compliant or potentially non-compliant?	
870:M5.2 – “Prior to construction, the proponent shall prepare and implement an ambient air monitoring programme to the satisfaction of the CEO on the advice of the Chief Executive Officer of the DEC.”	
Was the implementation condition or procedure non-compliant or potentially non-compliant?	
Non-compliant	
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?	
8/7/2015 – 7/7/2016	
Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?	
☐ Yes ☐ Reported to OEPA verbally Date ___________ ☐ Reported to OEPA in writing Date _______	☑ No
What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?	
An ambient air quality monitoring programme for the construction and operations phases of the TAN plant have been defined in the TAN plant Air Quality Management Plan (which is approved by OEPA). During the reporting period construction phase air quality monitoring effectively ceased. Although equipment has been deployed, substantial reliability issues have ensued (see Section 4.1 for more information).	
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)	
Not applicable	
What was the cause(s) of the non-compliance or potential non-compliance?	

Due to the change in the air emissions risk profile of the site and the extended duration of the construction phase, monitoring equipment was not adequately maintained or serviced during the period and consequently did not adequately perform.
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?
As the air emission risk profile of the TAN plant has changed into an operations phase emissions profile, rather than construction dust profile, no remedial actions to reinstate the dust monitoring equipment has been taken.
What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?
Yara environmental personnel now have direct control and accountability for the ambient air quality monitoring at the TAN plant. Construction related dust impacts are no longer a major risk for the site and the focus is on implementing the operational phase ambient air monitoring to ensure that production related emissions to air are managed and minimised.
Please provide information/documentation collected and recorded in relation to this implementation condition or procedure: • in the reporting period addressed in this Statement of Compliance; and • as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance. (the above information may be provided as an attachment to this Statement of Compliance)

3.4.3 Non-compliance / potential non-compliance # 3

Which implementation condition or procedure was non-compliant or potentially non-compliant?	
870:M7.2(5) “Within 14 days following completion of the construction activities requiring the use of open trenches and other construction related voids, the proponent shall provide a report on fauna found, both dead and alive, within the TAN plant site boundary to the CEO.”	
Was the implementation condition or procedure non-compliant or potentially non-compliant?	
Potentially non-compliant	
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?	
14 days after the completion of construction activities requiring the use of open trenches and other construction related voids.	
Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?	
☐ Yes ☐ Reported to OEPA verbally Date __________ ☐ Reported to OEPA in writing Date ______	☑ No
What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?	

YPN has provided records of fauna within previous CAR's. YPN has no evidence of correspondence of a report on fauna being provided to OEPA within 14 days of completion of construction activities that require the use of open trenches and other construction related voids.
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)
Not applicable
What was the cause(s) of the non-compliance or potential non-compliance?
Failure to notify the OEPA within 14 days after the completion of construction activities requiring the use of open trenches and other construction related voids
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?
YPN is preparing a report on fauna found during construction activities requiring the use of open trenches and other construction related voids. This will be submitted to OEPA once completed.
What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?
Once in operations, fauna interactions will be recorded in a central database for all of Yara Pilbara operations.
Please provide information/documentation collected and recorded in relation to this implementation condition or procedure: • in the reporting period addressed in this Statement of Compliance; and • as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance. (the above information may be provided as an attachment to this Statement of Compliance)

3.4.4 Non-compliance / potential non-compliance # 4

Which implementation condition or procedure was non-compliant or potentially non-compliant?
870:M8.6 - "The proponent shall make the monitoring reports required by condition 8-5(5) publicly available in a manner approved by the CEO"
Was the implementation condition or procedure non-compliant or potentially non-compliant?
Potentially non-compliant
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?
8/7/2015-7/7/2016
Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?
☐ Yes ☐ Reported to OEPA verbally Date ___________ ☐ Reported to OEPA in writing Date _______ ☑ No
What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?
YPN is unable to provide evidence that the monitoring reports required by condition 8-5(5) were publicly available on its website during the reporting period.
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)
Not applicable
What was the cause(s) of the non-compliance or potential non-compliance?
Monitoring reports required by condition 8-5(5) were not made publicly available.
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?
Groundwater monitoring reports required by condition 8-5(5) are now publically available at: http://yara.com.au/about-yara/about-yara-local/yara-pilbara/nitrates/
What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?
An internal resource within YPN HESQ Department now has access to updating the public external website and ensuring that required documents are publically available.
Please provide information/documentation collected and recorded in relation to this implementation condition or procedure: • in the reporting period addressed in this Statement of Compliance; and • as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance. (the above information may be provided as an attachment to this Statement of Compliance)

3.4.5 Non-compliance / potential non-compliance # 5

Which implementation condition or procedure was non-compliant or potentially non-compliant?	
870:M6.1(5) - “No new species of weeds (including both declared weeds and environmental weeds) shall be introduced into the area as a result of the implementation of the proposal”	
Was the implementation condition or procedure non-compliant or potentially non-compliant?	
Potentially non-compliant	
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?	
8/7/2015-7/7/2016	
Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?	
☐ Yes ☐ Reported to OEPA verbally Date __________ ☐ Reported to OEPA in writing Date ______	☑ No
What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?	
YPN is unable to provide evidence that demonstrates that no new species of weeds (including both declared weeds and environmental weeds) have been introduced into the plant site.	
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)	
Not applicable	
What was the cause(s) of the non-compliance or potential non-compliance?	
No update of the weed distribution map was undertaken during the reporting period.	
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?	
YPN plans to engage a suitable qualified botanist to inspect the plant site to document what weed species are present on site and compare this to the baseline vegetation survey to determine if any new weed species have established on site.	
What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?	
Measures to prevent weed introduction to site and control existing infestations will continue to be applied. The Operational Environmental Management Plan (currently in draft) contains measures of preventing and controlling weeds on site.	

Please provide information/documentation collected and recorded in relation to this implementation condition or procedure:

- in the reporting period addressed in this Statement of Compliance; and
- as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance.

(the above information may be provided as an attachment to this Statement of Compliance)

4 Environmental Monitoring

During the reporting period the following environmental monitoring is required to be implemented to meet MS870:

- Ambient air monitoring (as required by condition 5.2); and
- Groundwater monitoring (as required by condition 8.4)

4.1 Ambient Air Monitoring

Condition 5.2 of MS870 requires that YPN develops and implements an ambient air monitoring programme to the satisfaction of the CEO on the advice of the Chief Executive Officer of the DEC.

The ambient air monitoring program for the TAN plant is described within the TAN plant Air Quality Management Plan (February 2013). OEPA advised on 18 March 2013 that this plan adequately addresses Condition 5.2 of MS870.

4.1.1 Monitoring Programme

The TAN plant Air Quality Management Plan (AQMP) describes the monitoring to be undertaken during construction phase which are described in Table 3.

The AQMP anticipates that as construction comes to an end, commissioning commences and the Project enters the start-up and operations phases and consequently the air emissions risk profile of the site changes significantly. Emissions move from dust generated during earthworks, open areas and unsealed roads during construction, to a phase where the site is sealed and potential for dust emissions are minimal, into start-up and operations phase where the air emissions profile is characterised by emissions of gas streams through stacks from the production processes.

Sections 3.1.7 *Monitoring Duration* and 3.1.8 *Reporting Protocol* both address these issue with the following statements:

> *Construction compliance monitoring will be carried out upon commencement of construction and will end when construction is completed. This is anticipated to take 33 months.*
>
> *Completion of construction is defined as the completion of plant commissioning, prior to actual plant start-up.*

Following completion of concrete works and installation of modules, roads on the site were sealed and unsealed areas subject to traffic covered in coarse aggregate in mid-2015.

August 2015 marked 33 months since the commencement of construction.

Table 3 Construction Phase Ambient Air Monitoring Requirements

Type of Monitoring	Monitoring Location	Monitoring Frequency	Monitoring Equipment	Trigger Threshold for Additional Mitigation
Construction compliance monitoring (during construction for a period of 33 months) for compliance with EPA conditions				
PM10 ambient concentration	E1 - Eastern site boundary	Continuous	Two TEOMs (AS 3580.9.8:2008) or One co-located TEOM and DustTrak (or similar) and one standalone DustTrak	The trigger level is proposed to be set at three levels (Alert Level, Remedial Action Level and Extreme Action Level) to be protective of the overall 24-hour average PM10 criterion (50 µg/m3). In the event of the TEOM-DustTrak monitoring configuration, the proposed trigger values will be agreed with the DEC AQMB, prior to implementation, based upon the bias adjustment factor
	W1 – Western site boundary	Continuous		
Dust deposition	E1 - Eastern site boundary	Monthly	Deposition gauge (AS 3580.10.1: 2003)	Total of 4 g/m^2/month, with no more than 2 g/m^2/month above baseline levels. Baseline levels are defined through baseline monitoring.
	W1 – Western site boundary	Monthly		
Weather Monitoring (Continuous During Construction Compliance Monitoring) for compliance with EPA conditions				
Wind speed and direction	On-site	Continuous	Anemometer	-
Temperature	On-site	Continuous	Temperature sensor	-
Rainfall rate	On-site	24 hour rainfall, and 30 day samples for rainwater analysis	Tipping rain gauge	

4.1.2 Monitoring performance

The monitoring undertaken and performance is outlined in Table 4. Due to the change in the air emissions risk profile of the site and the extended duration of the construction phase, monitoring equipment was not adequately maintained or serviced during the period and consequently did not adequately perform.

Table 4 Construction Phase Ambient Air Monitoring Performance

Type of Monitoring	Monitoring Location	Monitoring Frequency	Monitoring Equipment	Performance
PM10 ambient concentration	TRA1 - Western site boundary	Continuous	TEOM (AS 3580.9.8:2008)	Monitor was deployed over the entire period, however maintenance and servicing was not conducted. Data availability returned 42%
	TRA2 - Eastern site boundary	Continuous	TEOM (AS 3580.9.8:2008)	Monitor was deployed over the entire period, however maintenance and servicing was not conducted. Data availability returned 23%
Dust deposition	TRA1 - Western site boundary	Monthly	Deposition gauge (AS 3580.10.1: 2003)	Monitor was deployed over the entire period, however no monitoring was conducted.
	TRA2 - Eastern site boundary	Monthly		
Weather Monitoring				
Wind speed and direction	On-site	Continuous	Anemometer	Monitoring equipment was deployed for the entire reporting period. Data collected between 1/9/2015 – 15/12/2015. Data is not available for the remainder of period. No rainwater samples were collected for analysis.
Temperature	On-site	Continuous	Temperature sensor	
Rainfall rate	On-site	24 hour rainfall, and 30 day samples for rainwater analysis	Tipping rain gauge	

4.1.3 Monitoring results

The available dust monitoring results were compared against the relevant air quality criteria (defined in the TAN plant Air Quality Management Plan) and is presented in Table 5.

Table 5 Construction Phase Ambient Air Monitoring Results

Site	Averaging Period	Air Quality Criteria	Maximum Allowable Exceedances	Results
TRA1 - Western site boundary	24 Hours	50 µg/m^3	Nil	41 days exceeded criteria (of 173 days where valid hourly data collected for 24 hours)
	1 year	30 µg/m^3	Nil	43 µg/m^3 (Average of 3666 valid hourly averages)
TRA2 - Eastern site boundary	24 Hours	50 µg/m^3	Nil	1 day exceeded criteria (of 90 days where valid hourly data collected for 24 hours)
	1 year	30 µg/m^3	Nil	26 µg/m^3 (Average of 1996 valid hourly averages)

4.1.4 Discussion of results

Although monitors were deployed during the period, the lack of maintenance, calibration and service means the results are considered unreliable, as demonstrated by the low availability of data.

As the TAN Plant is entering the start-up and operations phases the air emissions risk profile of the site has changed significantly. Emissions have moved from dust generated during earthworks, open areas and unsealed roads during construction, to a phase where the site is sealed and potential for dust emissions are minimal, into start-up and operations phase where the air emissions profile is characterised by emissions of gas streams through stacks from the production processes. Moving forward YPN is committed to monitoring the air emissions as defined in the Commissioning Environmental Management Plan and once operational, as defined in the Operations Environmental Management Plan (currently in draft).

4.2 Groundwater Monitoring

Conditions 8.3, 8.4 and 8.5 of MS870 requires that YPN undertakes groundwater monitoring and evaluates results against trigger levels.

> *870:M8.3 Groundwater The proponent shall design, construct, and locate groundwater monitoring bores to the satisfaction of the CEO on advice of the DEC and the Department of Water, having regard for the outcomes of the hydrogeological studies required by condition 8-1 and the Department of Water's Water Quality Protection Note 30 on Groundwater Monitoring Bores.*
>
> *870:M8.4 Groundwater The proponent shall sample/monitor all groundwater bores required by Condition 8-3 every six months and shall set groundwater monitoring trigger values at a value of 10% above the baseline contaminant concentrations obtained from the hydrogeological studies required by condition 8-1.*
>
> *870:M8.5 Groundwater In the event that monitoring required by condition 8-4 indicates an exceedance of trigger levels: 1. The proponent shall report such findings to the CEO within 7 days of the exceedance being identified; 2. The proponent shall provide evidence which allows determination of the cause of the exceedance; 3. If determined by the CEO to be project attributable, the proponent shall submit actions to be taken to address the exceedance within 7 days of the determination being made to the CEO; 4. The proponent shall implement actions to address the exceedance and shall continue until such time as the CEO determines that the remedial actions may cease; and 5. The proponent shall submit bi-annually, or at a frequency defined to the satisfaction of the CEO, the results of monitoring required by condition 8-4 to the CEO, until such time as the CEO determines that reporting may cease.*

4.2.1 Monitoring programme

The groundwater monitoring programme developed to meet the MS870 requirements is currently defined in the TAN plant Construction Environmental Management Plan – Water Quality Management Plan (Doc No: 2-250-329-PRO-TRE-0111-att02, Rev: 01).

Five (5) groundwater monitoring wells (MW1-MW5) have been installed across the site.

Routine six (6) monthly water level gauging and water quality monitoring is undertaken at these monitoring wells.

Monitoring is undertaken in accordance with a Standard Operating Procedure. Samples are collected in sample bottles in accordance with directions from the NATA-registered laboratory undertaking the analysis. Samples are analysed for the suite of parameters listed in Table 6.

Groundwater monitoring trigger values at a value of 10% above the baseline contaminant concentrations obtained from the hydrogeological studies required by Condition 8-1. Three (3) rounds of groundwater monitoring was completed as part of the hydrogeological study completed by ERM (2012). The baseline data collected to date has been used to calculate the Site specific trigger levels. The methodology for calculating the Site specific trigger levels involved using the maximum concentration of an analyte detected plus 10%. In the case where a range in concentration is applicable (i.e. pH), the maximum concentration plus 10% and minimum concentration minus 10% has been used to calculate the trigger levels during construction.

4.2.2 Monitoring performance

During the reporting period sampling was conducted during November 2015 and June 2016. Due to limitations in sampling equipment, site MW04 was unable to be sampled during the monitoring period. This is being addressed through the acquisition of new sampling equipment that will enable future sampling of this bore.

During both monitoring events samples were analysed for the full suite of parameters listed in Table 6.

4.2.3 Monitoring Results

Results of groundwater monitoring at the TAN plant during the reporting period is included in Table 7.

Table 6 Groundwater Monitoring Parameters and Trigger Levels

Analyte	Units	Trigger Level (construction only)
pH	pH Units	6 – 8.4
Total Dissolved Solids	mg/L	143,000
Total Suspended Solids	mg/L	2,090
Alkalinity (total) as CaCO3	mg/L	561
Ammonia	mg/L	0.04
Aluminium (filtered)	mg/L	0.021
Arsenic (filtered)	mg/L	NA
Cadmium (filtered)	mg/L	NA
Calcium (filtered)	mg/L	1210
Chloride	mg/L	95,700
Chromium (filtered)	mg/L	NA
Copper (filtered)	mg/L	NA
Iron (filtered)	mg/L	0.26
Iron (total)	mg/L	143
Lead (filtered)	mg/L	NA
Manganese (filtered)	mg/L	0.242
Magnesium (filtered)	mg/L	5,170
Mercury (filtered)	mg/L	0.0001
Nickel (filtered)	mg/L	NA
Nitrate (as NO3-)	mg/L	9.57
Nitrogen (total)	mg/L	5.6
Zinc (filtered)	mg/L	0.052
Oil and Grease	Visible	None visible[2]

1. NA – Not Available. There are a number of metals for which results have shown concentrations below the laboratory detection limits (Arsenic, Cadmium, Copper, Chromium, Lead and Nickel), and so a reliable trigger level has not been able to be determined at this stage.
2. Trigger Level based on IECA (2008)

4.2.4 Discussion of results

The groundwater monitoring results for the TAN plant to date continue to demonstrate variability in the groundwater chemistry with no clear trends. This suggests the results depict a combination of natural variability in groundwater chemistry and off site contributions as opposed to increasing concentrations of analytes associated with site activities. Based on the current results, none of the analytes observed exceeding the trigger levels are regarded as directly attributed to current on site activities.

Table 7 Groundwater Monitoring Results

Parameter		Standing water level (meters AHD)	pH	TDS	TSS	Alkalinity (total) as CaCO3	Inorganics						Metals														TRHs*				TRHs**				
							Ammonia	Ammonia as N	Chloride	Nitrate (as N)	Nitrate (as NO3-)	Nitrogen (Total)	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Total)	Iron (Filtered)	Lead (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury	Nickel (Filtered)	Zinc (Filtered)	C6-C10 less BTEX (F1)	>C10-C16 less naphthalene (F2)	>C16-C34 (F3)	>C34-C40 (F4)	C6 - C9	C10 - C14	C15 - C28	C29-C36	C10-36 (sum of total)
Units		mAHD	pH units	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				µg/L				
Current Trigger Level		**NA**	**6-8.4**	**143,000**	**2,090**	**561**	**0.04**	**40**	**95,700**	**NA**	**9.57**	**5,600**	**0.021**	**NA**	**NA**	**1210**	**NA**	**NA**	**143**	**0.26**	**NA**	**5170**	**0.242**	**0.0001**	**NA**	**0.052**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
MW1	30/04/2011		6.95	2,000		350		38	780	1.70		2,500	0.010	<0.001	<0.0001	200	<0.001			0.008	<0.001	63	0.170	<0.00005		0.016					<40	<50	<200	<200	<450
	20/09/2011		6.86		180	320		18	710			3,400	0.002	<0.001	<0.0001	170	<0.001		1.80	<0.005		54	0.046		<0.001	0.027									
	27/02/2012		6.90		220	300	<0.005	5	670	2.00	8.70	2,100	0.002	<0.001	<0.0001	180	<0.001		4.20	<0.005		53	0.088		<0.001	0.038									
	11/10/2012		7.09		520	300	0.064	53	600	1.10	4.70	1,500	0.005	<0.001	<0.0001	170	<0.001		30.00	0.009		51	0.038		<0.001	0.008									
	6/03/2013		7.26		2,900	300	0.018	15	570	1.90	<0.05	2,000	<0.005	<0.001	<0.0001	160	<0.001		14.00	<0.005		49	0.170		<0.001	0.010									
	17/04/2013		6.71		16	290		5	560	2.20		2,400	<0.005	<0.001	0.0004	160	<0.001	0.0010	0.39	<0.005	<0.001	49	0.087		<0.001	0.010									
	17/10/2013	4.40	5.60	940	25	367		32	300	0.09		240	0.006	0.001	<0.00005	66	<0.0002	<0.0005	1.47	0.437	<0.0001	29	0.425	<0.0001	0.001	0.005	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	9/04/2014	4.98	7.13	995	<5	358		114	345	1.60		2,090	<0.005	0.001	<0.00005	57	<0.0002	<0.0005	0.57	0.430	<0.0001	31	0.272	<0.0001	<0.0005	<0.001	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/10/2014	4.54	7.44	981	<5	361		5	366	0.16		2,620	0.018	0.001	<0.00005	88	<0.0002	<0.0005	0.33	0.052	<0.0001	32	0.204	<0.0001	0.001	0.009	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/04/2015	4.58	7.31	1,010	<5	272		31	374	2.24		3,040	0.006	0.000	<0.00005	92	<0.0002	0.0050	0.32	0.044	<0.0001	33	0.080	<0.0001	0.001	0.003	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	23/11/2015	4.25	7.22	1,110	<5	316		5	394	0.25		260	0.006	0.001	<0.0001	98	<0.0005	<0.001	0.42	<0.005	<0.0002	33	0.009	<0.0001	0.001	<0.005	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	1/06/2016		7.90	1,100	440	288		<10	428		2.50	3,100	0.610	0.001	<0.0001	102	<0.005	<0.002		1.000	0.006	33	0.240	<0.0001	0.005	0.052									
MW2	30/04/2011		7.16	2,000		250		200	930	3.30		3,900	0.005	<0.001	<0.0001	99	<0.001			<0.005	<0.001	66	0.005	<0.00005		0.013					<40	<50	<200	<200	<450
	20/09/2011		6.78		190	290		5	1,200			1,400	0.002	<0.001	<0.0001	150	<0.001		6.00	<0.005		98	0.001		<0.001	0.021									
	27/02/2012		6.83		84	300	0.036	30	1,400	0.62	2.70	880	0.005	<0.001	<0.0001	240	<0.001		4.60	0.240		140	0.220		<0.001	0.047									
	11/10/2012		7.12		440	370	<0.005	5	1,300	0.63	2.80	1,100	0.002	<0.001	<0.0001	160	<0.001		12.00	<0.005		94	0.010		<0.001	0.021									
	6/03/2013		7.28		320	360	<0.005	5	1,000	0.60	2.70	700	0.006	<0.001	<0.0001	150	<0.001		15.00	<0.005		87	0.012		<0.001	0.017									
	17/04/2013		5.34		290	340		5	811	2.28		720	<0.005	<0.001	<0.00005	112	<0.001	<0.001	5.20	<0.005	<0.001	100	0.012		<0.001	0.012									
	17/10/2013		6.90	2,040	10	281		5	1,100	0.51		2,700	<0.005	<0.0002	0.0003	160	<0.0002	<0.0005	0.06	<0.002	<0.0001	76	<0.0005	<0.0001	<0.0005	<0.001	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	9/04/2014		6.98	1,550	<5	250		5	730	4.94		4,960	<0.005	<0.0002	<0.00005	71	<0.0002	<0.0005	<0.05	<0.002	<0.0001	57	0.001	<0.0001	<0.0005	<0.001	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/10/2014		7.14	1,650	<5	276		5	771	2.49		2,720	0.017	<0.0002	<0.00005	98	<0.0002	<0.0005	<0.05	<0.002	<0.0001	64	0.002	<0.0001	<0.0005	0.006	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/04/2015	2.70	7.19	1,720	<5	304		17	758	3.55		4,350	<0.005	0.000	<0.00005	103	<0.0002	0.0015	0.14	0.004	0.000	66	0.001	<0.0001	0.001	0.021	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	23/11/2015	2.20	7.03	1,680	<5	292		5	692	5.44		6,840	<0.005	<0.0005	<0.0001	94	<0.0005	<0.001	<0.05	<0.005	<0.0002	57	<0.0005	<0.0001	<0.0005	<0.005	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	14/06/2016		7.90	1,700	240	281		10	750		5.50	5,900	<0.005	<0.001	<0.0001	93	<0.005	0.0004		<0.005	<0.0001	60	0.010	<0.0001	<0.001	0.006									
MW3	30/04/2011		7.30	9,800		400		54	5,400	1.90		2,600	0.013	<0.005	<0.0005	120	<0.005			<0.025	<0.005	300	0.022	<0.00005		0.020					<40	<50	<200	<200	<450
	20/09/2011		7.22		280	450		57	3,700			220	0.019	<0.005	<0.0005	85	<0.005		7.40	<0.025		210	0.014		<0.005	0.047									
	27/02/2012		7.18		230	460	<0.005	5	4,000	0.32	1.40	610	0.005	<0.005	<0.0005	95	<0.005		6.80	<0.025		210	0.026		<0.005	0.032									
	11/10/2012	1.98	7.47		270	540	0.015	12	4,200	0.12	0.51	330	<0.01	<0.01	<0.001	100	<0.01		5.80	<0.05		260	0.027		<0.01	0.031									
	6/03/2013	2.05	7.32		180	470	<0.005	5	5,900	0.26	1.10	420	<0.025	<0.005	<0.0005	130	<0.005		6.30	<0.025		340	0.018		<0.005	<0.025									
	17/04/2013	1.84	6.17		470			770	28,000	0.03		1,500	0.072	<0.01	<0.001	350	<0.01	<0.01	21.00	0.520	<0.001	910	1.700		<0.01	<0.05									
	17/10/2013	2.83	7.19	7,280	54	479		5	3,140	0.61		530	0.021	0.001	<0.00005	91	<0.0002	0.0005	<0.05	0.010	<0.0001	232	0.004	<0.0001	0.001	<0.001	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	9/04/2014	2.40	7.50	9,050	6	466		5	5,000	0.46		840	<0.005	0.001	<0.00005	104	<0.0002	0.0017	<0.05	<0.002	<0.0001	286	0.013	<0.0001	<0.0005	<0.001	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/10/2014	2.27	7.97	6,520	<5	533		5	3,480	0.18		400	0.024	0.001	<0.00005	68	0.0004	0.0014	<0.05	0.005	<0.0001	196	0.002	<0.0001	0.001	0.025	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/04/2015	2.00	7.36	7,020	<5	570		19	3,780	2.37		3,260	<0.005	0.001	<0.00005	75	0.0003	0.0006	<0.05	<0.002	<0.0001	208	0.013	<0.0001	<0.0005	0.003	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	23/11/2015	1.69	7.31	7,620	<5	582		10	3,980	2.03		3,360	0.013	0.001	<0.0001	78	<0.0005	0.0020	0.08	0.055	<0.0002	214	0.102	<0.0001	<0.0005	0.012	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	1/06/2016		7.80	8,300	300	593		<10	4,640		1.90	2,100	0.067	<0.005	<0.0005	90	<0.005	<0.002		0.079	0.001	250	0.150	<0.0001	<0.005	0.010									
MW4	30/04/2011		7.64	6,700		510		740	3,900	0.82		2,100	<0.005	<0.005	<0.0005	39	<0.005			<0.025	<0.005	100	0.014	<0.00005		0.010					<40	<50	<200	<200	<450
	20/09/2011		7.58		670	370		18	2,500			540	<0.005	<0.005	<0.0005	28	<0.005		31.00	<0.025		68	0.011		<0.005	0.029									
	27/02/2012		7.50		1,900	390	<0.005	5	3,200	0.17	0.74	760	<0.005	<0.005	<0.0005	49	<0.005		130.00	<0.025		96	0.033		<0.005	0.047									
	11/10/2012		7.66		2,900	420	<0.005	5	3,700	0.44	1.90	1,200	<0.01	<0.01	<0.001	69	<0.01		130.00	<0.05		150	0.041		<0.01	0.012									
	17/04/2013		7.17	43,810	210	390		5	4,700	0.24		730	0.031	<0.005	<0.0005	94	<0.005	<0.005	7.40	<0.025	<0.005	190	0.120		<0.005	<0.025									
	17/10/2013	2.48	4.32	136,000	74	109		877	69,800	2.89		3,600	<0.025	<0.0025	<0.001	972	<0.0025	0.0050	1.63	<0.025	<0.001	3,900	0.277	<0.0001	0.048	<0.025	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	9/04/2014	2.46	6.99	88,300	43	148		14	49,000	4.07		7,870	<0.025		<0.001	598	<0.0025	<0.005	<0.5	0.034	<0.001	2,210	0.003	<0.0001	0.035	0.042	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/10/2014	2.04	7.15	41,000	14	317		5	25,700	2.17		3,160	0.013	0.002	<0.0004	248	0.0018	<0.002	1.02	0.019	<0.0004	921	0.075	<0.0001	0.021	0.042	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/04/2015	2.08	6.81	134,000	201	118		5	38,600	0.44		410	<0.025	<0.0025	<0.001	1,120	0.0040	<0.005	6.76	<0.025	<0.001	4,590	3.290	<0.0001	0.037	<0.025	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	23/11/2015	1.91	6.80	128,000	133	203		5	72,200	1.21		1,430	<0.005	0.002	0.0005	1,020	0.0051	0.0030	4.71	<0.005	0.000	3,960	0.098	<0.0001	0.034	0.006	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	1/06/2016		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW5	30/04/2011		6.73	130,000		370		56	87,000	1.10		5,100	<0.05	<0.05	<0.005	1,000	<0.05			<0.25	<0.05	4,100	0.220	0.0001		<0.05					<40	<50	<200	<200	<450
	20/09/2011		6.55		1,100	210		47	87,000			2,700	<0.1	<0.1	<0.01	1,100	<0.1		12.00	<0.5		4,300	<0.1		<0.1	<0.1									
	27/02/2012		6.62		1,400	150	<0.005	5	80,000	1.20	5.50	3,400	<0.1	<0.1	<0.01	1,100	<0.1		25.00	<0.5		4,700	<0.1		<0.1	<0.1									
	11/10/2012	5.64	6.90		2,600	160	0.750	620	77,000	1.10	4.70	1,800	<0.05	<0.05	<0.005	970	<0.05		37.00	<0.25		3,700	<0.05		<0.05	<0.05									
	6/03/2013	5.79	6.84		660	170	1.200	1,000	64,000	1.30	6.00	3,400	<0.25	<0.05	<0.005	770	<0.05		18.00	<0.25		3,000	<0.05		<0.05	<0.25									
	17/04/2013	4.67	6.21		1,600	170		5	58,000	1.60		2,600	0.300	<0.05	<0.005	740	<0.05	<0.05	44.00	<0.25	<0.05	2,900	<0.05		<0.05	<0.25									
	17/10/2013	2.16	6.77	75,400	63	207		5	40,500	3.29		3,460	<0.01	0.001	<0.0004	599	0.0120	<0.002	0.80	<0.01	<0.0004	2,030	0.001	<0.0001	0.007	<0.01	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	9/04/2014	2.28	7.08	47,100	78	275		18	25,700	1.54		4,170	0.086	<0.001	<0.0004	303	0.0070	<0.002	1.13	0.015	<0.0004	1,040	0.003	<0.0001	0.003	0.017	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/10/2014	2.19	7.24	33,200	<5	351		5	20,500	1.02		1,340	<0.005	0.002	<0.0002	194	0.0065	<0.001	<0.25	0.010	<0.0002	665	0.002	<0.0001	0.002	<0.005	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	30/04/2015	2.22	7.25	25,400	154	397		20	16,300	1.00		1,870	<0.005	0.001	<0.0002	139	0.0030	0.0020	4.80	0.007	<0.0002	464	0.005	<0.0001	0.002	0.020	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	23/11/2015	1.93	7.37	19,400	119	638		15	10,600	1.44		4,490	<0.005	0.001	<0.0001	20	0.0040	<0.001	0.59	<0.005	<0.0002	220	0.002	<0.0001	0.001	<0.005	<0.02	<0.1	<0.1	<0.1	<20	<50	<100	<50	<100
	1/06/2016		7.90	17,000	49	485		<10	9,300		5.10	5,400	0.031	<0.010	<0.0010	54	<0.005	<0.002		0.02	<0.0010	172	0.013	<0.0001	<0.010	<0.005									

Note: NS = Not Sampled. See explanatory notes within 2016 CAR

5 Attachments

The following documents are attached to this 2016 CAR as evidence of compliance:

- Attachment 4A: Letter from OEPA, dated 23 August 2012, approving the TAN plant Compliance Assessment Plan.
- Attachment 4B: Letter to OEPA, dated 21 December 2015, advising of an exceedance of groundwater trigger values.
- Attachment 4C: Letter to OEPA, dated 1 September 2016, advising of an exceedance of groundwater trigger values that were not reported within 7 days.
- Attachment 4D: Letter to OEPA, dated 13 November 2013 , submitting CAR 2013.
- Attachment 4E: Letter to OEPA, dated 26 September 2014, submitting CAR 2014.
- Attachment 4F: Email to OEPA, dated 4 March 2016, submitting CAR 2015.
- Attachment 5A: Letter from OEPA, dated 18 March 2013, approving revised Air Quality Management Plan and submission on best practice pollution technology.
- Attachment 7A: Email from DPAW, dated 25 June 2015, providing support for bird deterrent systems assessment and selected technology.
- Attachment 7B: Bird Deterrent Systems Assessment Report.
- Attachment 7C: Photograph of bird deterrent lines across site water pond.
- Attachment 8A: Hydrogelogical and Hydrological Investigation report, June 2012.
- Attachment 8B: Letter to OEPA, dated 12 February 2014, providing rationale for Groundwater Monitoring Well Re-Locations.
- Attachment 8C.1: Letter to OEPA, dated 12 December 2015, providing explanation of November 2015 Groundwater Monitoring Results.
- Attachment 8C.2: Groundwater monitoring results to accompany Letter Att8C.1.
- Attachment 8D: Letter from OEPA, dated 1 September 2015, notifying results of June 2016 Groundwater Monitoring Results.
- Attachment 9A: Preliminary Acid Sulfate Soil Investigation Report, dated August 2011.
- Attachment 9B: Letter from DEC Contaminated Sites Branch stating Acid Sulfate Soil investigation report meets the requirements of condition 9.1.
- Attachment 10A: Decommissioning Environmental Management Plan, Revision 6.

- Attachment 10B: Letter from OEPA, dated 23 October 2015, approving the DEMP Revision 6.

The following list of evidence has not been sighted during the preparation of this 2016 CAR, but has been referenced in previous CAR's for the TAN plant:

- Letter to OEPA, dated 15 November 2012, notifying that the proponent contact details are Yara Pilbara Nitrates Pty Ltd (ACN 127 391 422) Level 5, 182 St Georges Terrace, Perth, WA 6000.
- Letter from OEPA, dated 17 December 2012 acknowledging change in proponent.
- Letter to EPA, circa November 2012, notifying EPA of substantial commencement.
- Letter to OEPA, 10 October 2012, submitting CAR 2012.

Attachment 4A

Letter from OEPA, dated 23 August 2012, approving the TAN plant Compliance Assessment Plan.

Government of **Western Australia**
Office of the **Environmental Protection Authority**

Your Ref: 2-250-329-PRO-TRE-0104
Our Ref: A533490:OEPA2011/000430
Enquiries: Mark Rust, 6467 5316
mark.rust@epa.wa.gov.au

Mr Rajan Sinha
Deputy General Manager (TAN Project)
Burrup Nitrates Pty Ltd
Locked Bag 5009
KARRATHA WA 6714

Dear Mr Sinha

STATEMENT 870 - COMPLIANCE ASSESSMENT PLAN

Thank you for your email dated 9 August 2012 submitting the TAN Burrup Project Compliance Assessment Plan (MS870) to the Office of the Environmental Protection Authority (OEPA) as required by Conditions 4-1 and 4-2 of Statement 870.

The OEPA has reviewed the TAN Burrup Project Compliance Assessment Plan (MS870) and determined that it meets the requirements of Conditions 4-1 and 4-2 of Statement 870.

Burrup Nitrates Pty Ltd is advised that the TAN Burrup Project Compliance Assessment Plan (MS870) is acceptable.

Yours sincerely

Kim Taylor
GENERAL MANAGER

23 August 2012

Attachment 4B

Letter to OEPA, dated 21 December 2015, advising of an exceedance of groundwater trigger values

BURRUP TAN PROJECT TEAM

To
Mark Rust
Senior Environmental Officer
Office of the Environmental Protection Authority
Locked Bag 10, East Perth
WA - 6892

Date: **21/12/2015**

Attn: Mr. Mark Rust

Subject: Report to OEPA for Groundwater Monitoring Result as per Conditions 8-4 of Ministerial Statement No. 870 for Month of November 2015.

Dear Sir,

Reference is made to Contractor's letter 02080-TRS-BNP-L-01212 dated 14 December 2015 Condition 8-4 of Ministerial Statement No. 870, requires YPNPL to sample/monitor all groundwater bores every six months as per Condition 8-3 on a biannual basis. The condition sets a trigger value of 10% above the screening contaminant concentrations as established based on the 2011 data. In accordance with Condition 8-5 of Ministerial Statement No. 870, YPNPL is required to report findings to the CEO of the OEPA within 7 days of the exceedance being identified. It is anticipated that this will be the last pre-operational groundwater monitoring event (GME) prior to the start of plant operations, planned for February 2016.

This letter is intended to inform the OEPA on the outcomes of the latest GME which was undertaken by ERM on behalf of YPNPL at the five existing bores on 23.11.2015, using the consistent sampling methodology applied for the last GMEs (i.e. peristaltic pump low –flow).

In general the results of the recent GME display similar (or even improved) conditions to those documented in the previous GMEs with several parameters having values closer to those identified at the beginning of the construction works in 2012-2013. There were fewer exceedances of the trigger values in November 2015 compared to previous events and in most cases as previously stated, these are considered to be reflective of a natural variability rather than a result of site related potential contamination sources as a result of ongoing construction activities.

More specific, in November 2015 reactive phosphorus, manganese, total nitrogen (oxidised and neutral forms), total Kjendahl nitrogen and total alkalinity were detected at concentrations slightly above trigger values. Due to high salinity of water in the sample from MW4 the detection limit for specific parameters had to be raised (dilution required) by the laboratory. It is noted that three of the seven exceedances relate to various nitrogen based parameters being identified at well MW04.

The details of the exceedances are outlined below:

Reactive Phosphorus as P

- Exceedance at MW3 – 0.021 mg/L compared to the maximum acceptable screening value of 0.011 mg/L Historical results have been below the maximum acceptable screening value with concentrations between <0.002 and 0.021 mg/L, with a previous exceedance of 0.020 mg/L in April 2015 .

Manganese (Filtered)

- Exceedance at MW4 - 0.975mg/L (value actually identified in the field duplicate QC01 of MW04) compared to the maximum acceptable screening value of 0.242 mg/L, however improved compared to Apr 2015 Historical results have been mostly below the maximum acceptable screening value with concentrations between 0.0029 and 0.277 mg/L, with the highest exceedance of 3.29 mg/L in Apr 2015.

Nitrogen (Total oxidised)

- Exceedance at MW2 – 5.44 mg/L compared to the maximum acceptable screening value of 3.63 mg/L. Historical results have been mostly below the maximum acceptable screening value with concentrations between 0.51 and 3.55 mg/L, with a previous exceedance of 4.95 mg/L in Apr 2014.

Nitrogen (Total)

- Exceedance at MW2 – 6,840 mg/L compared to the maximum acceptable screening value of 5,610 mg/L. Historical results have been consistently below the maximum acceptable screening value with concentrations between 700 and 4,960 mg/L.

Kjeldahl Nitrogen Total

- Exceedance (marginal) at MW5 – 3.05 mg/L compared to the maximum acceptable screening value of 2.97 mg/L. Historical results have been consistently general below the maximum acceptable screening value with concentrations between 0.17 and 2.7 mg/L.

Total alkalinity

- Exceedance (marginal) at MW3 - 582 mg/L compared to the maximum acceptable screening value of 561 mg/L. Historical results have been generally below the maximum acceptable screening value with concentrations between 400 and 560 mg/L and one previous exceedance of 570 mg/L in Apr 2015.

Fluoride

- Exceedance at MW03 – 1.9 mg/L compared to the maximum acceptable screening value of 1.65 mg/L. Historical results have been consistently below the maximum acceptable screening value with concentrations between <0.1 and 1,6 mg/L and a single previous exceedance of 1.7 mg/L in Apr 2014.

In general other analytes were reported at concentrations similar or lower to those recorded in the previous monitoring events. The water quality conditions at one particular well (MW4) that appeared to be different in April 2015 to previously documented levels for some parameters (including salinity, total dissolved solids (TDS), hardness, sulphate, iron, calcium) have returned to historical values, indicating that April 2015 was rather an isolated spike that could be associated with less freshwater contributing to the already hypersaline aquifer at this particular location, in the fall period.

It is noted that at based on the field measurements at well MW05, TDS values have decreased steadily since Oct 2012 (94,705 mg/L) to Nov 2015 (19,949 mg/L), a trend that could be related to additional fresh water inputs. This well is located down gradient from the TAN and therefore could be considered that the source of freshwater that decreases the salinity of the aquifer at this location may be related to construction activities (such as dust suppression water infiltrating into the ground, infiltration from onsite water evaporation ponds, etc.). However, no other parameters that could be of concern (such as heavy metals or nutrients) have increased in concentrations over time and the pH and Eh values at this location have been generally consistent over the monitoring period.

As a general note the dissolved oxygen field measurements at all five wells are as expected, during spring events and deteriorating during fall events, trend confirmed by the November 2015 data.

In conclusion, the GME November 2015 results continue to support the fact that the observed variability in the groundwater chemistry with no clear trends suggests the results depict a combination of natural variability in groundwater chemistry and off site contributions as opposed to increasing concentrations of analytes associated with site activities. Based on the current results, none of the analytes observed exceeding the trigger levels are regarded as directly attributed to current on site activities.

The full GME report is in preparation by ERM and if required by the OEPA this can be provided as further reference to the above stated facts.

Attached to this letter is the summary table showing the November 2015 groundwater monitoring results as well as well as the historical monitoring data, to enable a review of the variability of the discussed parameters over time since 2011.

Yours sincerely,

Rajan Sinha
Technical Services & Business Development Manager

Attachment: Full groundwater monitoring results

Attachment 4C

Letter to OEPA, dated 1 September 2016, advising of an exceedance of groundwater trigger values that were not reported within 7 days.

1st September 2016

Our Reference: 200-200-LET-EPA-0009

Your Reference: 2013-0000239827:ST02-2013-004

Mark Rust
Senior Environmental Officer
Office of the Environmental Protection Authority
Locked Bag 10
East Perth WA 6892

Email: mark.rust@epa.wa.gov.au

Dear Mark,

Subject: Report to OEPA for Groundwater Monitoring Results as per Condition 8 of Ministerial Statement No. 870

This letter to inform the OEPA on the outcomes of the latest groundwater monitoring undertaken by Yara Pilbara Nitrates Pty Ltd (YPNPL) at the Technical Ammonium Nitrate Production Facility (TANPF) as required by Conditions 8-4 and 8-5 of Ministerial Statement 870.

Condition 8-4 *The proponent shall sample/monitor all groundwater bores required by Condition 8-3 every six months and shall set groundwater monitoring trigger values at a value of 10% above the baseline contaminant concentrations obtained from the hydrogeological studies required by condition 8-1.*

Condition 8-5 *In the event that monitoring required by condition 8-4 indicates an exceedance of trigger levels: 1. The proponent shall report such findings to the CEO within 7 days of the exceedance being identified; 2. The proponent shall provide evidence which allows determination of the cause of the exceedance; 3. If determined by the CEO to be project attributable, the proponent shall submit actions to be taken to address the exceedance within 7 days of the determination being made to the CEO; 4. The proponent shall implement actions to address the exceedance and shall continue until such time as the CEO determines that the remedial actions may cease; and 5. The proponent shall submit bi-annually, or at a frequency defined to the satisfaction of the CEO, the results of monitoring required by condition 8-4 to the CEO, until such time as the CEO determines that reporting may cease.*

YPNPL has reported results to OEPA of previous monitoring regularly (most recently in December 2015), as ongoing monitoring continues to show substantial variation that are considered to be reflective of a natural variability rather than a result of site related potential contamination sources as a result of ongoing construction activities. Since the last report to OEPA in December 2015 progress in commissioning of the TANPF has been significantly slower than anticipated and the plant is yet to be fully commissioned.

Groundwater sampling was undertaken in June 2016, with resampling undertaken in August 2016 to check the representativeness of some results from the June sampling event. Due to limitations in sampling equipment, site MW04 was unable to be sampled. This is being addressed through the acquisition of new sampling equipment that will enable sampling of this bore. MW04 will be sampled at the next monitoring event.

In June 2016 a number of analytes were detected at concentrations slightly above trigger values. When these were retested in August 2016 one (1) analyte at one (1) well, MW02, was found to exceed the trigger value of Total Nitrogen.

The Total Nitrogen value at MW2 of 13,000 µg/L has exceeded the trigger value of 5,610µg/L. As previously reported, this was also exceeded in November 2015 (6,840µg/L). YPNPL has initiated an investigation to understand the cause of this elevated Nitrogen value. Results from this investigation will be submitted to the OEPA once it is complete.

Attached to this letter is a summary table showing the 2016 groundwater monitoring results as well as the historical monitoring data, to enable a review of the variability of the parameters over time since 2011.

If you have any queries please do not hesitate to contact Susan Giles, Environmental Superintendent on 9183 4167 or susan.giles@yara.com.

Yours sincerely

Brian HOWARTH

HESQ Manager

Yara Pilbara Nitrates

Attachments

1. TANP Groundwater monitoring results

						Inorganics									Metals																TRHs**				
Parameter		pH	TDS	TSS	Alkalinity (total) as CaCO3	Ammonia	Ammonia as N	Chloride	Nitrate (as N)	Nitrate (as NO3-)	Nitrogen (Total)	Reactive Phosphorus as P	Sulphide	Sulphate	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (III+VI) (Filtered)	Chromium (hexavalent)	Chromium (Trivalent)	Copper (Filtered)	Iron (Total)	Iron (Filtered)	Lead (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury	Nickel (Filtered)	Zinc (Filtered)	C6 - C9	C10 - C14	C15 - C28	C29-C36	C10-36 (sum of total)
Units		pH units	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L				
Current Trigger Level		**6-8.4**	**143,000**	**2,090**	**561**	**0.04**	**40**	**95,700**	**NA**	**9.67**	**5,600**	**NA**	**NA**	**5,720**	**0.021**	**NA**	**NA**	**1210**	**NA**	**NA**	**NA**	**NA**	**143**	**0.26**	**NA**	**5170**	**0.242**	**0.0001**	**NA**	**0.052**	**NA**	**NA**	**NA**	**NA**	**NA**
MW1	30/04/2011	6.95	2,000		350		38	780	1.70		2,500	<0.002		170	0.010	<0.001	<0.0001	200	<0.001	<0.002	<0.005			0.008	<0.001	63	0.170	<0.00005		0.016	<40	<50	<200	<200	<450
	20/09/2011	6.86		180	320		18	710			3,400	0.008	<0.5	150	0.002	<0.001	<0.0001	170	<0.001				1.80	<0.005		54	0.046		<0.001	0.027					
	27/02/2012	6.90		220	300	<0.005	5	670	2.00	8.70	2,100	<0.002	<0.5	140	0.002	<0.001	<0.0001	180	<0.001				4.20	<0.005		53	0.088		<0.001	0.038					
	11/10/2012	7.09		520	300	0.064	53	600	1.10	4.70	1,500	0.003	<0.5	100	0.005	<0.001	<0.0001	170	<0.001				30.00	0.009		51	0.038		<0.001	0.008					
	6/03/2013	7.26		2,900	300	0.018	15	570	1.90	<0.05	2,000	0.003	<0.5	100	<0.005	<0.001	<0.0001	160	<0.001				14.00	<0.005		49	0.170		<0.001	0.010					
	17/04/2013	6.71		16	290		5	560	2.20		2,400	0.004	<0.5	120	<0.005	<0.001	0.0004	160	<0.001			0.0010	0.39	<0.005	<0.001	49	0.087		<0.001	0.010					
	17/10/2013	5.60	940	25	367		32	300	0.09		240	0.007	<0.1		0.006	0.001	<0.00005	66	<0.0002		<0.001	<0.0005	1.47	0.437	<0.0001	29	0.425	<0.0001	0.001	0.005	<20	<50	<100	<50	<100
	9/04/2014	7.13	995	<5	358		114	345	1.60		2,090	0.006	<0.1	59	<0.005	0.001	<0.00005	57	<0.0002		<0.001	<0.0005	0.57	0.430	<0.0001	31	0.272	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	30/10/2014	7.44	981	<5	361		5	366	0.16		2,620	0.018	<0.1	75	0.018	0.001	<0.00005	88	<0.0002		<0.001	<0.0005	0.33	0.052	<0.0001	32	0.204	<0.0001	0.001	0.009	<20	<50	<100	<50	<100
	30/04/2015	7.31	1,010	<5	272		31	374	2.24		3,040	0.014	<0.1	119	0.006	0.000	<0.00005	92	<0.0002	<0.001	<0.0001	0.0050	0.32	0.044	<0.0001	33	0.080	<0.0001	0.001	0.003	<20	<50	<100	<50	<100
	23/11/2015	7.22	1,110	<5	316		5	394	0.25		260	0.010	<0.1	103	0.006	0.001	<0.0001	98	<0.0005	<0.001	<0.001	<0.001	0.42	<0.005	<0.0002	33	0.009	<0.0001	0.001	<0.005	<20	<50	<100	<50	<100
	1/06/2016	7.90	1,100	440	288		<10	428		2.50	3,100				0.610	0.001	<0.0001	102	<0.005	0.002		<0.002		1.000	0.006	33	0.240	<0.0001	0.005	0.052					
	9/08/2016														<0.005								<0.005												
MW2	30/04/2011	7.16	2,000		250		200	930	3.30		3,900	0.004		170	0.005	<0.001	<0.0001	99	<0.001	<0.002	<0.005			<0.005	<0.001	66	0.005	<0.00005		0.013	<40	<50	<200	<200	<450
	20/09/2011	6.78		190	290		5	1,200			1,400	0.004	<0.5	210	0.002	<0.001	<0.0001	150	<0.001				6.00	<0.005		98	0.001		<0.001	0.021					
	27/02/2012	6.83		84	300	0.036	30	1,400	0.62	2.70	880	<0.002	<0.5	220	0.005	<0.001	<0.0001	240	<0.001				4.60	0.240		140	0.220		<0.001	0.047					
	11/10/2012	7.12		440	370	<0.005	5	1,300	0.63	2.80	1,100	<0.002	<0.5	180	0.002	<0.001	<0.0001	160	<0.001				12.00	<0.005		94	0.010		<0.001	0.021					
	6/03/2013	7.28		320	360	<0.005	5	1,000	0.60	2.70	700	<0.002	<0.5	170	0.006	<0.001	<0.0001	150	<0.001				15.00	<0.005		87	0.012		<0.001	0.017					
	17/04/2013	5.34		290	340		5	811	2.28		720	0.003	<0.5	200	<0.005	<0.001	<0.00005	112	<0.001			<0.001	5.20	<0.005	<0.001	100	0.012		<0.001	0.012					
	17/10/2013	6.90	2,040	10	281		5	1,100	0.51		2,700	0.003	<0.1		<0.005	<0.0002	0.0003	160	<0.0002		<0.001	<0.0005	0.06	<0.002	<0.0001	76	<0.0005	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	9/04/2014	6.98	1,550	<5	250		5	730	4.94		4,960	0.007	<0.1	135	<0.005	<0.0002	<0.00005	71	<0.0002		<0.001	<0.0005	<0.05	<0.002	<0.0001	57	0.001	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	30/10/2014	7.14	1,650	<5	276		5	771	2.49		2,720	0.010	<0.1	138	0.017	<0.0002	<0.00005	98	<0.0002		<0.001	<0.0005	<0.05	<0.002	<0.0001	64	0.002	<0.0001	<0.0005	0.006	<20	<50	<100	<50	<100
	30/04/2015	7.19	1,720	<5	304		17	758	3.55		4,350	0.008	<0.1	163	<0.005	0.000	<0.00005	103	<0.0002	<0.001	<0.0001	0.0015	0.14	0.004	0.000	66	0.001	<0.0001	0.001	0.021	<20	<50	<100	<50	<100
	23/11/2015	7.03	1,680	<5	292		5	692	5.44		6,840	0.006	<0.1	180	<0.005	<0.0005	<0.0001	94	<0.0005	<0.001	<0.001	<0.001	<0.05	<0.005	<0.0002	57	<0.0005	<0.0001	<0.0005	<0.005	<20	<50	<100	<50	<100
	14/06/2016	7.90	1,700	240	281		10	750		5.50	5,900				<0.005	<0.001	<0.0001	93	<0.005	<0.001		0.0004		<0.005	<0.0001	60	0.010	<0.0001	<0.001	0.006					
	9/08/2016										13,000																								
MW3	30/04/2011	7.30	9,800		400		54	5,400	1.90		2,600	0.003		800	0.013	<0.005	<0.0005	120	<0.005	<0.002	<0.005			<0.025	<0.005	300	0.022	<0.00005		0.020	<40	<50	<200	<200	<450
	20/09/2011	7.22		280	450		57	3,700			220	0.006	<0.5	810	0.019	<0.005	<0.0005	85	<0.005				7.40	<0.025		210	0.014		<0.005	0.047					
	27/02/2012	7.18		230	460	<0.005	5	4,000	0.32	1.40	610	<0.002	<0.5	940	0.005	<0.005	<0.0005	95	<0.005				6.80	<0.025		210	0.026		<0.005	0.032					
	11/10/2012	7.47		270	540	0.015	12	4,200	0.12	0.51	330	0.003	<0.5	710	<0.01	<0.01	<0.001	100	<0.01				5.80	<0.05		260	0.027		<0.01	0.031					
	6/03/2013	7.32		180	470	<0.005	5	5,900	0.26	1.10	420	0.003	<0.5	670	<0.025	<0.005	<0.0005	130	<0.005				6.30	<0.025		340	0.018		<0.005	<0.025					
	17/04/2013	6.17		470			770	28,000	0.03		1,500	0.006	<0.5	1,400	0.072	<0.01	<0.001	350	<0.01			<0.01	21.00	0.520	<0.001	910	1.700		<0.01	<0.05					
	17/10/2013	7.19	7,280	54	479		5	3,140	0.61		530	<0.001	<0.1		0.021	0.001	<0.00005	91	<0.0002	<0.001	<0.001	0.0005	<0.05	0.010	<0.0001	232	0.004	<0.0001	0.001	<0.001	<20	<50	<100	<50	<100
	9/04/2014	7.50	9,050	6	466		5	5,000	0.46		840	0.009	<0.1	647	<0.005	0.001	<0.00005	104	<0.0002	<0.001	<0.001	0.0017	<0.05	<0.002	<0.0001	286	0.013	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	30/10/2014	7.97	6,520	<5	533		5	3,480	0.18		400	0.021	<0.1	537	0.024	0.001	<0.00005	68	0.0004	<0.001	<0.001	0.0014	<0.05	0.005	<0.0001	196	0.002	<0.0001	0.001	0.025	<20	<50	<100	<50	<100
	30/04/2015	7.36	7,020	<5	570		19	3,780	2.37		3,260	0.020	<0.1	475	<0.005	0.001	<0.00005	75	0.0003	<0.01	0.0003	0.0006	<0.05	<0.002	<0.0001	208	0.013	<0.0001	<0.0005	0.003	<20	<50	<100	<50	<100
	23/11/2015	7.31	7,620	<5	582		10	3,980	2.03		3,360	0.021	<0.1	548	0.013	0.001	<0.0001	78	<0.0005	<0.001	<0.001	0.0020	0.08	0.055	<0.0002	214	0.102	<0.0001	<0.0005	0.012	<20	<50	<100	<50	<100
	1/06/2016	7.80	8,300	300	593		<10	4,640		1.90	2,100				0.067	<0.005	<0.0005	90	<0.005	<0.001		<0.002		0.079	0.001	250	0.150	<0.0001	<0.005	0.010					
	9/08/2016				553										<0.005																				
MW4	30/04/2011	7.64	6,700		510		740	3,900	0.82		2,100	0.008		350	<0.005	<0.005	<0.0005	39	<0.005	<0.002	<0.005			<0.025	<0.005	100	0.014	<0.00005		0.010	<40	<50	<200	<200	<450
	20/09/2011	7.58		670	370		18	2,500			540	0.009	<0.5	280	<0.005	<0.005	<0.0005	28	<0.005				31.00	<0.025		68	0.011		<0.005	0.029					
	27/02/2012	7.50		1,900	390	<0.005	5	3,200	0.17	0.74	760	0.007	<0.5	410	<0.005	<0.005	<0.0005	49	<0.005				130.00	<0.025		96	0.033		<0.005	0.047					
	11/10/2012	7.66		2,900	420	<0.005	5	3,700	0.44	1.90	1,200	0.007	<0.5	380	<0.01	<0.01	<0.001	69	<0.01				130.00	<0.05		150	0.041		<0.01	0.012					
	6/03/2013			210	390		5	4,700	0.24		730	0.010	<0.5	440	0.031	<0.005	<0.0005	94	<0.005			<0.005	7.40	<0.025	<0.005	190	0.120		<0.005	<0.025					
	17/04/2013	4.32	136,000	74	109		877	69,800	2.89		3,600	<0.001	<0.1	3,540	<0.025	<0.0025	<0.001	972	<0.0025		<0.02	0.0050	1.63	<0.025	<0.001	3,900	0.277	<0.0001	0.048	<0.025	<20	<50	<100	<50	<100
	17/10/2013	6.99	88,300	43	148		14	49,000	4.07		7,870	<0.001	<0.1	2,290	<0.025		<0.001	598	<0.0025		<0.001	<0.005	<0.5	0.034	<0.001	2,210	0.003	<0.0001	0.035	0.042	<20	<50	<100	<50	<100
	9/04/2014	7.15	41,000	14	317		5	25,700	2.17		3,160	0.009	<0.1		0.013	0.002	<0.0004	248	0.0018		<0.001	<0.002	1.02	0.019	<0.0004	921	0.075	<0.0001	0.021	0.042	<20	<50	<100	<50	<100
	30/10/2014	6.81	134,000	201	118		5	38,600	0.44		410	0.004	<0.1	5,960	<0.025	<0.0025	<0.001	1,120	0.0040	<0.01	0.0040	<0.005	6.76	<0.025	<0.001	4,590	3.290	<0.0001	0.037	<0.025	<20	<50	<100	<50	<100
	30/04/2015	6.80	128,000	133	203		5	72,200	1.21		1,430	0.009	<0.1	4,070	<0.005	0.002	0.0005	1,020	0.0051	0.0050	<0.001	0.0030	4.71	<0.005	0.000	3,960	0.098	<0.0001	0.034	0.006	<20	<50	<100	<50	<100
	23/11/2015																																		
	1/06/2016																																		
	9/08/2016																																		
MW5	30/04/2011	6.73	130,000		370		56	87,000	1.10		5,100	0.007		5,200	<0.05	<0.05	<0.005	1,000	<0.05	0.0100	<0.005			<0.25	<0.05	4,100	0.220	0.0001		<0.05	<40	<50	<200	<200	<450
	20/09/2011	6.55		1,100	210		47	87,000			2,700	0.010	<0.5	4,100	<0.1	<0.1	<0.01	1,100	<0.1				12.00	<0.5		4,300	<0.1		<0.1	<0.1					
	27/02/2012	6.62		1,400	150	<0.005	5	80,000	1.20	5.50	3,400	0.006	<0.5	4,400	<0.1	<0.1	<0.01	1,100	<0.1				25.00	<0.5		4,700	<0.1		<0.1	<0.1					
	11/10/2012	6.90		2,600	160	0.750	620	77,000	1.10	4.70	1,800	0.005	<0.5	3,500	<0.05	<0.05	<0.005	970	<0.05				37.00	<0.25		3,700	<0.05		<0.05	<0.05					
	6/03/2013	6.84		660	170	1.200	1,000	64,000	1.30	6.00	3,400	0.007	<0.5	3,800	<0.25	<0.05	<0.005	770	<0.05				18.00	<0.25		3,000	<0.05		<0.05	<0.25					
	17/04/2013	6.21		1,600	170		5	58,000	1.60		2,600	0.014	<0.5	3,300	0.300	<0.05	<0.005	740	<0.05			<0.05	44.00	<0.25	<0.05	2,900	<0.05		<0.05	<0.25					
	17/10/2013	6.77	75,400	63	207		5	40,500	3.29		3,460	0.005	<0.1		<0.01	0.001	<0.0004	599	0.0120		<0.01	<0.002	0.80	<0.01	<0.0004	2,030	0.001	<0.0001	0.007	<0.01	<20	<50	<100	<50	<100
	9/04/2014	7.08	47,100	78	275		18	25,700	1.54		4,170	0.002	<0.1	2,110	0.086	<0.001	<0.0004	303	0.0070		<0.001	<0.002	1.13	0.015	<0.0004	1,040	0.003	<0.0001	0.003	0.017	<20	<50	<100	<50	<100
	30/10/2014	7.24	33,200	<5	351		5	20,500	1.02		1,340	0.013	<0.1	1,800	<0.005	0.002	<0.0002	194	0.0065		<0.001	<0.001	<0.25	0.010	<0.0002	665	0.002	<0.0001	0.002	<0.005	<20	<50	<100	<50	<100
	30/04/2015	7.25	25,400	154	397		20	16,300	1.00		1,870	0.016	<0.1	1,510	<0.005	0.001	<0.0002	139	0.0030	<0.01	0.0030	0.0020	4.80	0.007	<0.0002	464	0.005	<0.0001	0.002	0.020	<20	<50	<100	<50	<100
	23/11/2015	7.37	19,400	119	638		15	10,600	1.44		4,490	0.003	<0.1	1,200	<0.005	0.001	<0.0001	20	0.0040	0.0030	0.0010	<0.001	0.59	<0.005	<0.0002	220	0.002	<0.0001	0.001	<0.005	<20	<50	<100	<50	<100
	1/06/2016	7.90	17,000	49	485		<10	9,300		5.10	5,400				0.031	<0.010	<0.0010	54	<0.005	0.0040		<0.002		0.02	<0.0010	172	0.013	<0.0001	<0.010	<0.005					
	9/08/2016														<0.005																				

Attachment 4D

Letter to OEPA, dated 13 November 2013 , submitting CAR 2013.

Our Reference : 200-200-LET-EPA-0006

13th November, 2013

Mark Rust
Senior Environmental Officer
Office of the Environmental Protection Authority
Locked Bag 10, East Perth
WA - 6892

Attention: **Mark Rust**

SUB: REPORT TO OEPA FOR COMPLIANCE ASSESSMENT REPORT FOR STATEMENT 870 FOR THE REPORTING PERIOD OF JULY 2012 TO OCTOBER 2013.

Dear Mark Rust,

Please find the attached the transmittal of Compliance Assessment Report for Statement 870 for the reporting period of July 2012 to October 2013. As the report is big size, we are sending it through CD by express post.

Yours sincerely,

Yara Pilbara Nitrates Pty Ltd.

Rajan Sinha
Deputy General Manager

Yara Pilbara Nitrates Pty Ltd
Level 5, 182 St. Georges
Terrace Perth WA 6000
Australia
+61 8 9327 8100
Facsimile
+61 8 9327 8199
ABN Number
33127391422

Attachment 4E

Letter to OEPA, dated 26 September 2014, submitting CAR 2014.

26th September,2014

Mark Rust
Senior Environmental Officer
Office of the Environmental Protection Authority
Locked Bag 10, East Perth
WA - 6892

Attention: **Mark Rust**

Dear Mark Rust,

Sub: REPORT to OEPA FOR COMPLIANCE ASSESSMENT FOR STATEMENT 870 FOR THE REPORTING PEIOD OF OCTOBER 2013 TO OCTOBER 2014.

Please find the attached Compliance Assessment Report for Statement 870 for the reporting period of October 2013 to October 2014. As the complete report (with attachments) is of big size, we are sending it through CD by express post.

Yours sincerely,
Yara Pilbara Nitrates Pty. Ltd.

Rajan Sinha
Deputy General Manager

Yara Pilbara Nitrates Pty Ltd
Level 5, 182 St. Georges Terrace
Perth WA 6000
Australia
+61 8 9327 8100
Facsimile
+61 8 9327 8199
ABN Number
33127391422

Attachment 4F

Email to OEPA, dated 4 March 2016, submitting CAR 2015.

Peter French

Subject: FW: Annual Compliance Assessment Report for Statement 870
Attachments: Transmittal 0046.pdf

From: Rajan Sinha
Sent: Friday, March 04, 2016 10:56 AM
To: Mark Rust; compliance@epa.wa.gov.au
Cc: Susan Giles; Brian Howarth; Monazzam Ali; Rob Stevens; Carly Mott; Erwin Storms
Subject: FW: Annual Compliance Assessment Report for Statement 870

Hi Mark,

Please find the attached transmittal 0046 and Compliance Assessment Report for Statement No. 870 for the reporting period of 2015.

The report has been loaded to Yara's Sharefile and the below link can be used to download. The link will be valid for 7 days .

https://yara.sharefile.com/d-se364e79761948cab

Hard copy of compliance assessment report & CD (contains report and all attachments) are being sent to you by through express post.

Please feel free to discuss for any further query on the above.

Regards,

Rajan Sinha
Technical Services and Business Development Manager
Operations
Upstream
Production
Mobile: +61 410 840 369
Office: +61891834139
Email: rajan.sinha@yara.com

YARA

Yara Pilbara Fertilisers Pty Ltd
Lot 564. Village Road Burrup
WA 6714 Karratha, Australia
www.yara.com

From: OEPA Compliance [mailto:Compliance@epa.wa.gov.au]
Sent: Tuesday, February 16, 2016 4:54 PM
To: Rajan Sinha
Subject: RE: Annual Compliance Assessment Report for Statement 870

Hello Rajan

The OEPA notes your advice that due to construction delays Yara's contractor EPC had not provided Yara with the 2015 Compliance Assessment Report and therefore it was not submitted by the required submission date of 8 October 2015.

The OEPA consider submitting the Compliance Assessment Report for year 2015 by 4 March 2016 to be acceptable on this occasion, but advise Yara that future Compliance Assessment Reports are required to be submitted by 8 October annually.

Kind Regards
Mark

Mark Rust | Senior Environmental Officer
Office of the Environmental Protection Authority | Compliance Branch
The Atrium, Level 8, 168 St Georges Terrace, Perth
Locked Bag 10, East Perth WA 6892
**** OEPA HAS NEW PHONE NUMBERS** Direct: 08 6145 0850| Reception: 08 6145 0800|**
mark.rust@epa.wa.gov.au | http://www.epa.wa.gov.au/

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From: Rajan Sinha [mailto:rajan.sinha@yara.com]
Sent: Monday, 15 February 2016 11:36 PM
To: Mark Rust
Subject: RE: Annual Compliance Assessment Report for Statement 870

Hi Mark,

Thanks for your mail and reminder on the submission of Compliance Assessment Reports for year 2015. Please note that we have yet to receive the compliance assessment reports for year 2015 from our EPC contractor, as TAN Project has been delayed more than six months due to non-completion of construction activity. We will be able to submit a Compliance Assessment Report for year 2015 by 4th March,16.

Your approval on the above is highly appreciated.

Regards,

Rajan Sinha
Technical Services and Business Development Manager
Operations
Upstream
Production
Mobile: +61 410 840 369
Office: +61891834139
Email: rajan.sinha@yara.com

Yara Pilbara Fertilisers Pty Ltd
Lot 564. Village Road Burrup
WA 6714 Karratha, Australia
www.yara.com

From: Mark Rust [mailto:Mark.Rust@epa.wa.gov.au]
Sent: Thursday, February 11, 2016 3:57 PM
To: Rajan Sinha
Subject: Annual Compliance Assessment Report for Statement 870

Hello Rajan

Condition 4-6 of Statement 870 requires Yara Pilbara Nitrates Pty Ltd (YPNPL) to submit a Compliance Assessment Report annually.

The attached TAN Burrup Project Compliance Assessment Plan (CAP) required by Conditions 4-1 and 4-2 of Statement 870 was submitted to the OEPA by YPNPL on 9 August 2012 and approved by the Office of the Environmental Assessment (OEPA) in a letter dated 23 August 2012.

Section 4 of the CAP states Compliance Assessment Reports will be submitted by 8 October annually. The OEPA have no record of a Compliance Assessment Report for Statement 870 being submitted by 8 October 2015.

If YPNPL did submit a Compliance Assessment Report by 8 October 2015, please provide a copy to the OEPA by close of business on **Tuesday 16 February 2016.**

If YPNPL did not submit a Compliance Assessment Report in 2015 please advise the OEPA by close of business on Tuesday **16 February 2016.**

Kind Regards
Mark

Mark Rust | Senior Environmental Officer
Office of the Environmental Protection Authority | Compliance Branch
The Atrium, Level 8, 168 St Georges Terrace, Perth
Locked Bag 10, East Perth WA 6892
** **OEPA HAS NEW PHONE NUMBERS**** **Direct: 08 6145 0850| Reception: 08 6145 0800|**
mark.rust@epa.wa.gov.au | http://www.epa.wa.gov.au/

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Attachment 5A

Letter from OEPA, dated 18 March 2013, approving revised Air Quality Management Plan and submission on best practice pollution technology.

Government of **Western Australia**
Office of the **Environmental Protection Authority**

Mr Rajan Sinha
Deputy General Manager
Yara Pilbara Nitrates Pty Ltd
Locked Bag 5009
KARRATHA WA 6714

Your Ref: *0086269*
Our Ref: *A574214:OEPA2012/0638-1*
Enquiries: *Annarie Boer, 6467 5431*
Email: *annarie.boer@epa.wa.gov.au*

Dear Mr Sinha

BURRUP TECHNICAL AMMONIUM NITRATE PRODUCTION FACILITY – AIR QUALITY MANAGEMENT PLAN (MINISTERIAL STATEMENT 870)

Thank you for your communication of 22 February 2013 submitting the revised Burrup Technical Ammonium Nitrate Production Facility Air Quality Management Plan (Reference 0086269) and 'Burrup TAN Plant Emission Comparison with Best Available Techniques Reference Documents' (Document no: 15626-F16-002). The revised plan has been submitted to address previous comments to you provided in Office of Environmental Protection Authority (OEPA) correspondence dated 18 January 2013 and discussed via conference call on 12 February 2013.

These documents have been prepared to address Conditions 5-1 and 5-2 of Ministerial Statement 870. Condition 5-1 states:

> *The proponent shall adopt and implement best practice pollution control technology as determined by the Chief Executive Officer of the Department of Environment and Conservation (DEC) on advice of the CEO to minimise all relevant emissions from the TANPF ammonium nitrate prilling plant.*

Condition 5-2 states:

> *Prior to construction, the proponent shall prepare and implement an ambient air monitoring programme to the satisfaction of the CEO on the advice of the Chief Executive Officer of the DEC.*

The revised Plan has been reviewed by the OEPA and is considered to address the relevant conditions above.

If there are any changes to the Plan that would substantially affect the management actions or targets, the amended plan would require submittal to the OEPA.

Should you have any queries with regard to content of this letter, please contact Annarie Boer on 6467 5431.

Yours sincerely

Kim Taylor
GENERAL MANAGER

18 March 2013

Cc

- Mr Adrian Blockley, Air Quality Management Branch, Department of Environment and Conservation (DEC)
- Ms Suzanne Roworth, Pilbara Region, DEC
- Ms Fiona Esszig, Pilbara Region, DEC

Attachment 7A

Email from DPAW, dated 25 June 2015, providing support for bird deterrent systems assessment and selected technology.

Peter French

Subject:	FW: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project
Attachments:	20150618085325416.pdf

From: Corbellini, Michelle [mailto:Michelle.Corbellini@DPaW.wa.gov.au]
Sent: Thursday, June 25, 2015 1:48 PM
To: Rajan Sinha
Cc: Wessels, Nigel
Subject: RE: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project

Hi Rajan

Yara fertiliser Pilbara's proposed methodology appears to align directly with the Department of Parks and Wildlife's (Parks and Wildlife) Pilbara Region advice dated 23 April 2015. Parks and Wildlife has no further comments on the proposed bird deterrent methods.

Kind regards

Michelle Corbellini
Environmental Project Coordinator
Pilbara Region

Department of Parks and Wildlife
Locked Bag 104, Bentley Delivery Centre, WA, 6983
Ph: (08) 9334 0260
Michelle.Corbellini@DPaW.wa.gov.au

From: Rajan Sinha [mailto:rajan.sinha@yara.com]
Sent: Thursday, 18 June 2015 9:47 AM
To: Corbellini, Michelle
Cc: Wessels, Nigel
Subject: RE: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project

Hi Michelle,

Please find the attached document with regards to the information requested under your mail below as per your advice and it is related with overhead wires. Enclosed please see updated Bird Deterrent System Assessment report.

Please feel free to contact me for any further information. Your approval on the above is highly appreciated.

Regards,

Rajan Sinha
Technical Services and Business Development Manager
Operations
Upstream
Production
Mobile: +61 410 840 369
Office: +61891834139
Email: rajan.sinha@yara.com

Yara Pilbara Fertilisers Pty Ltd
Lot 564. Village Road Burrup
WA 6714 Karratha, Australia
www.yara.com

From: Corbellini, Michelle [mailto:Michelle.Corbellini@DPaW.wa.gov.au]
Sent: Thursday, April 23, 2015 2:24 PM
To: Rajan Sinha
Cc: Wessels, Nigel
Subject: RE: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project

Hi Rajan

Thank you for providing the Department of Parks and Wildlife (Parks and Wildlife) Pilbara Region with further information regarding Yara Fertilisers proposed bird deterrents at the Technical Ammonium Nitrate Production Facility, on the Burrup Peninsula, approved under Ministerial Statement 870. Ministerial Statement 870 includes the following requirement in relation to deterring birds from entering the contaminated water pond, clean water pond and sewage wastewater treatment station evaporation pond.

> *7-1 The proponent shall employ such structures and apparatus as are necessary and agreed by the DEC to deter birds from entering the contaminated water pond, clean water pond, and sewage wastewater treatment station evaporation pond.*

Parks and Wildlife considers that the proposed deterrent techniques appear to be appropriate, provided that Yara Fertilisers commit to a monitoring program being developed and undertaken, to measure the effectiveness of the deterrent devices on the presence and abundance of bird species over time. If monitoring systems detect no effect of the devices, or a reduction in effectiveness is noted over time then other methods should be considered and implemented.

The preparation and implementation of a monitoring program is highly recommended as the effectiveness of ultrasonic and audio devices is variable, and highly dependent on how they are deployed, and dependent on target species present within the area. The range of sounds able to be detected between species varies markedly and the successfulness of an audio or ultrasonic devices in deterring birds can vary based on the activity that the bird is undertaking. There are concerns about relying solely on audio repellents for birds because they have not been demonstrated to be an effective long term solution. Some species become habituated to the devices over time. An effective deterrent system requires a variety of methods to be successful, whether in combination or in rotation, as well as frequently changing the type, timing and location of the equipment. Other deterrent methods which may be used in combination include, modifying the surface banks to make them less desirable to shorebirds (e.g. covering the banks with rocks to prevent nesting and foraging in the mud), or the installation of non-electrified string lines parallel across the ponds to prevent birds from landing or entering the water. Trials at BHP's Olympic dam have been successful in using string lines spaced at 5m intervals to deter birds (reducing presence by 99.2%). These additional methods should be considered if monitoring detects that the devices are not effective, or are decreasing in effectiveness over time.

If you have any further queries please do not hesitate to contact me.

Kind regards

Michelle Corbellini
Environmental Project Coordinator

Department of Parks and Wildlife - Pilbara Region
17 Dick Perry Ave, Kensington
Locked Bag 104, Bentley Delivery Centre, WA, 6983
Ph: (08) 9334 0260
Michelle.Corbellini@DPaW.wa.gov.au

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From: Rajan Sinha [mailto:rajan.sinha@yara.com]
Sent: Monday, 30 March 2015 8:23 PM
To: Corbellini, Michelle
Cc: Wessels, Nigel
Subject: RE: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project

Hi Michelle,

Please find the attached document with regards to the information requested under your mail below ref.: "Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project", dated on 19/December/2014. We were trying to source out the information from the vendor, and we received the detailed information just recently.

Please feel free to contact me for any further information. Your approval on the above is highly appreciated.

Regards,

Rajan Sinha
Technical Services and Business Development Manager
Operations
Upstream
Production
Mobile: +61 410 840 369
Office: +61891834139
Email: rajan.sinha@yara.com

Yara Pilbara Fertilisers Pty Ltd
Lot 564. Village Road Burrup
WA 6714 Karratha, Australia
www.yara.com

From: Corbellini, Michelle [mailto:Michelle.Corbellini@DPaW.wa.gov.au]
Sent: Friday, December 19, 2014 8:20 AM
To: Rajan Sinha
Cc: Wessels, Nigel
Subject: RE: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project

Hi Rajan

Thanks for your email and phone call to discuss yesterday.

I've had one of Parks and Wildlife's fauna experts review the deterrent methods proposed by Yara Pilbara Nitrate. They have requested that a bit more information is provided on how this method is implemented and what other options have been considered by Yara Pilbara Nitrate. If you could please provide the following information this would assist with a timely review of your request:

- State the model of the devices (i.e. brand, model number/series)
- Indicate the number of devices to be installed in total, and the number per pond, indicate the location of the installation on the map
- Indicate how the devices will be applied - frequency of use
- Provide information on other deterrent methods/devices which Yara has considered. How were other options assessed to be appropriate or inappropriate in this circumstance? Examples of other methods include noise cannons, physical barriers etc. Were other methods considered to be applied in combination (i.e. more than one method)?
- State the common bird species at this site, which may use these ponds. This is required as it appears that certain species are more sensitive than others to these particular deterrent devices. The use of the device should be justified based on the bird species found in this area.

Please note that our fauna expert and I will be taking leave over the Christmas / New Year period, and therefore based on the supply of the above information we should be able to provide you with a response during January.

If you do have any questions please do not hesitate to give me a call on the number below.

Kind regards,

Michelle Corbellini
Environmental Project Coordinator

Department of Parks and Wildlife - Pilbara Region
17 Dick Perry Ave, Kensington
Locked Bag 104, Bentley Delivery Centre, WA, 6983
Ph: (08) 9334 0260
Michelle.Corbellini@DPaW.wa.gov.au

Department of
Parks and Wildlife

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From: Rajan Sinha [mailto:rajan.sinha@yara.com]
Sent: Wednesday, 17 December 2014 11:29 AM
To: Corbellini, Michelle
Cc: Esszig, Fiona; David Hegerty; Jason Roberts; Guillaume Holweck
Subject: Request to get approval of bird deterrents as per condition 7.1 of MS 870 of YARA PILBARA NITRATE Project

Hi Michelle,

Please note that YARA PILBARA NITRATE (YPNPL) is currently constructing a Technical Ammonium Nitrate Plant in Burrup Peninsula. You may get more information about this project in the website www.ypnpl.com.au . Please find the attached letter to get the approval of bird deterrents as per advice from Department of Environment Regulation.

Please feel free to contact me for any further information.

Regards,

Rajan Sinha
Deputy General Manager (TAN Project)
Yara Pilbara
Mobile: +61 410840369
Office: +61 (8) 91834139
rajan.sinha@yara.com

YARA
Lot 564, Village Road, Burrup Peninsula
WA 6714
(Locked Bag 5009, Karratha WA 6714)
ABN : 33127391422
www.yara.com

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Attachment 7B

Bird Deterrent Systems Assessment Report.

Bird Deterrent Systems Assessment Report

Yara Pilbara Nitrates Pty Ltd

Level 5, 182 St. Georges Terrace
Perth WA 6000
Australia

+61 8 9327 8100
Facsimile
+61 8 9327 8199

ABN Number
33127391422

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Figure 4-1 Bird Deterrent Method (s) Location on Site 10

Table 2-1 EPBC Listed Migratory species - Conservation Significant Bird species which have the potential to occur within the Site 3

Table 2-2 EPBC Listed Migratory species - Conservation Significant Bird species which may potentially frequent the Site 4

Table 2-1 WC Act Listed Species - Conservation Significant Bird species which have the potential to occur within the Site 6

Table 2-1 Bird Species Observed on Site 7

Table 2-1 Bird Deterrent Method (s) implemented on Site 9

1. INTRODUCTION AND PURPOSE

Yara Pilbara Nitrates Pty Ltd (YPNPL) is developing a Technical Ammonium Nitrate Production Facility (TANPF) with a production capacity of (circa) 350,000 TPA or 915 MTPD of Technical Ammonium Nitrate (TAN).

The TANPF development site is located approximately 13 km northwest of Karratha and 1300 km north of Perth, on the Burrup Peninsula, Western Australia, within the Shire of Roeburne. The site for the TANPF is a 49 Ha area located adjacent to the existing Yara Pilbara Fertilisers Pty Ltd (YPFPL) Ammonia plant.

The purpose of this document is to describe the process followed to identify, assess and install the bird control measure at TANPF in order to comply with Condition 870:M7.1 of the Environmental Ministerial Statement (MS) 870:

- *"The proponent shall employ such structures and apparatus as are necessary and agreed by the DEC to deter birds from entering the contaminated water pond, clean water pond, and sewage wastewater treatment station evaporation pond".*

- *"Seek advice from DEC is required".*

2. FAUNA BIRDS IDENTIFICATION AT TANPF

2.1 General

The Burrup Peninsula has a rich bird fauna, attributed to its complex topography and consequent diversity of habitats, i.e. Rock Piles, Grasslands, Intertidal, Supratidal, and Mangroves including inter-tidal and marine areas.

One hundred and sixty-eight (186) species are known from either the Burrup or from areas close by (DEC, 2006). Although the peninsula possesses no large permanent fresh-water wetlands, the salt ponds of the Dampier Solar Salt operation and the sheltered waters of the mangroves, creeks and small embankments all provide good localities for episodic visits by many waterbirds (DEC, 2006).

From the 186 species, some of them are considered as Conservation Significant fauna species listed under both the EPBC Act and the WC Act.

2.2 Conservation Significant Bird species

Migratory bird habitats within the Site are considered to occur in association with the saline supra-tidal flat that occurs through the centre of the Site. As this area is likely to be inundated after extreme tides, storm surges or after extended heavy rainfall, it is likely that this area would provide occasional foraging habitat in the period following these events. These species represents protected matters under the EPBC Act. Refer to Table 2-1. In addition to these species a number of migratory species listed under the JAMBA, CAMBA and ROKAMBA conventions have previously been recorded within the Burrup Peninsula or are known for the area (DEC 2006). These species also represents protected matters under the EPBC Act. Refer to Table 2-2.

Conservation Significant fauna species listed under both the WC Act which have a high or medium likelihood of occurrence within the Site are included in Table 2-3.

Table 2-1 EPBC Listed Migratory species - Conservation Significant Bird species which have the potential to occur within the Site

Species Name	Common Name	Habitat Requirements	Habitat Potential of the Site?
Black-winged Stilt	Himantopus himantopus	Migratory bird species are known to rely on coastal wetland habitats along western Australia	Supratidal flat is likely to provide an occasional foraging resource for migratory bird species
Common Greenshank	Tringa nebularia		

Red-capped Plover	Charadrius ruficapillus	as part of their habitat requirements. The Supratidal flat located within the site is considered to provide a potential foraging resource	
Rainbow Bee-eater	Merops ornatus		
Little eagle	Hieraaetus morphnoides		
Common Sandpiper	Actitis Hypoleucos		

Table 2-2 EPBC Listed Migratory species - Conservation Significant Bird species which may potentially frequent the Site

Matters of National Environmental Significance – Migratory Species				Potential to Occur on Site
Species	**JAMBA**	**CAMBA**	**ROKAMBA**	
Apus pacificus Fork-tailed Swift	✓	✓	✓	Site represents potential habitat.
Ardea alba Great Egret, White Egret	✓	✓		Supratidal flat is likely to provide an occasional foraging resource
Ardea ibis Cattle Egret	✓			Supratidal flat is likely to provide an occasional foraging resource
Ardea sacra Eastern reef heron		✓		Supratidal flat is likely to provide an occasional foraging resource
Arenaria interpres interpres Ruddy turnstone	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris acuminata Sharp-tailed sandpiper	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris alba Sanderling	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris canutus rogersi Red knot	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris ferruginea Curlew sandpiper	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris ruficollis Red-necked stint	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris subminuta Long-toed stint	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Calidris tenuirostris Great knot	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Charadrius l. leschenaultii Great sand plover	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Charadrius mongolus Lesser sand plover	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Charadrius veredus Oriental Plover, Oriental Dotterel			✓	Supratidal flat is likely to provide an occasional foraging resource
Cuculus saturatus optatus Oriental cuckoo	✓	✓		Site represents potential habitat.
Fregata ariel Lesser frigatebird	✓	✓	✓	Site represents potential habitat.
Gallinago stenura Pin-tailed snipe	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource

Matters of National Environmental Significance – Migratory Species				Potential to Occur on Site
Species	**JAMBA**	**CAMBA**	**ROKAMBA**	
Glareola maldivarum Oriental Pratincole	✓	✓		Site represents potential habitat.
Haliaeetus leucogaster White-bellied sea-eagle		✓		Site represents potential habitat.
Hirundo rustica Barn Swallow		✓	✓	Site represents potential habitat.
Limicola falcinellus Broad-billed sandpiper	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Limosa lapponica menzbieri Bar-tailed godwit	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Macronectes giganteus Southern Giant Petrel				Supratidal flat is likely to provide an occasional foraging resource
Merops ornatus Rainbow Bee-eater				Recorded on site.
Numenius madagascariensis Eastern curlew	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Numenius minutus Little curlew	✓		✓	Supratidal flat is likely to provide an occasional foraging resource
Numenius minutus Little Curlew, Little Whimbrel	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Numenius phaeopus variegatus Whimbrel	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Oceanites oceanicus Wilson's storm petrel	✓			Supratidal flat is likely to provide an occasional foraging resource
Phalaropus lobatus Red-necked phalarope	✓	✓	✓	Site represents potential habitat.
Pluvialis squatarola Grey plover	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Puffinus pacificus Wedge-tailed shearwater	✓			Supratidal flat is likely to provide an occasional foraging resource
Sterna anaethetus Bridled tern	✓	✓		Supratidal flat is likely to provide an occasional foraging resource
Sterna bengalensis Lesser crested		✓		Supratidal flat is likely to provide an occasional foraging resource
Sterna bergii Crested tern	✓			Supratidal flat is likely to provide an occasional foraging resource
Sterna caspia Caspian tern		✓		Supratidal flat is likely to provide an occasional foraging resource
Sterna hirundo Common tern	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Sterna leucoptera White-winged black tern	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Sula leucogaster plotus Brown booby	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Tringa brevipes Grey-tailed tattler	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Tringa cinerea Terek sandpiper	✓	✓	✓	Supratidal flat is likely to provide an occasional foraging resource
Tringa hypoleucos Common sandpiper	✓	✓	✓	Recorded on site.

Matters of National Environmental Significance – Migratory Species				Potential to Occur on Site
Species	JAMBA	CAMBA	ROKAMBA	
Tringa nebularia Common greenshank	✓	✓		Recorded on site
Tringa stagnatilis Marsh sandpiper	✓	✓		Supratidal flat is likely to provide an occasional foraging resource

Table 2-3 WC Act Listed Species - Conservation Significant Bird species which have the potential to occur within the Site

Species Name	Common Name	Conservation WC Act	Habitat Requirements	Habitat Potential of the Site?
Falco peregrinus	Peregrine Falcon	S4	Nests on cliffs, crevice or large tree hollow. Occurs in a variety of environments including wetlands, plains and timbered watercourses (Pizzey & Knight 1997).	Site represents potential foraging habitat.
Ardeotis australis	Australian Bustard	P4	Grasslands, open shrublands and open scrublands. Species is relatively common away from settled areas (Pizzey & Knight 1997).	Species not previously recorded within the site or adjacent BNPL site.
Burhinus grallarius	Bush Stonecurlew	P4	Open woodland, coastal scrub and mangrove fringes (Pizzey & Knight 1997).	Species not previously recorded within the site or adjacent BNPL site.
Numenius Madagascariensis	Eastern Curlew	P4	Tidal mudflats, saltmarses and grasslands near water (Pizzey & Knight 1997).	Site represents potential habitat.
Phaps histrionica	Flock Bronzewing	P4	Flooded claypans, watercourses and treeless grassy plains, nest on the ground by low bush or tussock.	Site represents potential habitat.

WC Act Conservation Status:
S1 = Fauna that is rare or likely to become extinct.
S4 = Fauna that is in need of special protection.
P1 = Taxa with few, poorly known populations on threatened lands.
P4 = Taxa in need of monitoring.

2.3 Bird Survey on TANPF Site

ERM conducted a fauna survey (PER, Annex J) of Site D within the King Bay Hearson Cove Industrial Precinct on the Burrup Peninsula. The bird fauna observed is shown in Table 2-4.
The TANPF and temporary laydown areas had result in the removal of approximately 49 Ha of occasional foraging habitat associated with the supra-tidal flat. Areas of habitat would continue to exist to the south and west of the TANPF.
As such, the TANPF development is supposed to have implied the habitat loss of the migratory species now considered not having the potential to utilize the Site. Refer to the Public Environmental Review (PER).

Table 2-4 Bird Species Observed on Site

Species Name	**Common Name**
Birds	
Phaps chalcoptera	Common Bronze-wing Pigeon
Geopelia cuneata	Diamond Dove
Grallina cyanoleuca	Magpie Lark
Coracina novaehollandiae	Black-faced Cuckoo Shrike
Lichenostomus virescens	Singing Honeyeater
Larus novaehollandiae	Silver Gull
Himantopus himantopus	Black-winged Stilt*
Tringa nebularia	Common Greenshank*
Charadrius ruficapillus	Red-capped Plover*
Egretta garzetta	Little Egret
Sterna caspia	Caspian Tern
Megalurus timoriensis	Tawny Grassbird
Hirundo neoxena	Welcome Swallow
Artamus cinereus	Blackfaced Woodswalow
Hieraaetus morphnoides	Little Eagle*
Merops ornatus	Rainbow Bee-eater*
Egretta novaehollandiae	Whitefaced Heron
Nycticorax caledonicus	Nankeen Night Heron
Malurus lamberti	Variegated Fairy-wren
Actitis Hypoleucos	Common Sandpiper*

(*): EPBC Listed Migratory species - Conservation Significant Bird species

3. BIRD CONTROL METHODS IDENTIFICATION AND ASSESSMENT

3.1 Identification of Bird Deterrent Methods

The following available methods to deter birds have been identified:

- Physical Bird Control: Wire system, Bird Control Spikes, Bird Spiders, Hydroblast, Netting/Mesh.
- Electrical/Electronic Bid Controls: Audible Bird Control, Non Audible Bird Control Visual Bird Control, electrifier wire.
- Chemical Bird Controls (gels, avicides, fogging agents, etc.).

3.2 Assessment of Bird Deterrent Methods

Generally, all of the methods above listed have limited effectiveness requiring to carry out a decision making process to select a suitable bird deterrent system. Issues of installation and associated costs limit the choices even further. The factors considered when selecting a bird deterrent system for the ponds include the following:

- Bird species (including size, behaviour and habits);
- Bird Control effectiveness.
- Environmentally safe;
- Installation and Maintenance;
- Number and size of ponds,

A netting system has been discarded as an accurate installation to be effective is very difficult, time consuming and expensive due to size of the contaminated ponds. Because of the big of the ponds (e.g. 3,000 m2), bridges are needed to be able to tension and support the mesh hence this is a huge impact that does not justify the purposes. Netting systems requires a difficult netting clean and maintenance.
Chemical control, electrifier wirer and spikes are discarded due to the occupational health and safety regulations restrictions and potential harm to people, fauna and environment.
Sound bird control devices have been discarded due to the noise pollution originated: distress signals are generally very loud, thus disturbing the human inhabitants as well. There is also a possibility of habituation towards the noise. The effects are temporary in that birds may return after the distress signal is turned off.
The 'silent' ultrasonic repellents were considered at first instance taking into account the following applications and advantages: effective against most species of birds identified under Table 2-4, eco-friendly ('green'), environmentally safe, non-toxic and non-harmful, easy to install, low clean-up and repair costs and acoustic environment for customers and employees. Nevertheless suppliers have recognised that ultrasonic device as their range and affect is limited outdoors, and are ineffective on many bird types or species become habituated to the devices over time.
Following recommendations from Department of Parks and Wildlife - Pilbara Region, YPNPL has investigated further other methods already implemented as modifying the surface banks to make them less desirable to shorebirds (e.g. covering the banks with rocks to prevent nesting and foraging in the mud), or the installation of non-electrified string lines parallel across the ponds to prevent birds from landing or entering the water. Trials at BHP's Olympic dam have been successful in using string lines hand effectiveness have been investigated by YPNPL. The BHP Billiton Olympic Dam project identified the suspension of parallel overhead wires above the evaporation ponds as a potential option to restrict wildlife interaction with the TRS. To test the effectiveness of this approach a trial was undertaken at a local waterbody. A series of wires/lines 1m above the water surface were installed on it for a period of three weeks, during that time the spacing between the lines was tested at different intervals (5m, 7m and 10m). The trial concluded that lines spaced at 5m intervals are capable of reducing the presence of waterfowl by 99.2%.
In addition, Department of Parks and Wildlife - Pilbara Region recommends that YPNPL should commit to a monitoring program being developed and undertaken, to measure the effectiveness of the deterrent devices on the presence and abundance of bird species over time. If monitoring systems detect no effect of the method (deviations to targets in reducing the number of listed migratory birds lost), or a reduction in effectiveness is noted over time then other methods should be considered and implemented whether in combination or in rotation.

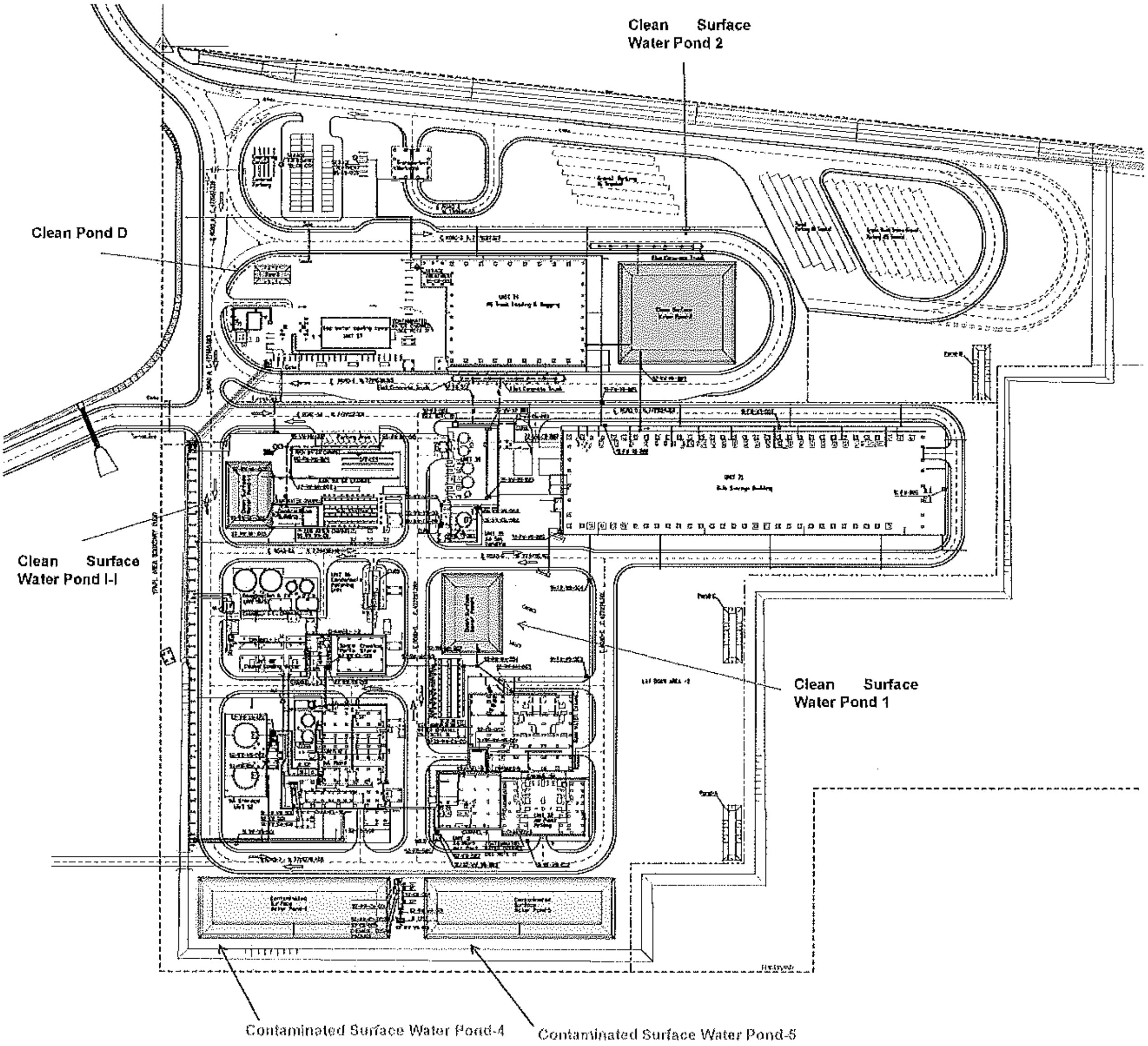
4. NUMBER OF BIRD DETERRENT DEVICES AT TANPF'S

Based on the assessment undertaken under section 3.2 and recommendations made from Department of Parks and Wildlife - Pilbara Region, the methods considered to deter birds method from entering the contaminated water pond, clean water pond and sewerage wastewater treatment station evaporation pond are described in Table 4-1.

Table 4-1 Bird Deterrent Method (s) implemented on Site

	Civil Drawing	Pond Dimension East-West	Pond Dimension North-South	Pond Surface	Bird Deterrent Method Measures
Clean Pond D	2-300-329-DWG-TRE-2964	20 m	10 m	200 m2	- Parallel overhead wire lines spaced at 5 m and 1 m above water surface - Weekly monitoring program
Clean Surface Water Pond I-I	2-300-329-DWG-TRE-2964	20,8 m	32,8 m	662.4 m2	-Parallel overhead wire lines spaced at 5 m and 1 m above water surface - Weekly monitoring program
Clean Water Surface Pond-1	2-300-329-DWG-TRE-2964	32,9 m	42,35 m	1,393.31 m2	- Parallel overhead wire lines spaced at 5 m and 1 m above water surface - Weekly monitoring program
Clean Water Surface Pond-2	2-300-329-DWG-TRE-2964	60,8 m	51,3 m	3,119.04 m2	- Parallel overhead wire lines spaced at 5 m and 1 m above water surface - Weekly monitoring program
Contaminated Surface Water Pond-4	2-300-329-DWG-TRE-2962	99,8 m	29 m	2,894.2 m2	- Parallel overhead wire lines spaced at 5 m and 1 m above water surface - Weekly monitoring program

Figure 4-1 Bird Deterrent Method (s) Location on Site



5. WIRE LINE SYSTEM TECHNICAL DETAILS

HVAC Netting System

HVAC units provide birds with shelter (underneath the units), and a high perch to check out food and other opportunities (on top of the units).

Rooftop units can be difficult to protect. Installers generally screen off the bottoms, and put Daddi Long Legs on the top. The units need to be accessed for maintenance, and building owners generally don't like holes drilled in their roofs.

Our HVAC protection system offers many unique features:

- System protects top and space below the unit
- Corner Stand-off brackets raise net well above unit
- Brackets keep net away from the sides of the unit as well
- Brackets can usually mount to unit without screws
- Weighted hose secures to roof, no fasteners or holes necessary
- Hose can be lifted up for repair access
- Installed using most standard Bird Barrier items (StealthNet, cable, net-rings, tools etc.)
- Zippers can be installed for smaller access, or as pipes and other obstructions demand

Stand-off Bracket, 24"	HV-S024	163770
Stand-off Bracket, 48"	HV-S048	
Weighted Hose, 25 ft.	NR-WH25	115440

Bird Barrier provides an online HVAC Calculator that will generate a list of the materials you need and the cost for each. www.birdbarrier.com

[illegible]

Telescoping Support Poles

These poles can be used to build raised netting systems. The poles can be used to keep the center cable higher (like a tent), or to raise a whole net system above a flat roof, or a roof covered with HVAC equipment.

The top of the pole has four holes designed to accommodate both perimeter net cable and turnbuckles. This flexibility allows the pole to accommodate a wide range of possible installations. The bolts half-way-up the poles can be loosened to adjust the poles to the perfect height. By tensioning the cables equally in each direction, the flat base will simply sit in place. Protective neoprene pads insure no damage is done to the roof. Extend poles from 4.5 ft. to 8 ft. Each pole includes one protective pad.

Pole Cable Support, 4'6"-8'	HV-P04	731743
Protective Pad	HV-PAD12	732729

[illegible]

[illegible]

5/64" Copper Ferrules for Gridwire (100)	NG-N150	645108
5/64" Open Copper Ferrules (100)	GW-C100	
Ratchet Crimping Tool	TN-B100	638178
.77 mm SS Gridwire 500 ft.	GW-WX77	651434
.96 mm SS Gridwire 500 ft.	GW-WX96	652272
Fluorescent GridTwine w/SS, 1,000 ft.	GW-T100	
Pole Cable Support (see above)	HV-P04	731743

Orange Gridwire with two strands of SS wire for added longevity.

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Yours sincerely,

Yara Pilbara Nitrates Pty. Ltd.

Rajan Sinha
Technical Services & Business Development Manager

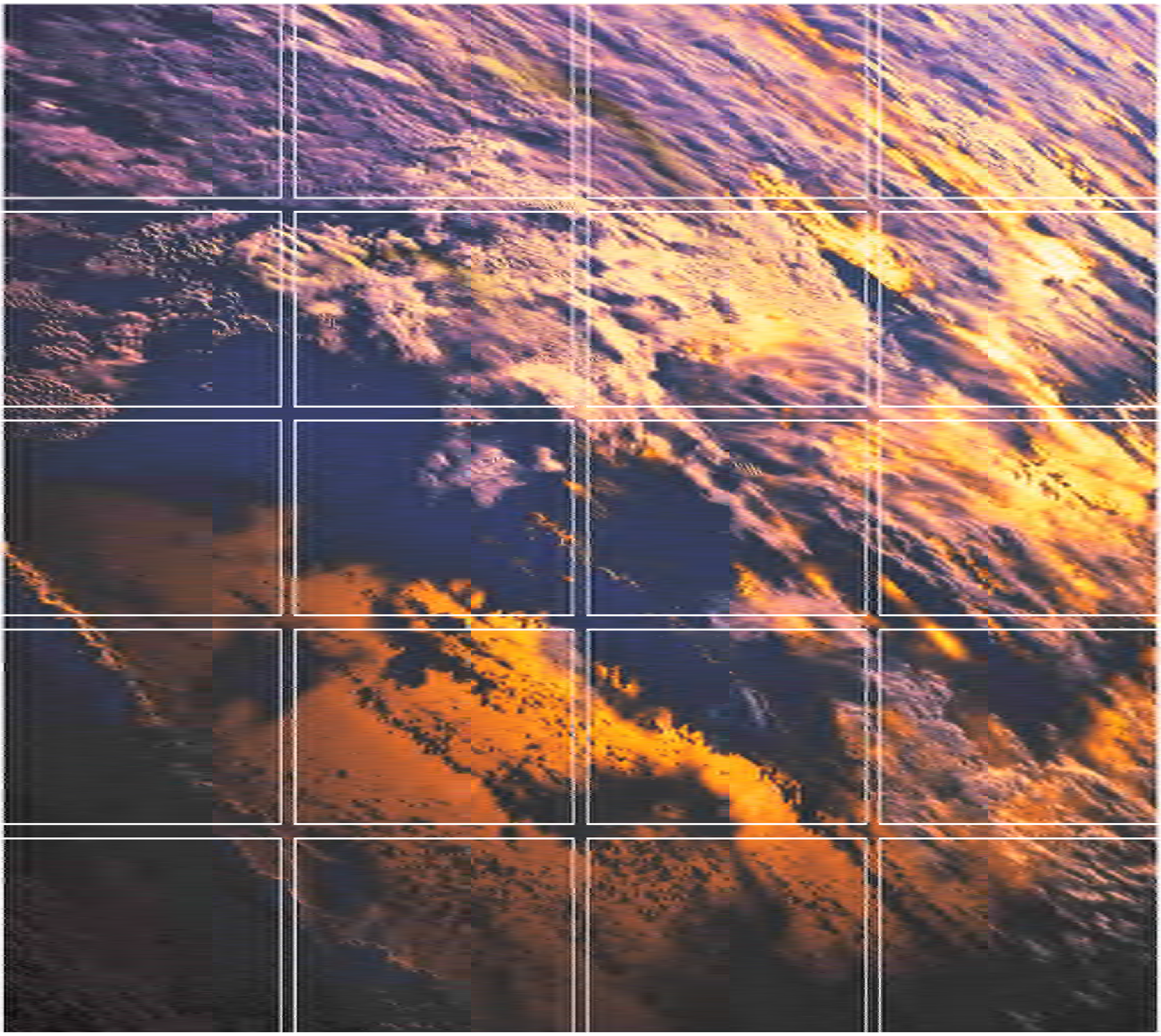
Attachment 7C

Photograph of bird deterrent lines across site water pond.


String Lines

Attachment 8A

Hydrogelogical and Hydrological Investigation report, June 2012.



Technical Ammonium Nitrate Production Facility

Hydrogeological and Hydrological Investigation

For Burrup Nitrates Pty Ltd

June 2012

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DRAFT REPORT

Burrup Nitrates Pty Ltd

Technical Ammonium Nitrate Production Facility

Hydrogeological and Hydrological Investigation

June 2012

Environmental Resources Management Australia
Building C, 33 Saunders Street
Pyrmont, NSW 2009
Telephone +61 2 8584 8888
Facsimile +61 2 8584 8800
www.erm.com

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EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Burrup Nitrates Pty Ltd (BNPL) in 2010 and 2011 to undertake hydrological and hydrogeological investigations of the proposed Technical Ammonia Nitrate Production Facility (TANPF), located at "Site D" within the Burrup Industrial Estate (BIE) on the Burrup Peninsula, Western Australia (WA).

This assessment was conducted to address Environmental Protection Authority Statement 870 Condition 8 Groundwater.

Desktop analysis and field assessment identified that the surface water at the proposed TANPF intersects a number of ephemeral watercourses which drain the slopes to the north. Diversion of these flows will be required.

Flood modelling undertaken by Golder (2011) indicates that water levels would rise to approximately 5.6 m AHD due to storm surge in a 100 year return interval event. This exceeds the proposed site level of 5.5 m AHD suggesting that some parts of the site could be inundated in such an event.

The groundwater assessment involved the installation of groundwater monitoring bores at the site, which were monitored over 18 months to evaluate baseline groundwater conditions. The average groundwater elevations across the site were 3.6 mAHD in late April 2011, and 3.4 mAHD in September 2011 and February 2012. Depth to groundwater ranged from over 3 mbgl in the northern, more elevated part of the site to approximately 0.5 mbgl in the supratidal flat area in the southern part of the site. The inferred groundwater flow direction was to the south-east, towards the supratidal flats in the southern part of the site where groundwater salinity is increased through evaporation and evapotranspiration. The hydraulic gradient was noted to be slightly steeper in the north-west than in the south of the site and groundwater elevation was generally noted to mimic surface topography.

Background groundwater quality at all monitoring well locations was dominated by sodium and chloride; however, groundwater from the northern (bedrock) part of the site contained more bicarbonate and calcium relative to chloride and sodium than groundwater from the southern part of the site. Salinity also increased in groundwater samples from the south of the site, consistent with the presence of the supratidal flats in this area.

Dewatering was considered as it formed part of one of the conditions of the EPA statement 870. The site may require dewatering during wet season or storm events, other dewatering activities will be determined by the installation methods finally chosen for the project.

Based on the findings of this report the following recommendations are made for further hydrological and hydrogeological assessment:

Further detailed design of upslope clean water diversion drains;

- *Review flood modelling to address uncertainties with respect to assumed downstream water levels;*

- *Conduct additional flood modelling to assess the relative increase in flood magnitude, frequency and flow velocities caused by filling the floodplain. Related issues to be addressed include:*

    - *assess impacts on surrounding land, ecosystems and developments (both existing developments and any proposed or foreseen developments within the area);*

    - *assess impacts on groundwater conditions (quality and levels) and soil salinity;*

    - *assess compliance with relevant legislation and flood planning controls; and*

    - *review of mitigation options to reduce potential impacts.*

- *Determine onsite stormwater detention requirements for clean and dirty water catchments based on final site design and development conditions;*

- *Prepare stormwater management plans that address the management of clean and dirty stormwater, including any discharge procedures and water quality targets;*

- *If dewatering is to be considered for the site, pumping tests and assessment of groundwater elevation and quality in nearby observation bores should be conducted; and*

- *As part of detailed design, develop management plans for control of potential sources of on-site contamination. Such sources might include water, chemical and fuel storage facilities, waste water treatment facilities, and water and waste discharge processes.*

1 *INTRODUCTION*

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Burrup Nitrates Pty Ltd (BNPL) in 2010 and 2011 to undertake hydrological and hydrogeological investigations of the proposed Technical Ammonia Nitrate Production Facility (TANPF), located at "Site D" within the Burrup Industrial Estate (BIE) on the Burrup Peninsula, Western Australia (WA) *(Figure 1.1)*.

The studies undertaken focused on the 35 ha northern portion of Site D (hereafter referred to as 'the site') which is the designated area of disturbance (both permanent and temporary) for the TANPF *(Figure 1.2)*.

These baseline studies are required in support of the environmental approvals process for the proposed TANPF.

1.1 *PROJECT APPRECIATION*

Site D within the BIE occupies an area of approximately 79 ha and extends from Village Road in the north to Hearson Cove Road in the south. The existing Burrup Fertiliser Pty Ltd (BFPL) ammonia plant is situated adjacent to the western boundary of Site D, with vacant land present between the site and Hearson Cove to the east.

The site (including temporary laydown areas) occupies approximately 35 ha of land in the northern section of Site D. Bulk earthworks disturbance associated with construction of permanent works for the TANPF will be constrained to approximately 16 ha of land (*Figure 1.2)* located within the western quadrant of the site.

The TANPF comprises three major processing units including a nitric acid plant, ammonium nitrate solutions plant and the technical ammonium nitrate (TAN) plant. The proposed site preparation works for the TANPF are anticipated to include the following activities:

- Removing vegetation within the designated area;
- Preparing the TANPF footprint and lay-down/stockpile areas, which will include cut and fill activities;
- Construction of a wastewater treatment plant;
- Installation of site drainage;
- Establishment of perimeter fencing;
- Road and access tracks for construction; and

- Potential dewatering and trenching (subject to detailed design requirements).

Legend

- Site D Boundary
- Area of Disturbance 'The Site'

Figure 1.1

Site Location

Client:	Burrup Nitrates Pty Ltd
Project:	Hydrogeological & Hydrological Report
Drawing	0086269p_Hydro_G001_R0.mxd
Date:	19/08/2011 Drawing Size: A4
Drawn By:	DN Reviewed By: SS
Projection:	GDA 1994 MGA Zone 50
Scale:	Refer to scale bar

N

0 250 500 750Km

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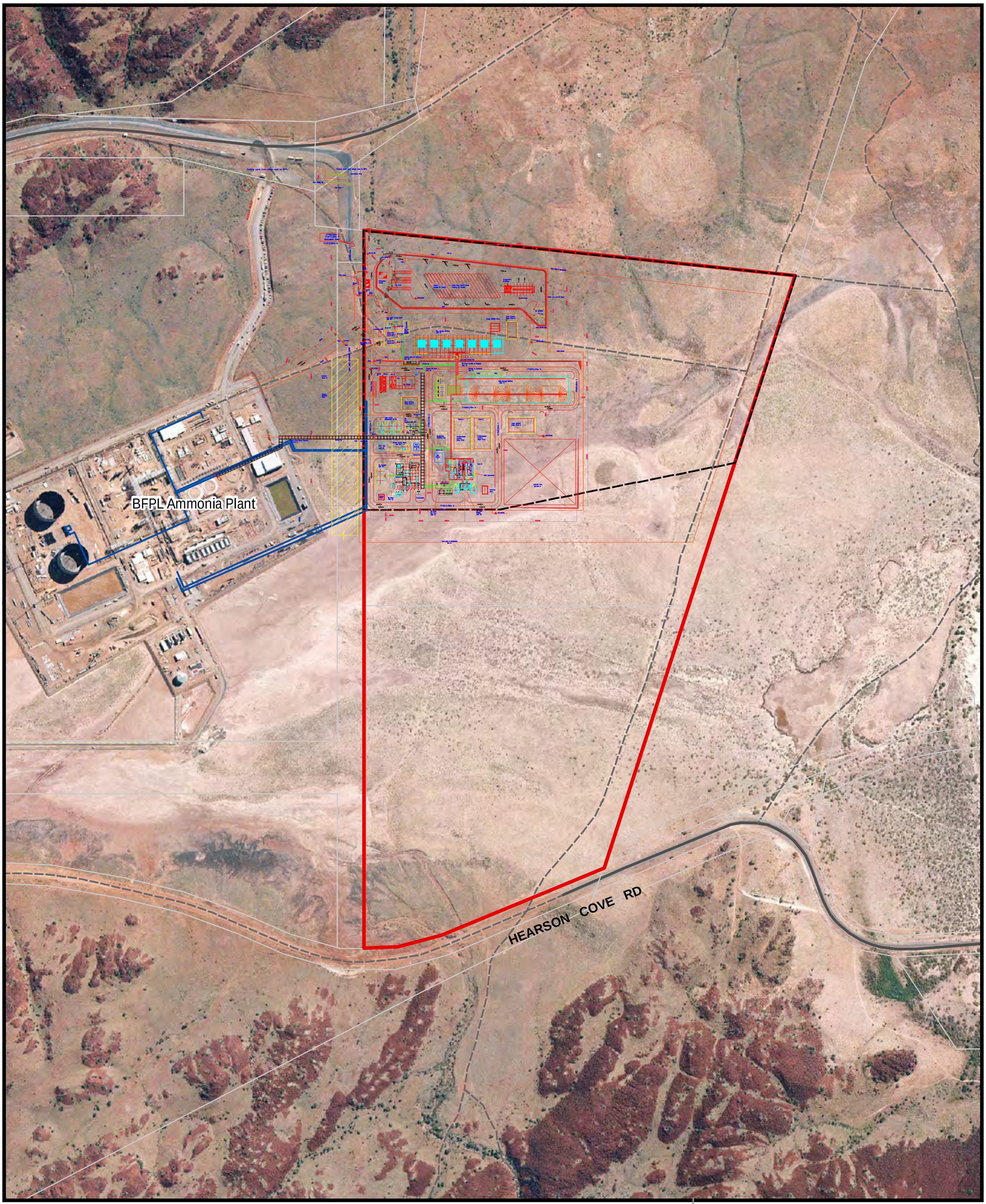

Legend

🟥 Site D Boundary

⬚ Area of Disturbance 'The Site'

— Pipeline

Figure 1.2

Site Layout

Client:	Burrup Nitrates Pty Ltd
Project:	Hydrogeological & Hydrological Report
Drawing	0086269p_Hydro_G002_R0.mxd
Date:	25/05/2012 Drawing Size: A4
Drawn By:	DN Reviewed By: SS
Projection:	GDA 1994 MGA Zone 50
Scale:	Refer to scale bar

N

0 100 200 300m

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The proposed civil works for the TANPF will include:

- Excavation for foundations and other minor civil works;
- Cut and fill activities;
- Controlled blasting (if required);
- Laying of concrete pads/footings;
- Equipment storage/construction laydown;
- Preparation of ammonia pipeline and utilities from the adjacent BFPL facility; and
- Site finishing activities (gravelling, asphalting, paving, drainage trenching etc.).

The potential impacts of the proposed development on the environment range from the direct impacts of clearing for the TANPF and associated pipe corridors, to indirect short and long-term impacts on the surface hydrology and groundwater regime during construction and operation of the TANPF.

The agreed scope of works to be completed by ERM also included an acid sulfate soil (ASS) assessment for the site, which has been reported separately (ERM, 2011).

1.2 OBJECTIVES

The agreed objectives of the hydrological and hydrogeological investigations are summarised as follows:

- To meet the requirements of Ministerial statement 870, condition 8;
- Assess peak flows for site runoff and flow to the site from the upgradient catchment to gain a preliminary understanding of the TANPF drainage design requirements to manage estimated stormwater drainage run off;
- Characterise baseline hydrogeological conditions, groundwater flow direction and groundwater chemistry, to inform the assessment of potential groundwater impacts during development and operation of the TANPF; and
- Develop a preliminary understanding of the risk of potential flooding and whether further surface water modelling and groundwater assessment is necessary.

1.3 REGULATORY CONTEXT

Requirements for the assessment and management of groundwater at the site were formally conditioned in Ministerial Statement No. 870 published on 7 July 2011. Condition 8 of the above-referenced ministerial approval articulates the following requirements, which must be implemented pursuant to the provisions of the WA *Environmental Protection Act 1986* in support of the construction and operation of the TANPF.

8 Groundwater

8-1 The proponent shall undertake detailed hydrogeological studies commencing at least 12 months prior to the commencement of construction to quantify groundwater quality, groundwater flow directions, and the depth to groundwater beneath the TANPF site and in surrounding areas.

8-2 The proponent shall develop appropriate management measures for dewatering to the satisfaction of the CEO on advice of the DEC and the Department of Water in the event that the information gathered from the hydrogeological studies required by condition 8-1 indicates that dewatering would be required during construction.

8-3 The proponent shall design, construct, and locate groundwater monitoring bores to the satisfaction of the CEO on advice of the DEC and the Department of Water, having regard for the outcomes of the hydrogeological studies required by condition 8-1 and the Department of Water's Water Quality Protection Note 30 on Groundwater Monitoring Bores.

8-4 The proponent shall sample/monitor all groundwater bores required by Condition 8-3 every six months and shall set groundwater monitoring trigger values at a value of 10% above the baseline contaminant concentrations obtained from the hydrogeological studies required by condition 8-1.

8-5 In the event that monitoring required by condition 8-4 indicates an exceedance of trigger levels:

1. The proponent shall report such findings to the CEO within 7 days of the exceedance being identified;

2. The proponent shall provide evidence which allows determination of the cause of the exceedance;

3. If determined by the CEO to be project attributable, the proponent shall submit actions to be taken to address the exceedance within 7 days of the determination being made to the CEO;

4. The proponent shall implement actions to address the exceedance and shall continue until such time as the CEO determines that the remedial actions may cease; and

5. The proponent shall submit bi-annually, or at a frequency defined to the satisfaction of the CEO, the results of monitoring required by condition 8-4 to the CEO, until such time as the CEO determines that reporting may cease.

8-6 The proponent shall make the monitoring reports required by condition 8-5(5) publicly available in a manner approved by the CEO.

The findings of the hydrological and hydrogeological studies reported herein may be used in support of the discharge of ministerial sub-condition 8-1 in respect of establishing a baseline understanding of groundwater depth, flow direction and chemical quality characteristics at the site.

1.4 LIMITATIONS

The findings of this report are based on the scope of work outlined in this report. ERM performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental profession. No warranties, expressed or implied, are made.

Subject to the scope of work, ERM's assessment is limited strictly to identifying typical environmental conditions associated with the subject property and does not evaluate structural conditions of any buildings on the subject property, nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials on the subject property should not be interpreted as a guarantee that such materials do not exist on the site.

The information relating to the soil and groundwater conditions in this document is considered to be accurate at the date of issue. Subsurface conditions can vary across a particular site, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the Site. Subsurface conditions including impact concentrations can change over a limited period of time.

All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved with the project and, while normal checking of the accuracy of data has been conducted, ERM assumes no responsibility or liability for errors in data obtained from regulatory agencies or any other external sources, nor from occurrences outside the scope of this project.

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2 *SCOPE OF WORKS*

To meet the project objectives, the following scope of works was completed in accordance with the approved proposal:

- Desktop assessment, which included reviewing relevant available reports (e.g. Golder Geotechnical Report, 2011), and other publically available data;
- Field investigation and field data analysis;
- Hydrological assessment;
- Hydrogeological assessment; and
- Preparation of this report to summarise the findings of the hydrological and hydrogeological investigations.

Each scope of work described above is discussed in detail below.

2.1 *DESKTOP ASSESSMENT*

The desktop assessment included a review of the following:

- Geological and hydrogeological data to identify potentially sensitive surface water and groundwater features in and surrounding the site;
- Historical investigation reports for the site and nearby industrial development (in particular the recent Golder Geotechnical survey undertaken in 2011);
- Meteorological data; and
- Hydrological and catchment data.

2.2 *FIELD INVESTIGATION*

A field investigation was completed in January 2011, with follow-up groundwater monitoring and analysis in April and September 2011 and February 2012 to inform the hydrological and hydrogeological characterisation of the site. Baseline studies were undertaken to provide initial characterisation of hydraulic conditions, groundwater flow directions and background groundwater chemistry. The studies were designed to assist with identifying potential impacts during development and operation of the TANPF and providing a baseline status.

A comprehensive assessment and installation of a monitoring network has not been completed at this time for this project, as the design and layout of the TANPF and installation methods have not yet been finalised. As such these works undertaken for this report are considered to be an initial assessment.

A summary of the works completed for the field investigation are detailed below.

2.2.1 *Health and Safety*

All works were completed in accordance with ERM health and safety (H&S) procedures. This included the preparation of site works risk/hazard analysis documents and the preparation of an H&S plan to oversee safe work practices at the site.

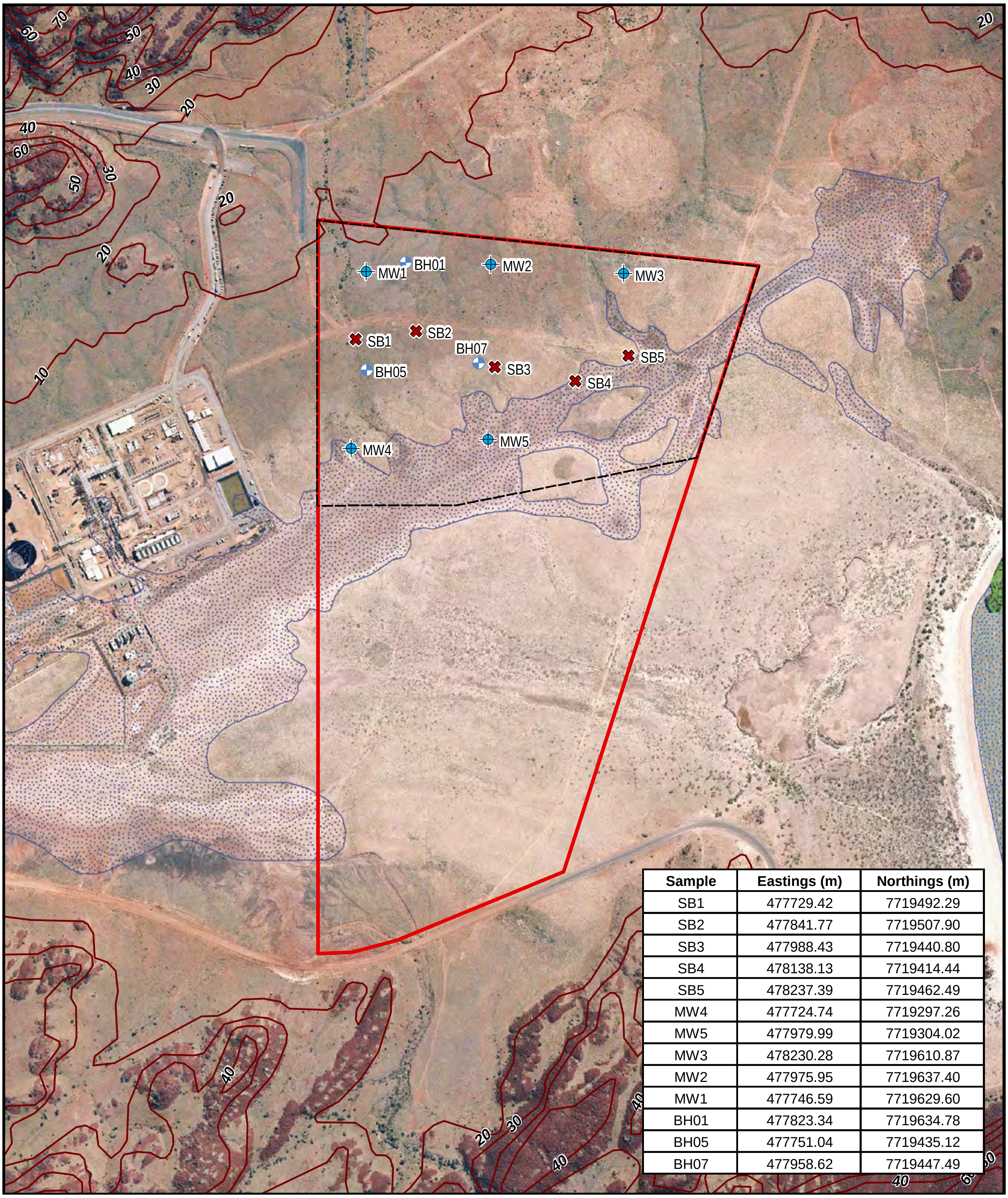
An H&S meeting was conducted with BNPL's appointed driller prior to mobilisation to ensure appropriate procedures and safety measures were in place for the site visit.

ERM required BNPL's drilling contractor to comply with ERM H&S procedures and measures discussed and agreed in the H&S meeting prior to mobilisation. If, for any reason, ERM staff felt that BNPL's subcontractor was not complying with the agreed H&S procedures/measures, or ERM staff felt an action was unsafe, ERM staff reserved the right to stand down or postpone works until appropriate safety practices were in place.

2.2.2 *Drilling and Groundwater Monitoring Well Installation*

The intrusive works undertaken in support of geological and hydrogeological characterisation of the site comprised advancement of 10 soil bores to a nominal target depth of 3 m. At five locations, drilling was advanced at least 2 m beyond the water table to facilitate monitoring well installation and subsequent groundwater sampling and analysis. The location of the soil bores and monitoring wells are provided in *Figure 2.1.*

Additional exploratory holes were advanced across the site to aid geotechnical characterisation and assessment of foundation design parameters and dewatering constraints, under the supervision of Golder Associates (Golder, 2011). This supplementary data has been used by ERM to refine the understanding of the site, particularly in regard to groundwater occurrence and behaviour, and the assessment of potential dewatering management implications (per Ministerial Condition 8-2, see *Section 1.3*).



Sample	Eastings (m)	Northings (m)
SB1	477729.42	7719492.29
SB2	477841.77	7719507.90
SB3	477988.43	7719440.80
SB4	478138.13	7719414.44
SB5	478237.39	7719462.49
MW4	477724.74	7719297.26
MW5	477979.99	7719304.02
MW3	478230.28	7719610.87
MW2	477975.95	7719637.40
MW1	477746.59	7719629.60
BH01	477823.34	7719634.78
BH05	477751.04	7719435.12
BH07	477958.62	7719447.49

Legend

🟥	Site D Boundary
⬚	Proposed Development Area 'The Site'
▨	Saline Coastal Flat
—	Contour Elevation (10m interval)

Sampling Locations

⊕	Monitoring Well
✖	Soil Sample
◕	Borehole

Figure 2.1
Well Locations

Client:	Burrup Nitrates Pty Ltd
Project:	Hydrogeological & Hydrological Report
Projection:	GDA 94 MGA Zone 50
Drawing No:	0086269p_Hydro_G008_R0.mxd
Date:	19/08/2011 Drawing size: A4
Drawn by:	DN Reviewed by: BC
Source:	Aerial supplied by Landgate
Scale:	1:5500

N

0 100 200 300 400m

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Environmental Resources Management Australia Pty Ltd
172 St Georges Tce, Perth, WA 6000
Telephone +61 8 89321 5200

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Hydraulic Testing

Slug tests (rising head tests) were completed at the site in April 2011 to assess the hydraulic conductivity of the underlying geology; however, due to the flooding at the site and unexpected field equipment failure, viable data were not obtained from these slug tests.

Repeat slug tests were completed during the September 2011 and February 2012 groundwater monitoring events. Three rising head tests were completed at each monitoring well to assess repeatability, with the exception of MW1 (February 2012) where the test was only repeated twice.

Prior to commencing each slug tests, the static water level was measured and recorded. A pressure transducer for measuring changes in water level was installed and a bailer was submerged below the water level. The water level was allowed to return to static levels before removing the full bailer in an instantaneous movement. The instantaneous drop in water level and subsequent recharge of groundwater into the well was measured by the pressure transducer. When the water level had returned to the initial static level the test was repeated. The duration of the test was dependent on the rate of water level recovery which, in turn, is dependent on the geological formation in which the well is installed.

The results of the analysis of the data are provided in *Annex H*.

2.2.3 Groundwater Sampling

The five groundwater monitoring wells (MW1-MW5) installed at the site were developed, purged and sampled in accordance with ERM's standard groundwater sampling protocols. Samples were collected and stored under full chain of custody procedures. QA/QC samples were collected and analysed in accordance with Australian Standard AS/NZS 5667.11:1998: Water quality – Sampling – Guidance on sampling of groundwater and the results summarised in *Annex I.*

2.2.4 Soil Sampling

Soil sampling was undertaken during advancement of all soil bores (SB1 to SB5) and monitoring wells (MW1 to MW5) (*Figure 2.1*). During drilling, soil lithology was logged by ERM field personnel in general accordance with the Unified Soil Classification System (USCS). Potential visual and olfactory indicators associated with acid sulfate soils were also recorded where apparent (e.g. soil colour, mottling, hydrogen sulphide odours). Full details of the implemented soil sampling procedures and associated analytical results are provided in the ERM report *'Preliminary Acid Sulfate Soil Investigation, Aug 2011'* (ERM, 2011) and are not discussed further in this report.

2.2.5 *Laboratory Analysis*

Groundwater samples were analysed at ALS in Perth, which is a NATA approved laboratory for the schedule of analytes recommended by the WA Department of Water (May 2007) for hydro-geological assessments, as listed below:

- Field parameters including; temperature, pH, oxygen reduction potential, electrical conductivity and dissolved oxygen;
- Cations and anions including calcium, magnesium, sodium, potassium, phosphate, ammonia, carbonate, bicarbonate, chloride, sulphate, nitrate, nitrite and silica;
- Total dissolved solids, total hardness and total alkalinity;
- Dissolved metals including; aluminium, arsenic, cadmium, chromium, iron, lead, manganese, mercury, selenium and zinc; and
- Total petroleum hydrocarbons.

2.2.6 *Data Management*

All geological and chemical data obtained from the field investigation were incorporated into ESDAT data management software. This software allows automated processing and presentation of geological and chemical data in tabulated and graphical forms. ESDAT data was coupled with GIS and CAD to enhance the spatial representation of data.

2.2.7 *Hydrological Assessment*

Hydrological calculations were undertaken to assess peak flows in catchments draining onto the site. The methods outlined in *Australian Rainfall and Runoff: A Guide to Flood Estimation* (AR&R) (Pilgrim ed., 1987) were used. Both the Rational Method and Index Flood Method were used as described for the North West Pilbara region of WA.

An estimate was made of stormwater detention volumes for 24-hour storm events of various recurrence intervals to inform the design of on-site stormwater detention facilities.

A review of existing information relating to flooding and storm surge was also conducted and relevant information summarised.

3 *INVESTIGATION FINDINGS*

3.1 *CLIMATE*

The Burrup Peninsula lies at the western edge of the semi-desert tropical Pilbara region within Australia's arid zone. The seasonal variations in the region do not accord directly with the traditional four seasons of higher latitudes and the climate is characterised by two seasons:

- Fine, warm and dry winters from May to November; and
- Hot, summers with periodic, heavy rains from December to March.

The climate of this region is monsoonal and seasonally controlled by the meridional position of the large high pressure cells, which pass from west to east across the Australian continent (Osborne *et al.*, 2000). These pressure systems, with their anticlockwise wind circulation, migrate from latitudes of 25° to 30ºS in winter to 35° to 40ºS in summer (Pierce *et al.*, 2003). Strong easterly winds prevail in the winter due to the development and intensification of anticyclones over southern WA or South Australia. In summer, prevailing winds are generally warmer and from the northwest and southwest.

Long-term meteorological data (including rainfall, temperature, humidity and wind data) has been recorded since 1969 at the operations of Dampier Salt and Karratha Airport by the Bureau of Meteorology (BoM). A summary of the meteorological data over the period 1993 to present for the area around the Burrup Peninsula is presented in *Table 3.1.*

3.1.1 *Temperature and Humidity*

The annual mean maximum temperature at Karratha Airport meteorological station (located 10 km south of the Site) is 32.3°C, with an annual mean minimum of 20.8°C. A summary of climate data taken from Karratha Airport meteorological station is provided in *Table 3.1.*

Table 3.1 Summary of Climate Data for Karratha Aero (BoM, 2012)

Month	**Temperature (°C)**		**Relative humidity (%)**		**Mean Daily Evaporation (mm)***	**Mean Monthly rainfall (mm)**	**Wind Speed (km/h)**	
	Mean Daily Max.	Mean Daily Min.	9 am Mean	3 pm Mean			9 am Mean	3 pm Mean
January	36.0	26.8	59	51	11.0	47.7	19.4	28.2
February	35.4	26.6	64	55	10.1	80.5	18.8	26.4
March	36.1	25.7	54	46	10.1	51.3	18.9	24.4
April	34.2	22.6	47	40	9.2	17.9	17.3	22.0
May	30.0	18.1	45	42	7.1	25.1	19.2	22.7
June	26.5	14.9	47	44	6.0	29.0	21.4	23.0
July	26.3	13.8	45	40	6.2	14.6	20.0	23.0
August	28.1	14.3	39	35	7.3	4.8	19.9	24.0
September	30.6	16.9	40	36	9.0	1.5	19.2	26.3
October	33.7	20.5	40	38	10.8	0.3	19.7	28.4
November	34.9	23.0	43	41	11.9	1.6	20.3	29.7
December	35.7	25.4	51	47	11.9	12.7	20.1	29.4
Annual Average	32.3	20.7	48	43	9.2	290.6**	19.5	25.6

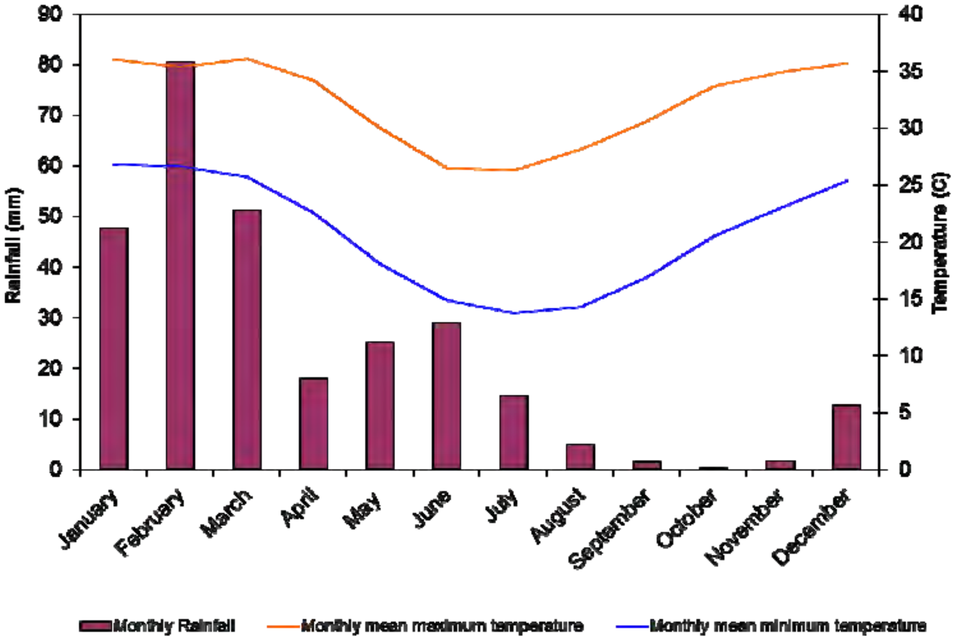
** Data sourced from Dampier Salt meteorological station 1972 - 2012 (BoM, 2012)*

*** Average annual total*

Monthly mean maximum temperatures recorded range from 26.3°C in July to 36.1°C in March. Monthly minimum temperatures recorded range from 13.8°C in July to 26.8 °C in January (BoM, 2012).

The annual mean relative humidity is 48% at 9 am, decreasing to 43% at 3 pm. Monthly mean maximum humidity at 9 am range from 64% in February to 39% in August. Monthly mean maximum humidity at 3 pm ranges from 55% in February to 35% in August (BoM, 2012). Monthly mean maximum and minimum temperatures and rainfall are illustrated in *Figure 3.1.*

Figure 3.1 Monthly Mean Maximum and Minimum Temperature and Rainfall at Karratha Aero (BoM, 2012)



3.1.2 *Rainfall and Evaporation*

Annual rainfall in the region is characterised by low, highly variable and very localised rain events due to thunderstorm and tropical cyclone activity in the summer months. Average annual rainfall recorded at Karratha Airport is 289.9 mm, with an annual average of only 20 days a year exceeding 1 mm of rainfall (BoM, 2012).

Rainfall in the region is seasonal, usually with two peaks per year. The first peak is from January to March due to tropical cyclones, tropical lows or rain-bearing depressions and tropical thunderstorms. The second peak is from May to June due to the passage of low pressure systems through the south of WA. Monthly average rainfall for the area ranges between 80.5 mm in February to 0.3 mm in October. Due to tropical cyclones, the area is prone to isolated extreme rainfall events. The highest rainfall recorded in a single month was 348.8 mm in February 2011, while all calendar months have at one stage recorded 0 mm of rainfall (BoM, 2012).

Annual average evaporation is 3,358 mm per year, or 9.2 mm per day, which is more than 11 times greater than the average annual rainfall (BoM, 2012).

Rainfall Events prior to Site Visit

On January 26 2011, Tropical Cyclone Bianca passed just north of nearby Barrow Island (approximately 150 km to the west of the site) bringing with it high winds and heavy rainfall. Damage to the weather station on the island meant that precise rainfall data for this event could not be ascertained. Following Tropical Cyclone Bianca, on 23 February 2011, Tropical Cyclone Carlos tracked over Barrow Island which resulted in a recorded daily rainfall of 283 mm.

As part of the field investigation, a site visit was undertaken by ERM personnel between the 28 and 30 April 2011. ERM personnel noted that there was evidence of temporal inundation in the low lying area east of the Burrup Fertilisers Pty Ltd (BFPL) Ammonia Plant (refer to the photolog in *Annex A*). A site visit conducted three months prior by the same ERM personnel noted that the same area was completely dry.

3.1.3 Wind

Winds in the area of the Burrup Peninsula are predominately from the east during the winter months of April, May, June, July and August with average wind speeds ranging between 17 – 24 km/h (BoM 2012). East to south-easterly winds are dominant in the mornings, shifting to north-easterly in the afternoon and easing in the evening in response to diurnal land temperature changes.

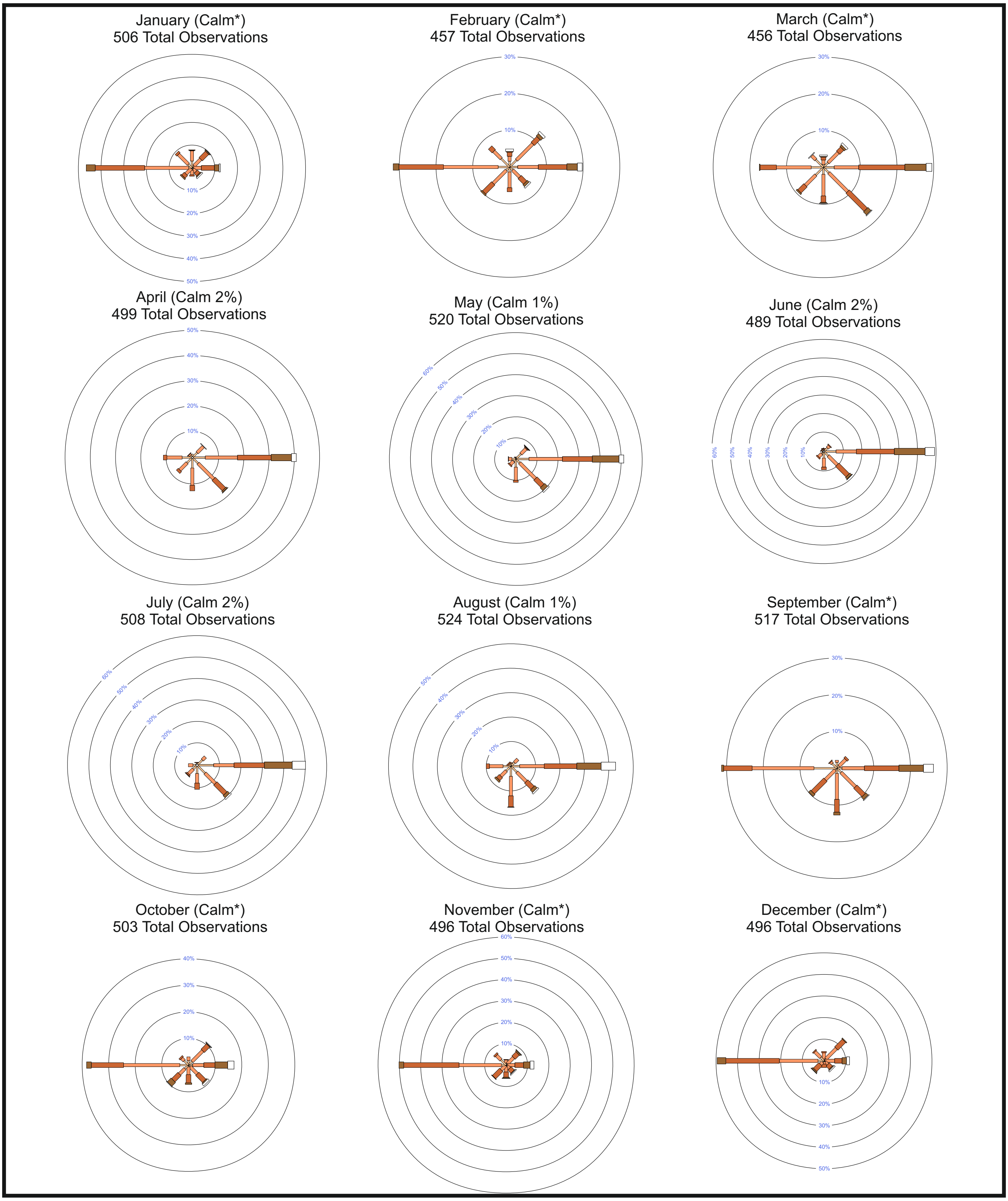
From October through to February winds are predominantly westerly in the morning, shifting to dominant north-westerly onshore winds in the afternoon with mean wind speeds varying between 19 and 30 km/h. The months of February, March and September are transition months with less dominant wind patterns, with mean wind speeds varying between 19 and 28 km/h. Monthly 9 am and 3 pm wind roses for Karratha are presented in *Figures 3.2* and *3.3*.

Extreme wind conditions may be generated in the region by tropical cyclones, strong easterly pressure gradients, squalls and tornados. Tropical cyclones generate the most significant storm conditions in the region with wind gusts of 259 km/h at Mardie being measured during cyclone Trixie in February 1975, and 183 km/h recorded at Dampier from cyclone Orson in 1989 (BoM, 2011b).

3.1.4 Cyclones

The Pilbara coast experiences more cyclones than any other part of Australia and is one of the most cyclone-prone regions in the world. Between 1910 and 2006, 48 cyclones in the Karratha, Dampier and Roebourne region caused damaging wind gusts in excess of 90 km/h (BoM, 2011b). Along the central

Pilbara coast the cyclone season runs from mid-December to April peaking in February and March as illustrated in *Figure 3.4* (BoM, 2011b).


January (Calm*)
506 Total Observations

February (Calm*)
457 Total Observations

March (Calm*)
456 Total Observations

April (Calm 2%)
499 Total Observations

May (Calm 1%)
520 Total Observations

June (Calm 2%)
489 Total Observations

July (Calm 2%)
508 Total Observations

August (Calm 1%)
524 Total Observations

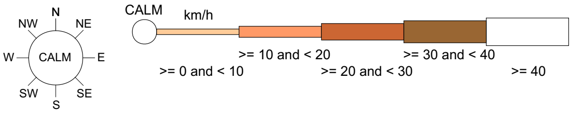
September (Calm*)
517 Total Observations

October (Calm*)
503 Total Observations

November (Calm*)
496 Total Observations

December (Calm*)
496 Total Observations

Legend



Notes:

Rose of Wind direction versus Wind speed in km/h (04 Aug 1993 to 30 Sept 2010)
Custom times selected, refer to attached note for details:
KARRATHA AERO
Site No: 004083, opened Dec 1971, still open
Latitude -20.7097^{0}, Longitude 116.7742^{0}), elevation 7m
An asterisk (8) indicates that calm is less than 0.5%. Other important info about this analysis is available in the accompanying notes.

Client: Burrup Nitrates Pty Ltd
Project: Hydrogeological & Hydrological Report
Drawing No: 0082692p_Hydro_C001.cdr
Date: 19/08/2011 Drawing size: A4
Drawn by: DN Reviewed by: SS
Source: Australian Government - Bureau of Meteorology
Scale: Not to Scale

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Figure 3.2

Wind Roses - 9am

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Legend

Notes:

Rose of Wind direction versus Wind speed in km/h (04 Aug 1993 to 30 Sept 2010)
Custom times selected, refer to attached note for details:
KARRATHA AERO
Site No: 004083, opened Dec 1971, still open
Latitude -20.7097°, Longitude 116.7742°), elevation 7m
An asterisk (8) indicates that calm is less than 0.5%. Other important info about this analysis is available in the accompanying notes.

Client:	Burrup Nitrates Pty Ltd		
Project:	Hydrogeological & Hydrological Report		
Drawing No:	0082692p_Hydro_C002.cdr		
Date:	19/08/2011	Drawing size:	A4
Drawn by:	DN	Reviewed by:	SS
Source:	Australian Government - Bureau of Meteorology		
Scale:	Not to Scale		

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Figure 3.3

Wind Roses - 3pm

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On average, two cyclones cross the Pilbara coast each year, which can result in wind gusts of up to 250 km/hr, along with heavy swells, storm surges and torrential rain (BoM, 2011). Data from the BoM, as illustrated in *Figure 3.5*, summarise the frequency, category and maximum wind gusts from cyclones that have occurred in the Dampier and Karratha Region between 1910 and 2006. *Figure 3.6* shows the frequency of tropical cyclones per annum across Australia.

Figure 3.4 Cyclone Frequencies in the Karratha/Dampier Region (BoM, 2011b)

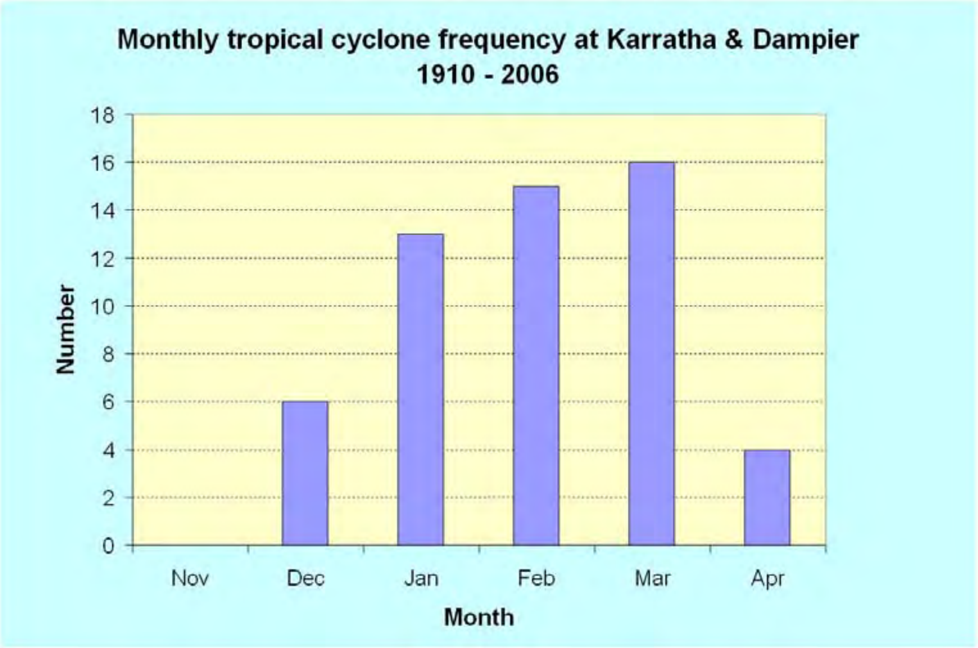
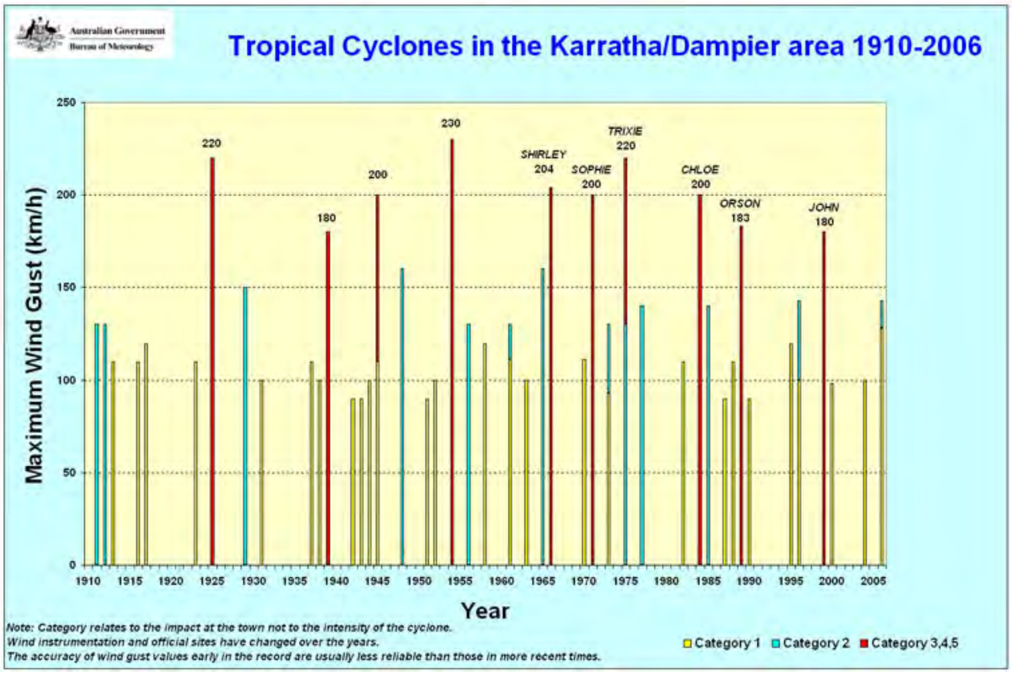
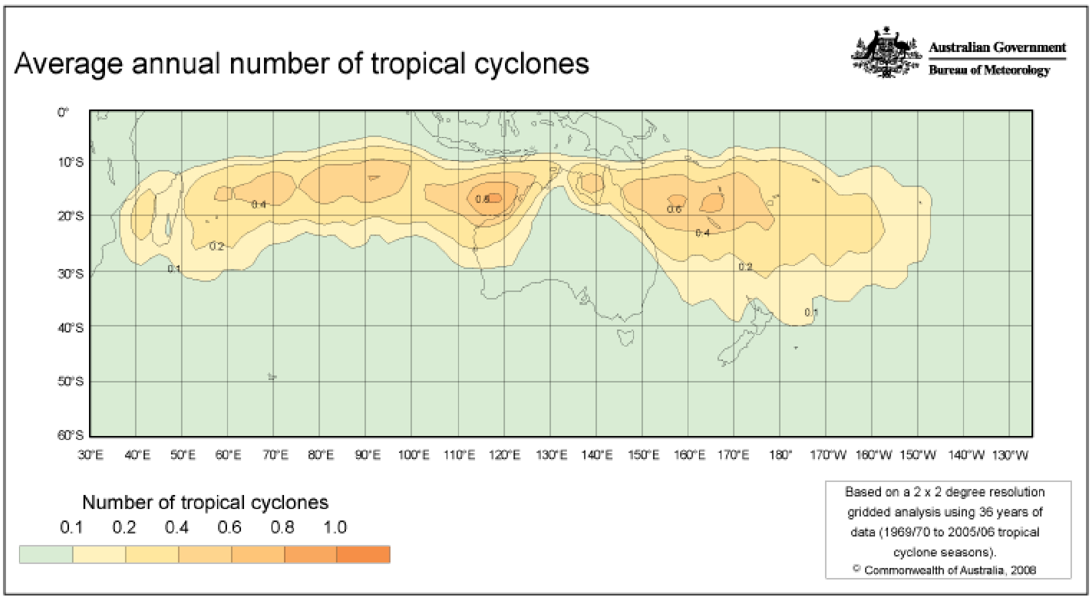


Figure 3.5 Tropical Cyclones that have occurred in the Karratha/Dampier Region (BoM, 2011b)



Note: Category relates to the impact at the town not to the intensity of the cyclone.
Wind instrumentation and official sites have changed over the years.
The accuracy of wind gust values early in the record are usually less reliable than those in more recent times.

Figure 3.6 Frequency of Tropical Cyclones Annually in Australia (BoM, 2011c)



Average annual number of tropical cyclones

Based on a 2 x 2 degree resolution gridded analysis using 36 years of data (1969/70 to 2005/06 tropical cyclone seasons).
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3.2 TOPOGRAPHY

3.2.1 *Landforms and Topography*

The Burrup Peninsula, approximately 22 km long and 5 km wide, was originally an island that formed part of the Dampier Archipelago. It was joined to the mainland in the mid 1960s by a road causeway, forming the Burrup Peninsula. The Burrup Peninsula is bound by Mermaid Sound to the west and Nickol Bay to the east and is distinguished by large areas of weather resistant rocky outcrops and scree slopes.

These high scree slopes form part of an extensive high scree range, which runs throughout most of the Burrup Peninsula and rises to 60 m above sea level in places, serving as the main catchment for water during rainfall events on the Burrup Peninsula.

Scree slopes and rocky outcrops exist to the north and south of the site, with steeply inclined valleys that occur along fault lines forming minor drainage lines, feeding into shallow drainage gullies through the site. These gullies then drain to the supratidal flats that run through the southern section of the site before flowing in a westward direction to King Bay.

The topography of the site is dominated by the supratidal flats that form an east-west trending valley at approximately 4 m Australian Height Datum (AHD) that divides the Burrup Peninsula into two separate units and extends from King Bay in the west to Hearson Cove in the east. The invert of this valley is composed of marine sediments.

The elevation of the site ranges between approximately 11.4 and 2.2 m AHD, with topography generally grading towards the south-east. The steepest area of the site is in the north-west section of the proposed development area, where the site gradient is approximately 1:15. Site topography is relatively flat in the southern section of the proposed development area. *Figure 3.7* presents topographical survey data for the site.

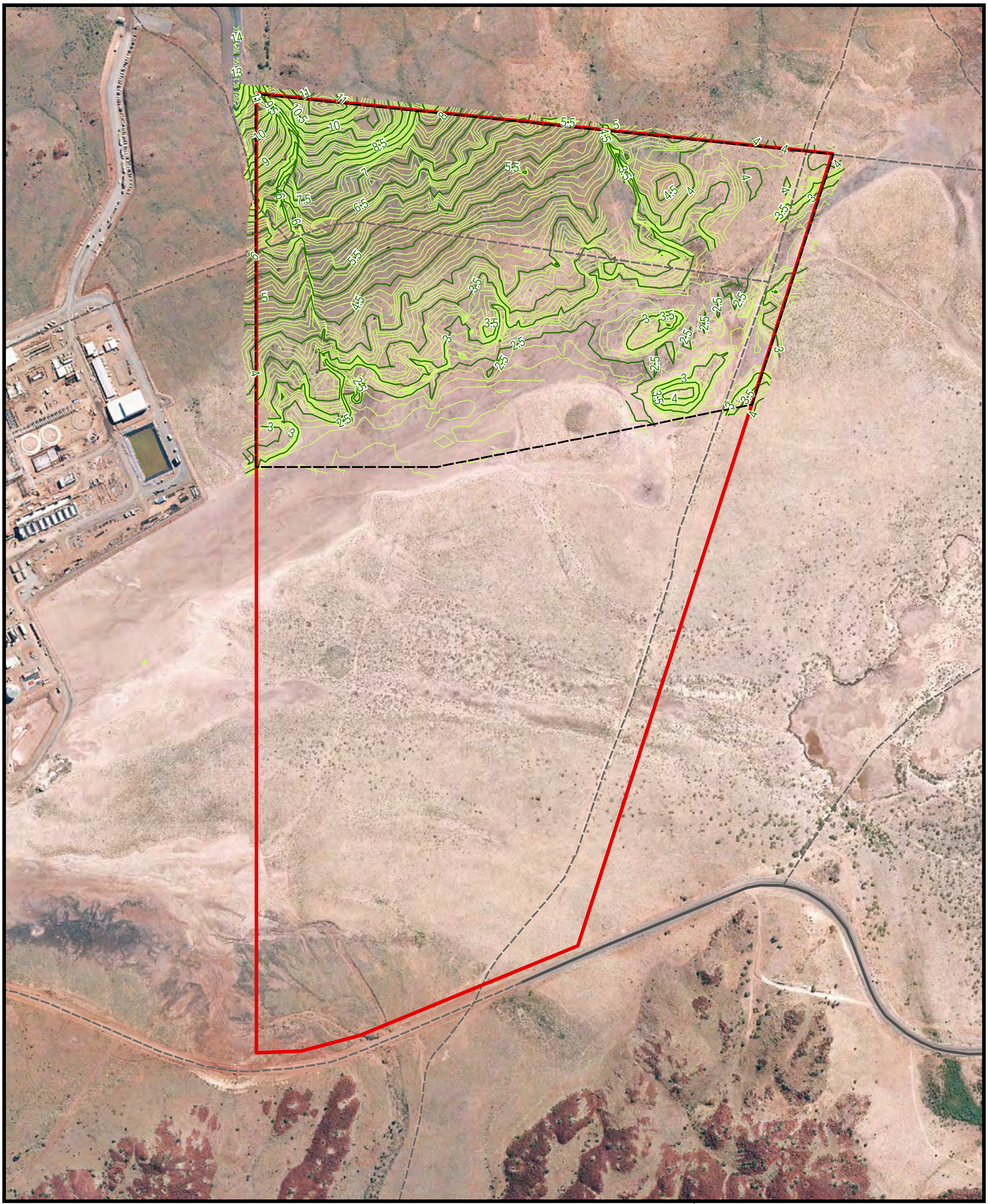
The five major landform features found on and adjacent to the site include:

- High scree slopes to the north and south;
- Uplands and upper hill slopes associated with the upper scree slopes bordering the northwest boundary of the site;
- Gentle, low, undulating hill slopes with occasional small rock outcrops and shallow drainage gullies;
- Tidal flats; and
- Tidal inlet and associated saline supratidal flats.

3.3 VEGETATION AND SITE COVERAGE

Vegetation coverage at Site D remains largely undisturbed as confirmed by Outback Ecology (2009) during a Level 1 vegetation survey conducted over Site D. Five main vegetation units were reported by Outback Ecology (2009) during their assessment and are discussed below, see *Figure 3.8*.

- **AbTeWa (Coastal Flats)** – High Open to Open Heath of *Acacia bivenosa,A. coriaceae* subsp. *coriacea* over Low Open Shrubland over *Triodia epactia* hummock grassland and mixed Closed Grasses over Herbs on the coastal flats. The coastal flats run parallel to the saline inlet to the south and the lower hill slopes to the north and occur in the southern and northern portions of Site D. Soils here become more sandy and slightly saline.
- **Sm (Saline inlet and Supratidal Flats) –** *Tecticornia (syn. Halosarcia)* spp. Scattered low shrubs to low open heath. Supratidal flats with *Tecticornia-Trianthema* succulent Dwarf Scrub. The saline inlet runs approximately east-west through the surrounding area.
- **ItTa (No Astron analogue)–** *Indigofera trita* low shrubland over *Triodia epactia* (*T. angusta*) hummock grassland. One small occurrence of this unit is mapped in the south-east corner of Site D.
- **TeSv (Coastal Flats)** As noted in Trudgen (2002) this community is broadly described as *Sporobolus virginicus* grassland occurring on the edge of tidal flats. *Acacia bivenosa* occurs as a scattered shrub species while other associated species include *Trianthema turgidifolia* and *Eragrostis falcate.* This unit occurs in the north of Site D, and is mixed with **AbTeWa**.



Legend

🟥 Site D Boundary

▭ Area of Disturbance 'The Site'

— Elevation Contours 0.5m

— Intermediate Elevation Contours 0.1m

Source:
Handley Surveys

Client: Burrup Nitrates Pty Ltd

Project: Hydrogeological & Hydrological Report

Drawing 0086269p_Hydro_G003_R0.mxd

Date: 19/08/2011 Drawing Size: A4

Drawn By: DN Reviewed By: SS

Projection: GDA 1994 MGA Zone 50

Scale: Refer to scale bar

N 0 75 150 225m

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Figure 3.7

Topography (1m Contours)

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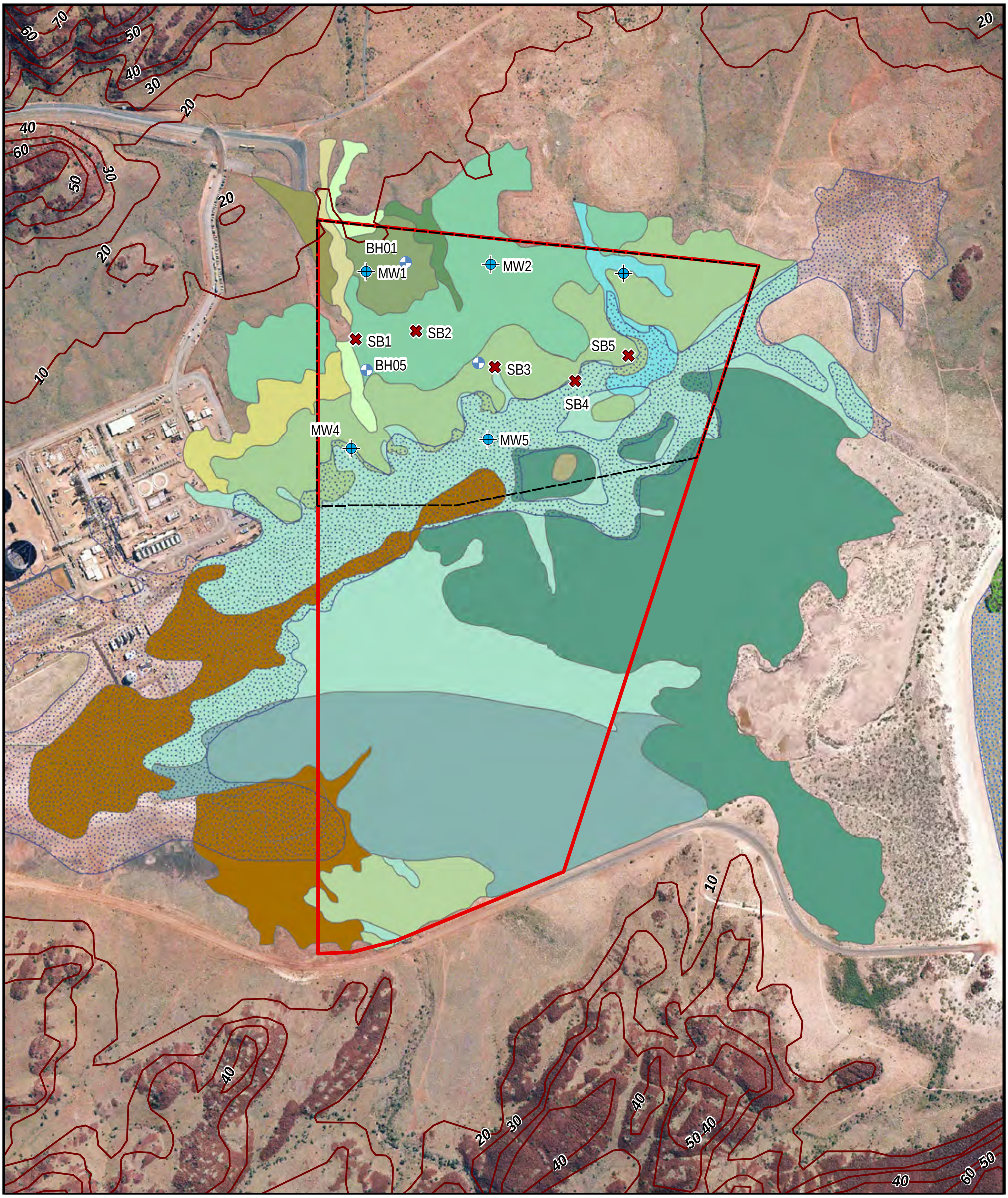

Legend

🟥 Site D Boundary

Proposed Development Area 'The Site'

Saline Coastal Flat

Contour Elevation (10m interval)

Sampling Locations

Monitoring Well

Soil Sample

Borehole

Vegetation Communities

(Te) Sv
*Cc Te
Ab Ta
Ab Ta / Abim Te
Ab Te Wa
Ab ImTe
Ao Il Tw
Ch Re
Gp CwTe
GpTw Ce
It Ta
MF
Sm
Tc Te Sg
Tw
Te Ab

Figure 3.8
Vegetation Survey Results

Client: Burrup Nitrates Pty Ltd

Project: Hydrogeological & Hydrological Report

Projection: GDA 94 MGA Zone 50

Drawing No: 0086269p_Hydro_G008_R0.mxd

Date: 19/08/2011 Drawing size: A4

Drawn by: DN Reviewed by: BC

Source: Aerial supplied by Landgate

Scale: 1:5500

N

0 100 200 300m

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Telephone +61 8 89321 5200

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AbImTe (Upland and Upper Slopes) Recorded on the Upper slopes of the northern part of Site D this community is described as an open *Acacia bivenosa* shrubland over gravel and stone. Additional shrub species present include *Indigofera monophylla*.

Vegetation condition was described as Very Good in the northern part of Site D to Degraded in the eastern and southern parts. The presence of *Cenchrus ciliaris* (Buffel Grass) an introduced species, was found to have an increased dominance and cover, based on consultation with consultants who surveyed Site D in 2000.

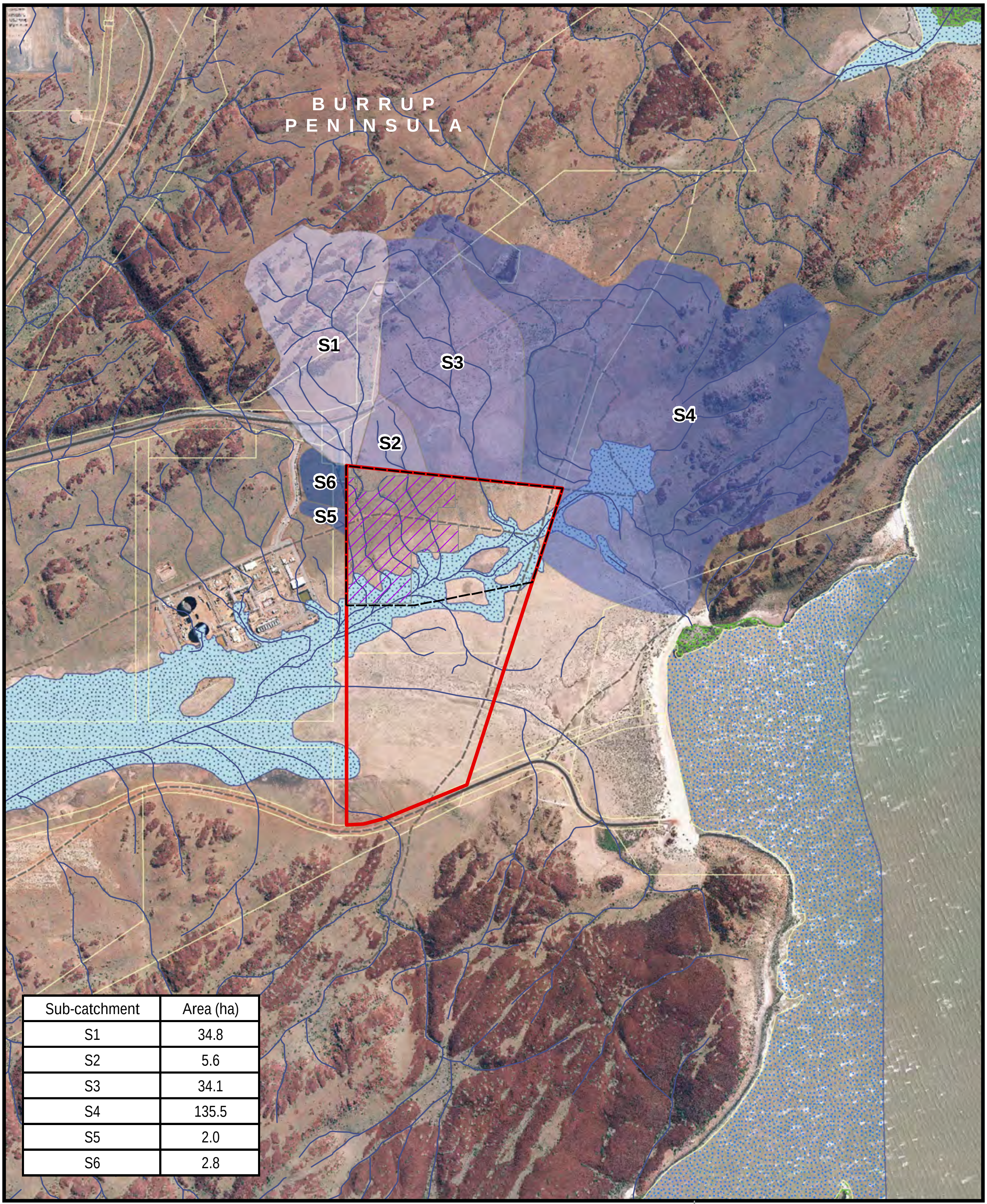
3.4 HYDROLOGY

3.4.1 Regional Hydrology

As with much of the west Pilbara, the Burrup Peninsula has limited fresh surface water. Fresh water flows are highly variable, characterised by short periods of very high flow that coincide with major rainfall events usually associated with tropical cyclone activity. These periods of high flow are followed by dry periods sometimes lasting years, when stream flow stops and even deeper waterholes in gorges can dry up completely (DEC, 2006).

As such, there are no permanent surface water features on the Burrup Peninsula, as creeks and rock pools are ephemeral and, therefore, rainfall dependent. Topographical features suggest that surface water has historically flowed through the proposed TANPF site in a south-south-easterly direction in drainage channels that originate on the steep sided hillsides to the north as shown in *Figure 3.9*. These drainage channels fan out onto the lower level supratidal mud flats located in the south of the TANPF site, which drain westward to King Bay and Mermaid Sound. The soils of the lower slopes and tidal flats are highly permeable (SKM, 2001).

Natural drainage to the supratidal flat between King Bay and Hearson Cove from up-gradient is characterised by a rapid response to rainfall. This is due to the geology of the catchment, which limits rainwater infiltration, as well as vegetation that has little capacity for interception storage of rainwater. This rapid response to rainfall has been described in the Karratha Storm Surge Inundation Study (KSSIS) prepared by the Bureau of Meteorology Special Service Unit Report No. SSU96-7 (BoM, 1996).



Sub-catchment	Area (ha)
S1	34.8
S2	5.6
S3	34.1
S4	135.5
S5	2.0
S6	2.8

Legend

- 🟥 Site D Boundary
- ▭ Area of Disturbance
- ▨ Proposed Permanent Plant Area
- — Water Course
- ▦ Saline Coastal Flat
- ▦ Mangrove
- ▦ Supratidal Flat

Sub-catchment

- ■ S1
- ■ S2
- ■ S3
- ■ S4
- ■ S5
- ■ S6

Client:	Burrup Nitrates Pty Ltd
Project:	Hydrogeological & Hydrological Report
Drawing	0086269p_Hydro_G004_R0.mxd
Date:	19/08/2011 Drawing Size: A4
Drawn By:	DN Reviewed By: SS
Projection:	GDA 1994 MGA Zone 50
Scale:	Refer to scale bar

N

0 175 350 525m

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Figure 3.9

Hydrology and Drainage

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Tidal Processes

During periods of extreme spring tides and storm surge the supratidal flats are periodically inundated with seawater for up to several hours. This tidal action supports the King Bay mangrove community west of Burrup Road by providing sedimentation, seawater recharge to maintain prevailing salinity fields, nutrient delivery and recruitment of benthos (Semeniuk, 1994). Evaporation of seawater over the tidal mudflats east of Burrup Road results in surface salinities ranging from 90,000 ppm to 300,000 ppm (Semeniuk, 1994).

The tidal range in the region is moderate and semi-diurnal in nature, with the tides in King Bay ranging from 0.1 m (LAT) to 5.2 m (HAT), which corresponds to -2.7 m AHD to 2.4 m AHD.

3.4.2 *Storm Surge*

Storm surge is the difference between the actual observed sea level and the predicted sea level. Wind stresses on the sea surface and a reduction in atmospheric pressure are the two main causes of storm surge (Department of Planning and Infrastructure (DPI), 2008).

Changes in sea level generated by extreme meteorological events, such as winter storms and cyclones, may be positive or negative depending on whether the sea level is higher or lower than predicted. The effect of storm surge is most severe when these extreme meteorological events occur in conjunction with high tide (DPI, 2008).

Storm surges, winds and rain associated with cyclones can cause considerable damage to coastal land and infrastructure in the Pilbara Region, with localised flooding possible in susceptible areas along rivers, creeks and low-lying areas, particularly when coinciding with a high tide (BoM, 2008).

Peak steady water levels have been estimated for a number of locations on the Karratha coast in the Karratha Storm Surge Inundation Study (BoM, 1996). The peak steady water level is the elevation of the sea surface above AHD caused by the combined effect of storm surge, tide and wave set-up. This water level is estimated to reach up to 5.0 m AHD within the vicinity of the TANPF Project site, for a 1-in-100 year event (BoM, 1996). The Burrup Road appears to be covered only at recurrence intervals around 100 years or greater (BoM, 1996).

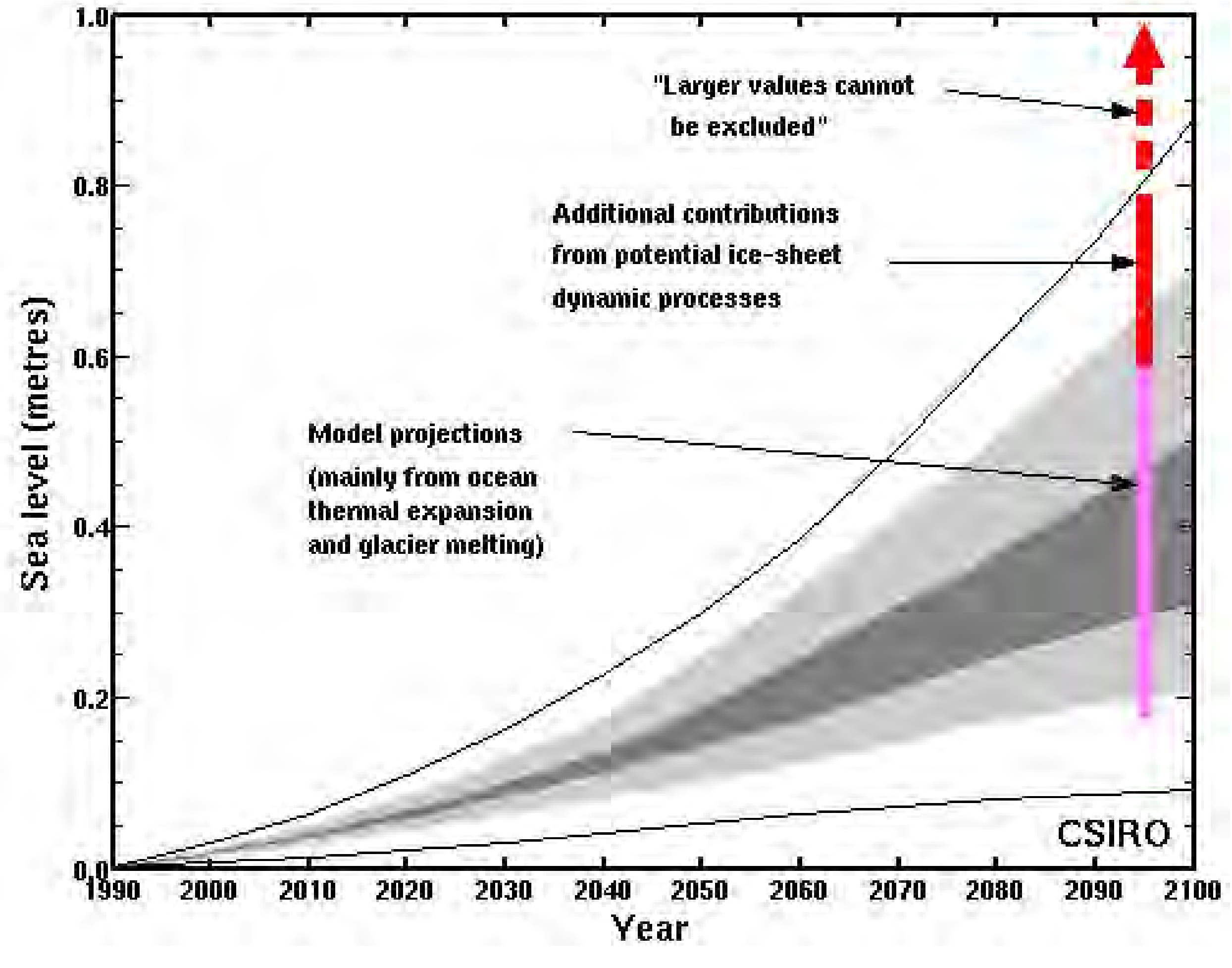
The interaction between storm surge and tides for the region is stated to be complex and non-linear. However results of the Karratha Storm Surge Inundation Study found that storm surges which exceeded 4.0 mAHD (1:50, 1:100 year events) were dominant over any tidal effects. In the event of a storm surge in this area, tidal effects can be considered negligible in favour of storm intensity and the location at which it crosses the coastline (BoM, 1996).

An investigation into the effect of rainfall runoff suggests that runoff generally does not greatly increase inundation water levels associated with storm surge except in more extreme events (BoM, 1996).

3.4.3 *Potential Sea Level Rise*

Based on the International Panel on Climate Change (IPCC) Third Assessment Report - 2001 (Church *et al.*, 2001), Fourth Assessment Report - 2007 (Meehl *et al.*, 2007) and interpretations from Hunter (2008), sea level on a global mean basis will rise between 6.7 and 20.8 cm by 2040 (*Figure 3.10* provides a graphical illustration of the predicted sea level rises and estimated contributions). This value is factored into the current proposed final TANPF level of 5.5 AHD.

Figure 3.10 IPCC Global Sea Level Rise Predictions (CSIRO, 2008)



3.4.4 *Flooding*

The supratidal flat, upon which the southernmost extent of the proposed TANPF is to be situated, hosts the water table aquifer in this area, and is likely to be subject to rapid flooding during high rainfall events. In addition, the supratidal flat between King Bay and Hearson Cove is known to be subject to flooding associated with storm surge events and with runoff during high rainfall events.

Golder (2011) indicated that to help mitigate potential flood impacts, BNPL propose to fill the site to achieve a typical level of 5.5 m AHD. Finished floor levels to buildings are indicated to be about 5.95 m AHD and road pavements will have a finished level of about 5.65m AHD.

ERM has reviewed flooding and storm surge data from two sources – the KSSIS (BoM, 1996) and Golder (2011). ERM's site observations from a recent inspection are also provided.

Groundwater conditions at the site are discussed further in *Section 3.6*.

Karratha Storm Surge Inundation Study (BoM, 1996)

The KSSIS (BoM, 1996) provides an estimation of storm surge for this region using a deterministic regional ocean model and historical cyclone events. The model did not account for the effects of sea level rise associated with climate change. This found that storm events with a return period of 100 years are expected to yield a storm surge of 5.0 mAHD, while storm events with a return interval of 50 years would result in a slightly lower rise in water level (4.6 mAHD).

The interaction between storm surge and tides for the region is stated to be complex and non-linear. However results of the KSSIS found that storm surges which exceeded 4.0 mAHD (1:50, 1:100 year events) dominated any tidal effects and, in this instance, tidal effects can be considered negligible in favour of storm intensity and the location at which it crosses the coastline.

Although it is reasonable to anticipate that flooding of this area will be exacerbated when high rainfall coincides with storm surges and/or spring tides, the KSSIS reported that rainfall runoff did not greatly increase water levels across much of the region except in the more extreme weather events, i.e. 1:100 storm events. It is however noted in the KSSIS study that an investigation of the relative frequency of extreme rain events coinciding with storm surge was beyond the scope of the study.

Golder Geotechnical Investigation (Golder, 2011)

The report *Geotechnical Investigation: Proposed technical Ammonium Nitrate Production Facility, Burrup Peninsula* (Golder, 2011) provides geotechnical and hydrological information on the site based on site specific investigations and modelling. This included development of a HEC-RAS model to predict flood levels across the supratidal flats and assess flood-related constraints to development. It is noted that the Golder (2011) assessment does not consider impacts from predicted sea level rise associated with climate change.

The modelling found that the southern boundary of the site is flood affected and that the 100-year Annual Recurrence Interval (ARI) flood level is estimated to be approximately 5.6 m AHD. The HEC-RAS model assumed an input downstream water level of 5.6 m AHD, which is reported to be the maximum tide plus storm surge in the area (Golder, 2011). Model results for ARIs from 10 to 100 years all produce a water level of 5.6 m AHD, equal to the assumed input water level. This value is clearly controlling the model outcome.

ERM notes that the source of the 5.6 mAHD value for maximum storm surge height used by Golder is not well explained or justified. It appears that this figure is based on simple addition of the maximum tide level (reported as 2.5 mAHD) and recorded storm surge (3.1 m) from cyclone Orson in 1989. ERM suggests this approach is likely to be unreliable and may over-estimate the potential maximum storm surge height in the vicinity of the site. ERM believes a better source of information on storm surge height is the KSSIS (BoM, 1996). The KSSIS predicts peak steady water level caused by the combined effect of storm surge, tide and wave set-up, would reach an estimated 5.0 mAHD within the vicinity of the TANPF Project site (Burrup Road at King Bay-Hearson Cove), for a 1-in-100 year event (BoM, 1996). The KSSIS also reports that the combined effects of storm surge, wave set-up and tide are not linear and cannot be simply added as was done by Golder (2011).

Based on the information available ERM questions the use of 5.6 mAHD as a downstream water level. ERM similarly questions the validity of the flood model undertaken by Golder (2011) given that the assumed storm surge level dominates all results. ERM recommends that the flood modelling be reviewed and if necessary revised after considering more appropriate input data on downstream water levels. It may be advisable to produce a flood model that assumes lower downstream water levels, more similar to a typical tidal maximum, to investigate the magnitude of flood effects caused by overland flow from large rain events. These effects appear to be hidden in the current model outputs, being subordinate to the effects of storm surge.

Filling of the site for construction of the TANPF will reduce the flood storage capacity of the supratidal flats to the south. This could affect flood levels both onsite and in adjacent areas during flood events, and may be particularly pronounced during extreme rain events and high catchment runoff. This impact has not been modelled and should be quantified.

Further discussion regarding impacts and recommendations associated with this issue is provided in the *Sections 4* and *5* of this report.

ERM Site Observations

During the site visit in April 2011, ERM observed indications of flooding across the low lying parts of the TANPF site related to extreme rainfall events caused by TC Bianca (January 2011) and TC Carlos (February 2011). There were indications that flood waters had reached a height of approximately 40 cm up the standpipe at monitoring well MW4. Ground level at MW4 is approximately 2.8 m AHD, suggesting water levels reached approximately 3.2 m AHD. It is not clear whether these levels were a result of very high tides, storm surge, overland flow, or a combination of factors.

3.4.5 *Catchment Peak Flows*

A number of ephemeral watercourses intersect the site, conveying stormwater from the rocky hill slopes to the north, in a south-easterly direction through the site and to the supratidal flats south of the TANPF. Six sub-catchments have been defined based on an interrogation of catchment drainage and focusing on watercourses that intersect the proposed development footprint. These sub-catchments have areas ranging from approximately 2 ha to 135 ha. *Figure 3.9* shows the relevant watercourses and their sub-catchments.

Peak flows within these sub-catchments were calculated for a range of ARI floods using the methods described in *Australian Rainfall and Runoff: A Guide to Flood Estimation* (AR&R) (Pilgrim ed., 1987). Both the Rational Method and Index Flood Method were used as described for the North West Pilbara region of WA. In relation to these methods and their applicability for use in WA, AR&R notes the following:

> *"It should be noted that the quality and quantity of the streamflow data used in deriving the methods vary considerably. The quality of the data is generally good in the South West region, but becomes poorer with distance from this more populous region. In particular the majority of gauging stations in the North West and Kimberley regions are poorly rated and have relatively short lengths of record. Hence, flood estimates derived for these regions using the methods given below should be treated with caution, especially for higher average recurrence intervals. The numbers of catchments used in deriving the various methods are rather limited, as are the ranges of data and characteristics sampled. These characteristics are therefore listed for each region to aid designers in assessing the accuracy of each method. Where the design conditions are outside the range of those sampled in derivation, the methods given in this Section are still recommended as the best available. However, it must be recognised that accuracy will be lower under these circumstances than when the design conditions fall within this range."*

For the Pilbara region the Rational Method is based on historical flood flow data from 12 catchments with areas ranging in size from 40.5 km^2 to 7,980 km^2 and stream lengths from 10 – 194 km. The Index Flood Method is based upon data from 13 catchments with areas ranging in size from 40.5 km^2

to 49,600 km² and stream lengths of 10 – 498 km. These catchments and stream lengths are all substantially larger than the sub-catchments and stream lengths being investigated here and this is likely to introduce increased errors to the calculations. The use of stream lengths and catchments areas that are less than the parameters upon which the peak flow equations were designed are also likely to increase the range of differences in results between the Index Flood Method and Rational Method.

AR&R provides the following caveat regarding the accuracy of the two methods:

> *The two methods are based on the same data in each region, and should therefore give similar results. The standard errors of estimate of the regressions for the runoff coefficients for the Rational Method are generally, but not always, slightly greater than those for the discharge in the Index Flood Method. However the differences would not be significant. Despite its slightly higher standard errors of estimate, the Rational Method should give more accurate results in most cases. The functional form of the relationships used in this method is likely to have greater validity than those used in the Index Flood Method for estimates involving combinations of catchment characteristics different from those used in developing the regressions. Also, most of the regressions for the runoff coefficient are for an ARI of 10 years, whereas most of those for the Index Flood Method are for the 2 or 5 year ARI Flood. In both cases, floods of larger ARIs are obtained by multiplication by a frequency factor, which also has a standard error of estimate. Although their values are not specified in the methods, the likely errors would increase as the extrapolation accounted for by the frequency factors increases. Most design floods have ARIs greater than 10 years, so that the Rational Method would generally involve less extrapolation and less error due to this cause. This does not apply to the Pilbara Region, where the ARI of the regression for the rational method is less than that for the Index Flood Method, and the latter may therefore be more accurate. It is not really possible to determine which method is more accurate for the Pilbara and Kimberley regions, as a result of the small amount of data on which the design relations are based.*

In regard to the Index Flood Method in particular AR&R states the method uses '*regressions which are limited in their functional forms to relations that lack a sound physical basis. They are likely to give poor results when extrapolated beyond the range of values used in their derivation, but also beyond the range of combinations of values used*'.

Although the two methods (Rational and Index Flood) are reported in AR&R to give similar results, this was not the case for the small catchments modelled here.

Comparison of the peak discharges produced from the Rational Method with the Index Flood Method shows larger peak discharges produced from the Rational Method. For 2 and 5 yr ARI events the peak discharges produced from the Rational Method are almost double those of the Index Flood

Method. The peak discharge for the 10 yr ARI event produced from the Rational Method is approximately three times greater than the Index Flood Method. The 20 yr ARI peak discharge produced from the Rational Method is approximately 2.5 to 3.6 times greater than that produced from the Index Flood Method. The 50 yr ARI peak discharge produced from the Rational Method is 2-3 times greater than that produced from the Index Flood Method. For conservatism and in the absence of more detailed modelling data, it is recommended that the Rational Method data be used to inform initial considerations relating to stormwater management by BNPL.

Sub-catchment peak flows have been calculated using both methods described in AR&R and for ARIs ranging from 2 to 50 years. The results are presented in *Table 3.2*. It is noted that AR&R only assigns frequency factors for ARIs from 2 to 50 years. As such, the method has not been used to calculate peak flows for ARIs outside this range.

Copies of the calculation spreadsheets, including a description of the formulae and terms used, are contained in *Annex B*. Also provided in *Annex B* is an Intensity-Frequency-Duration (IFD) chart developed for the site using the Bureau of Meteorology's online IFD program which was accessed on 26 July 2011, at:

http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml

Table 3.2 Subcatchment Peak Flows Using Rational and Index Flood Methods

Rational Method Peak flows (m^3/s)							
Site	**A (km^2)**	**2 yr,tc**	**5 yr,tc**	**10 yr,tc**	**20 yr,tc**	**50 yr,tc**	**100 yr,tc**
S1	0.35	1.71	3.81	7.10	13.0	16.6	n/a
S2	0.06	0.47	1.03	1.90	2.78	3.51	n/a
S3	0.34	1.64	3.64	6.80	12.8	16.2	n/a
S4	1.36	4.52	10.2	19.1	38.7	49.7	n/a
S5	0.02	0.22	0.47	0.87	1.12	1.40	n/a
S6	0.03	0.29	0.63	1.16	1.50	1.89	n/a
Index Flood Method Peak Flows (m^3/s)							
Site	**A (km^2)**	**2 yr,tc**	**5 yr,tc**	**10 yr,tc**	**20 yr,tc**	**50 yr,tc**	**100 yr,tc**
S1	0.35	0.89	1.58	2.37	3.56	5.37	n/a
S2	0.06	0.25	0.42	0.63	0.93	1.27	n/a
S3	0.34	0.87	1.56	2.34	3.50	5.30	n/a
S4	1.36	2.27	4.21	6.81	10.5	17.7	n/a
S5	0.02	0.12	0.20	0.30	0.44	0.61	n/a
S6	0.03	0.15	0.26	0.38	0.57	0.77	n/a

1. tc – time of concentration
2. Refer to AR&R for description of the peak flow calculation methods

3.4.6 *Onsite Water Management*

The following wastewater drainage systems are proposed for the clean and dirty catchments at the site:

- Clean Runoff:

  - Condensate from Air Chillers in TAN Unit;
  - Boiler blowdown from Nitric Acid Unit;
  - Purified process condensate; and
  - Chiller condensate.
- Potentially Contaminated Runoff:
  - potentially recoverable waste water (high concentration of ammonium nitrate) from AN Neutralisation Unit, TAN Unit and Off-spec Unit;
  - potentially contaminated surface water in process areas (rain water, flushing and cleaning); and
  - oil contaminated waters (caused by spills and other accidents in process areas);

A cleanwater pond and contaminated water pond will be constructed to treat the aforementioned runoff streams. The cleanwater pond will collect rainwater from roofs and parking areas. Condensate from air chillers in the TAN Unit will be sent to the sea water basin. All potentially contaminated runoff will be directed to the contaminated water pond.

Areas inside process units will be paved and bunded to ensure collection of spills, washdown water and surface water. These areas will be connected to the underground pipe system and will be sent to the Waste Water Unit for treatment. The waste water unit will consist of an oil water separator and pH neutralisation system. The neutralised water will then be sent to the Contaminated Water Evaporation Pond. Cleaning residual salts from the Contaminated Water Evaporation Pond will be required as necessary.

The locations of the ponds and the onsite drainage plan are shown in *Annex C.*

3.4.7 Onsite Stormwater Detention Requirements

Two separate stormwater systems are planned; one for stormwater runoff from clean areas, and one for stormwater runoff from dirty areas. Clean stormwater catchments include roofs, paved areas, roads and unsealed (gravel) surfaces. Dirty stormwater catchments include all areas where stormwater could be contaminated, and includes bunded material storage areas. The clean and dirty stormwater catchments will be segregated and managed separately.

Within the scope of this assessment ERM was asked to consider the potential stormwater detention volumes required to capture site stormwater during 24-hour rainfall events with ARI's of 50 and 100 years. These calculations have been undertaken for both the clean and dirty stormwater catchments.

hour rainfall events with ARI's of 50 and 100 years. These calculations have been undertaken for both the clean and dirty stormwater catchments.

Based on the preliminary drainage plan (see *Annex C*), catchment areas for the clean and dirty stormwater catchments are estimated as 21,000 m^2 (2.1 ha) and 600 m^2 (0.6 ha), respectively. It is noted that there may be minor changes in the final areas upon confirmation of the final plant layout and design.

To estimate 24-hour detention volume requirements, the volumetric runoff from the site was calculated for various ARIs by multiplying rain depth by site area. A runoff coefficient of 1.0 was used, which assumes that 100% of rainfall converts to runoff. This is a reasonable assumption during high intensity rain events where a large proportion of the catchment is relatively impervious.

From the IFD chart (*Annex B*), 24-hour rain intensities for ARIs of 50 and 100 years, are 13.5 mm/hour and 16.5 mm/hour, respectively. This equates to 24-hour rain depths of 324 mm and 396 mm, respectively.

Table 3.3 lists the 24-hour runoff volumes for each catchment for ARIs ranging from one to 100 years.

Table 3.3 ***Runoff Volumes for Onsite Stormwater Detention***

ARI, Y	**24-hour Rainfall Intensity, $I_{Y,24}$**	**24-hour Rain depth**	**Runoff Volume** Clean catchment (Area = 2.1 ha[1])	**Runoff Volume** Dirty catchment (Area = 0.6 ha[1])
(years)	**(mm/hour)**	**(mm)**	**(megalitres, ML)**	**(megalitres, ML)**
1	2.4	57.4	1.2	0.3
2	3.4	81.6	1.7	0.5
5	5.9	140.4	2.9	0.8
10	7.7	184.6	3.9	1.1
20	10.0	240.0	5.0	1.4
50	13.5	324.0	6.8	1.9
100	16.5	396.0	8.3	2.4

[1] The catchment areas these volumes have been calculated from may be altered upon final design.

For the clean water catchment with an estimated area of 2.1 ha, the 24-hour detention volumes are approximately 6.8 ML for a 50-year ARI event and 8.3 ML for a 100-year ARI event. For the dirty water catchment with an estimated area of 0.6 ha, the 24-hour detention volumes are approximately 1.9 ML for a 50-year ARI event and 2.4 ML for a 100-year ARI event.

Recent correspondence with the DEC has identified that ponds will be sized and designed for all operational requirements and conditions, including cyclones. Ponds will be protected around the perimeter with a bund of 300 mm in order to avoid water from surrounding areas entering the ponds. Both the clean and contaminated water ponds will be evaporation ponds. A back-up contaminated water pond is planned. Preliminary design pond sizes are provided below:

Clean Water Ponds:

- Pond 1: 32.4 m x 26.9 m x 2.6 m;
- Pond 2: 52.1 m x 29.6 m x 2.9 m; and
- Pond 3: 39.2 m x 31.2 m x 2.8 m.

The total volume provided by these three ponds is 10.2 ML which is of sufficient capacity to accommodate runoff estimated to be produced from the 1:100 yr 24 hr ARI storm event described above (8.3 ML).

Contaminated Water Pond:

- 63 m x 35 m x 3 m (2 ponds). One pond would be sufficient to accommodate the 1:100 yr 24 hr ARI storm event described above (2.4 ML).

All ponds will be lined with an elastomeric membrane to avoid leakage to and potential contamination of groundwater and surrounding soils. The clean water pond will also be lined despite not posing a contamination risk.

3.5 GEOLOGY

3.5.1 Regional Geology

The 1:250,000 series Australian geological map for Dampier-Barrow Island suggests that the site is likely to overlie surficial marine muds and coastal sand beach deposits. *Figure 3.11* presents the regional geology for the Burrup Peninsula. The 1:50,000 series Nickol Bay-Legendre sheet shows the surficial regional geology comprises the following:

- Holocene mud and silts on supratidal to inter-tidal flats, including areas of mangroves;
- Pleistocene red-brown silty sand in the north area of the site; and
- Proterozoic Gidley Granophyre bedrock.

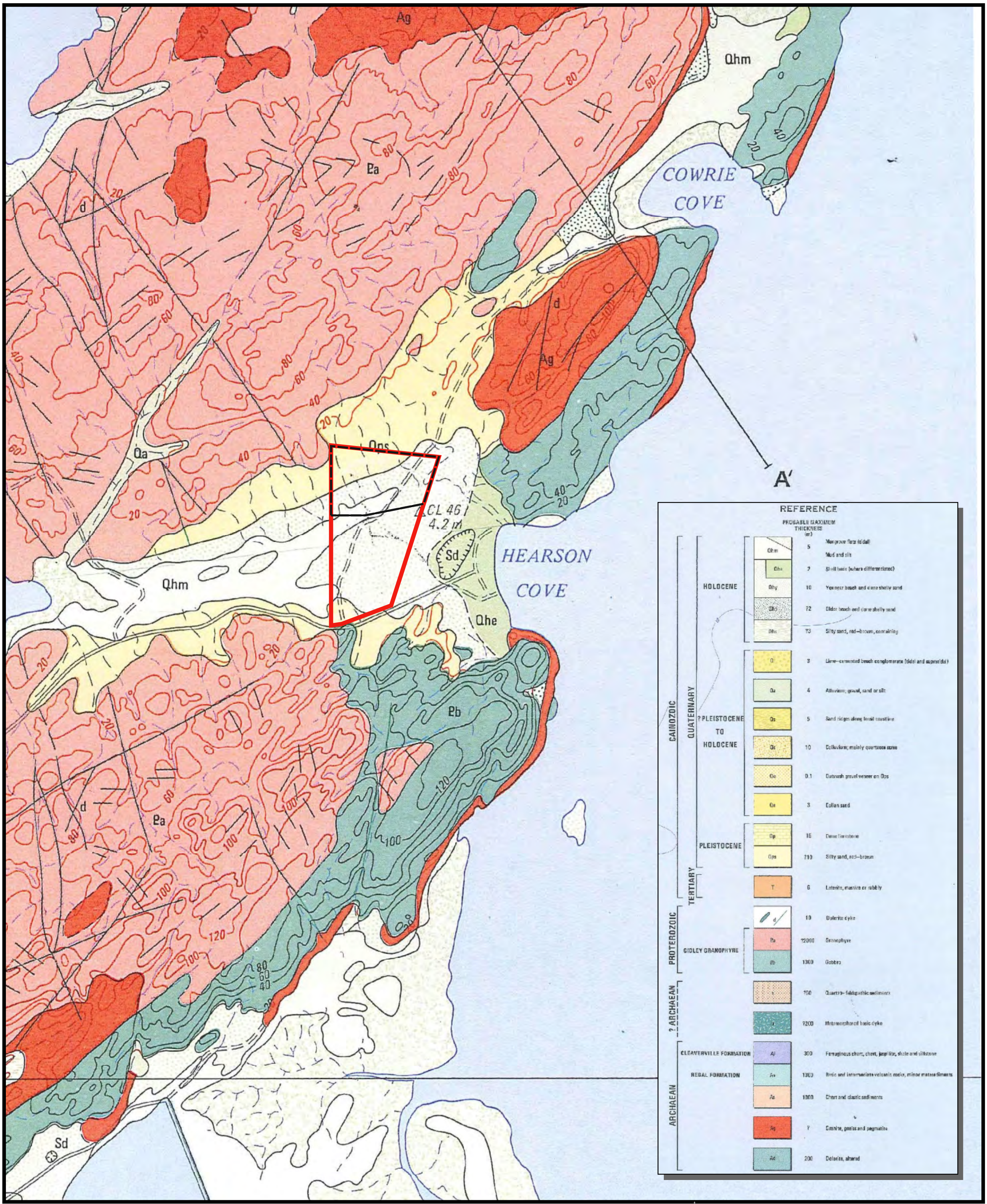
The geology of the Burrup Peninsula has been previously investigated by the Geological Survey of WA and has been described by O'Brien Planning Consultants (1994).

The Burrup Peninsula is composed mainly of an intrusive Proterozoic igneous rock outcrop known as the Gidley Granophyre, which is approximately 2,200 million years old. The main outcrop of Gidley

Granophyre occurs in the Dampier Archipelago and the adjacent mainland, along a basal unconformity of the Fortescue Group (Hickman, 1983).

The base of the intrusion consists of a differentiated coarse-grained gabbro and the main body is a fine-grained granophyre. The gabbro weathers to a dark brown and the granophyre to a lighter red-brown; both rock types are resistant to erosion and form aggregates of split boulder screes.

Rapid weathering of dolerite dykes that are also present has resulted in the formation of deeply incised, narrow valleys amongst the exposed granophyre bedrock, generally trending either south-west to north-east or west to east throughout the Burrup Peninsula.



Legend

🟥 Site D Boundary

▭ Area of Disturbance 'The Site'

Client: Burrup Nitrates Pty Ltd
Project: Hydrogeological & Hydrological Report
Drawing: 0086269p_Hydro_C004_R0.mxd
Date: 3/08/2011 Drawing Size: A4
Drawn By: DN Reviewed By: SS
Projection: GDA 1994 MGA Zone 50
Scale: Refer to scale bar

N 0 340 680 1,020m

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Figure 3.11

Geological Cross Section

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]

The proposed TANPF site is located on Pleistocene red-brown silty sand and silts and mud of the supratidal flats between King Bay and Hearson Cove. The area is associated with a large weathered dolerite dyke along the King Bay Hearson Cove lineament. As a result there is less outcrop of the exposed granophyre bedrock in this area than in other areas of the Peninsula. The large areas of exposed granophyre bedrock outcrops are generally located towards the southern and northern boundaries of Site D.

Supratidal flats run through the southern section of the site and indicate a soil profile associated with a low energy marine depositional environment. The soil profile is largely comprised of sandy silts to silty sands generally brown to grey in colour with occasional variations including green, yellow and red mottling. The sediments are typically organically rich and often contain a thin veneer of shelly lenses.

The soils of the area are generally alkaline (ERM 2011) as a result of the high carbonate content originating from marine sands and underlying calcrete bedrock.

3.5.2 *Site Geological Observations*

The geology encountered during drilling at the site is presented as borelogs in *Annex D*. The general geological profile observed during drilling is summarised as:

- Silty or clayey sand: red brown, fine to medium grained, sub angular sand, poorly sorted with gravel being more frequent in the northern area of the site and occasional cobbles being present, extending from between 0.5 m and 4.0 m, overlying;

- Granophyre: Pale grey, generally weathered with rock becoming fresher and less fractured with depth extending to the maximum depth of 5.0 m.

Golder (2011) noted that the granophyre bedrock consisted of pale grey and dark grey, fine to medium sized crystals, which was distinctly weathered and generally becoming fresher with depth. The bedrock was locally fractured along thin iron-stained quartz seams, generally of high to extremely high strength, extending to a maximum depth of 15 m. Golder also noted dolerite in one borehole location which was used for geotechnical purposes only (BH04).

Geotechnical investigations in the north-east portion of the site (temporary lay down area) suggest the presence of silty sands of colluvial origin to depths of up to 2.3 m (Golder, 2011). The 1:50,000 geology map also indicates the presence of marine mud and silt intertidal flat deposits in the southern area of the site. These superficial deposits are typically underlain by well jointed fresh granophyre bedrock (Golder, 2011). In the vicinity of tidal flats in the central and southern areas of the site, sandy clays are more dominant in the upper unconsolidated profile (ERM 2011).

Overall the geology encountered during the site investigation is considered to be consistent with the geology identified during the desktop study. The additional geotechnical investigation completed by Golder (2011) is also noted to be consistent with the ERM field observations.

3.6 HYDROGEOLOGY

3.6.1 *Regional Hydrogeology*

There is little readily accessible groundwater on the Burrup Peninsula. Like much of the Pilbara, groundwater is predominantly located in fractured rock aquifers where it is stored in the fractures, joints, bedding planes and cavities of the rock mass.

The Hydrogeological Atlas (DoW website) indicates that the upper aquifer in this region is the low permeability, unconfined Pilbara Fractured Rock Aquifer that occurs in fractured and weathered dolerite, gabbro and ultrabasic intrusions in the region. Groundwater recharge to this aquifer is directly related to rainfall events where water infiltrates the fractures of the surface rock or infiltrates from surface water flows. These fractured rock aquifers are localised systems with little regional flow (DEC, 2006).

Hyper-saline groundwater typically occurs beneath supratidal flats and is, therefore, considered likely to be present in the southern part of the site and to the south-west and east of the site. The aquifer in the low-lying coastal soils and supratidal flats is reportedly tidally influenced and the groundwater is saline (SKM, 2001). The shallow aquifer in this region is categorised as a Level 1 aquifer which indicates it is shallow and present within superficial deposits which are likely to be unconfined.

3.6.2 *Site Hydrogeology*

The Hydrogeological Atlas (DoW website) suggests that the site is located on top of fractured and weathered dolerite, gabbro and ultrabasic intrusions which would form the localised unconfined, low permeability aquifer system referred to as the Pilbara Fractured Rock Aquifer. These descriptions are consistent with the observed geology at the site.

Groundwater investigations undertaken near the site by Soil & Rock Engineering (1999) and HLA-Envirosciences (1999) indicated that groundwater is generally shallow and was typically at a depth of between approximately 3.4 and 0.5 metres below ground level. The groundwater level is anticipated to be higher during spring tides and following significant rainfall events.

3.6.3 *Groundwater Elevations*

Regional Groundwater Elevations

A number of geotechnical investigations have been undertaken at the ammonia facility located to the immediate west of the proposed site. These have included the installation of several groundwater monitoring wells. Water elevations for these wells were not presented in the reports reviewed and are currently unavailable (Soil and Rock Engineering, 2003a; Soil and Rock Engineering, 2003b). However, it is likely that, regionally, groundwater elevations mimic topography and are likely to be higher beneath outcropping bedrock in the north, and slope to the south before potentially discharging to the salt marsh and intratidal area or to King Bay to the west. Hearson Cove to the east is also a potential discharge point.

Site Groundwater Elevations

Groundwater elevations recorded on 29 April 2011, 20 September 2011 and 28 February 2012 are presented in *Annex E, Table 1* and interpolated groundwater elevation contour maps are provided as *Figure 3.12, 3.13 and 3.14*.

Recorded depths to groundwater at the site ranged from 0.54 to 3.4 metres below top of casing (mbTOC), (MW5 and MW1 in February 2012, respectively) and the groundwater elevations at the site ranged from 1.99 mAHD at MW5 in September 2011 to 6.46 mAHD at MW1 in April 2011.

The inferred groundwater flow direction was consistent, and to the south-east, during the three monitoring rounds at the Site. Groundwater elevations generally mimicked surface topography. The estimated hydraulic gradient in April 2011 was 0.011 across the site and was noted to be slightly steeper in the north-west section of the site. The hydraulic gradient in September 2011 was 0.0096 and in February 2012 was 0.009, indicating that although slightly lower, the hydraulic gradient was relatively consistent during the three groundwater monitoring events.

The groundwater elevation data indicates that, on the scale of monitoring, there was limited variation in groundwater elevations at the site; overall, groundwater elevations did not vary significantly in the April 2011, September 2011 and February 2012 monitoring rounds. However, these were point measurements and variations in groundwater elevations at the site are likely to have occurred between these two monitoring events.

The groundwater elevation in MW1 was observed to be 0.6 m higher during April 2011 compared to the September 2011 and February 2012 monitoring events. This decline in groundwater elevation was not observed in the other monitoring wells present on site over the same time period.

During the geotechnical assessment by Golder (2011), groundwater elevations were monitored in several geotechnical wells during late January and early

February 2011. The results for BH01, BH05 and BH07 (see *Figure 2.1*) all showed a strong response to the significant rainfall events associated with Cyclone Bianca, with groundwater levels increasing by up to 1.7 m in response to 117 mm of rainfall, which could indicate a low specific yield in a fractured rock system (Golder, 2011). A delayed response was observed in the water level in BH01, in the north-west of the site, potentially indicating a lower density of interconnected fractures, whereas a rapid response was observed in BH05 and BH07 indicating the likely presence of an interconnected fracture network. The interpretation provided by Golder is consistent with the borelogs which indicated greater average defect spacing in BH01 than BH05 and BH07 (Golder, 2011).

Golder (2011) also completed tidal monitoring between 20 January and 3 February 2011 (Golder, 2011) which indicated that the groundwater beneath the central and western portion of the site (in the vicinity of BH01, BH05 and BH07) is not tidally influenced. Data after 26 January 2011 was not assessed due to the likely influence of the significant rainfall event associated with Cyclone Bianca. The results were reportedly inconclusive with regard to neap tidal cycles, due to the short monitoring interval.

Legend

🟥 Site D Boundary

▭ Area of Disturbance 'The Site'

⊕ Monitoring Well Locations

—3.5— Groundwater Contour (mAHD)

(3.5) Groundwater Elevation (mAHD)

— Water Course

▨ Saline Coastal Flat

Client:	Burrup Nitrates Pty Ltd
Project:	Hydrogeological & Hydrological Report
Drawing	0086269p_Hydro_G005_R0.mxd
Date:	16/04/2012 Drawing Size: A4
Drawn By:	DN Reviewed By: SS
Projection:	GDA 1994 MGA Zone 50
Scale:	Refer to scale bar

N

0 90 180 270m

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Figure 3.12

Inferred Groundwater Contour Plan - April 2011

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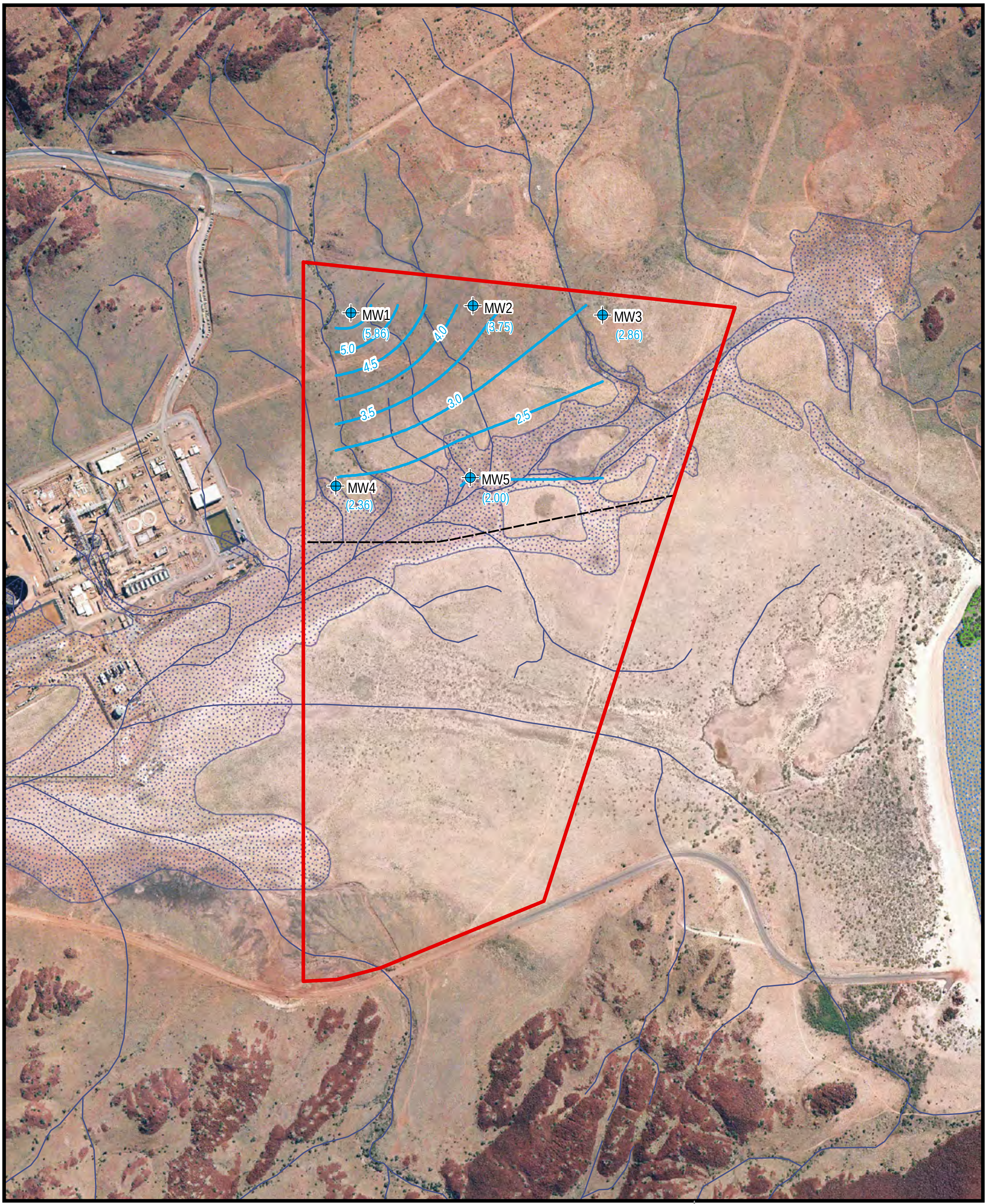

Legend

- 🟥 Site D Boundary
- ☐ Area of Disturbance 'The Site'
- 3.5 Groundwater Contour (mAHD)
- ⊕ Monitoring Well Locations
- (3.5) Groundwater Elevation (mAHD)
- — Water Course
- ▨ Saline Coastal Flat

Figure 3.13
Inferred Groundwater Contour Plan - September 2011

Client:	Burrup Nitrates Pty Ltd		
Project:	Hydrogeological & Hydrological Report		
Drawing	0086269p_Hydro_G010_R0.mxd		
Date:	16/04/2012	Drawing Size:	A4
Drawn By:	DN	Reviewed By:	SS
Projection:	GDA 1994 MGA Zone 50		
Scale:	Refer to scale bar		

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0 90 180 270m

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Figure 3.14

Inferred Groundwater Contour Plan - February 2012

Legend

- 🟥 Site D Boundary
- ⬚ Area of Disturbance 'The Site'
- 3.5 Groundwater Contour (mAHD)
- ⌖ Monitoring Well Locations
- (3.5) Groundwater Elevation (mAHD)
- — Water Course
- ▨ Saline Coastal Flat

Client:	Burrup Nitrates Pty Ltd		
Project:	Hydrogeological & Hydrological Report		
Drawing	0086269p_Hydro_G011_R0.mxd		
Date:	16/04/2012	Drawing Size:	A4
Drawn By:	DN	Reviewed By:	SS
Projection:	GDA 1994 MGA Zone 50		
Scale:	Refer to scale bar		

N

0 90 180 270m

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Aquifer Physical Parameters

Little desk-based information on the likely aquifer parameters in the region of the site is currently available; therefore site-specific data collected during the site investigation constitutes the principal means of evaluating hydrogeological parameters for the site.

Field Observations

During groundwater sampling (April 2011), MW1 – MW3 (see *Figure 2.1*) were all considered to have low to medium water level recovery rates, which appears consistent with the aquifer (Pilbara Fractured Rock Aquifer) in which the wells are screened. MW5 (see *Figure 2.1*) is screened in superficial Quaternary sediments and were observed to have good to moderate recovery rates during sampling. MW4 is screened across the basement rock and the overlying Quaternary sediments. The field observations are considered to be consistent with literature data for fractured rock aquifers and unconsolidated superficial sands, silts and clays.

Slug Testing Results

Slug tests were completed prior to conducting the groundwater monitoring event to assess the site-specific hydrogeological properties, however due to equipment failure and flooding at the site no results were obtained during the April 2011 visit.

Twenty nine slug tests were successfully completed at the five monitoring wells during the subsequent September 2011 and February 2012 visits. Aqtesolv™ was used to complete the analysis of the slug test data. Several solution methods were used to assess the potential range of hydraulic conductivity values. Slugtest analyses and a table of the results are presented in *Annex H*. *Table 3.4* below provides a summary of these results.

Table 3.4 Summary of Slug Test Results

		Hydraulic Conductivity, K (m/day)			
Well Number	Date of Test	Minimum	Median	Maximum	Solution Method
MW1	Sept 11	$2x10^{-1}$	$2x10^{-1}$	$3x10^{-1}$	BR[1]/H[2]
MW2	Sept 11	$2x10^{0}$	$2x10^{0}$	$3x10^{0}$	BR/H/KGS[3]/Degan
MW3	Sept 11 & Feb 12	$6x10^{-1}$	$8x10^{-1}$	$1x10^{0}$	BR/KGS
MW4	Sept 11 & Feb 12	$2x10^{0}$	$3x10^{0}$	$7x10^{0}$	BR/KGS
MW5	Sept 11 & Feb 12	$5x10^{0}$	$7x10^{0}$	$1x10^{1}$	BR/H/KGS

[1] BR – Bouwer-Rice Solution
[2] H – Horslev Solution

Hydraulic Conductivity, K (m/day)

[3] KGS - KGS Method (Hyder, et al. 1994)

The Bouwer-Rice (1976) and Hvorslev (1951) methods, which are straight line solutions, showed a reasonable comparison for the same data sets; however the Hvorslev solution which is for a confined aquifer generally resulted in higher estimated hydraulic conductivities. The Degan solution (straight line solution) was also used for comparative purposes and was found to provide similar results to the Bouwer-Rice and Hvorslev solutions. The KGS (1994) solution which is a curve matching solution also resulted in similar values to the straight line methods. Overall, the hydraulic conductivity values from the different methods were within a factor of 2 to 3, with the highest hydraulic conductivity values estimated from MW5 ($5x10^0$ to $1x10^1$ m/d) in the supratidal flats, and the lowest values estimated from MW1 ($2-3x10^{-1}$ m/d), located in bedrock, higher in the catchment .

Sensitivity Analysis

The sensitivity of the results was assessed by varying the estimated saturated thickness of the aquifer and the slope or curve of the match line. These results indicated that as the aquifer thickness was increased (in this instance a 5 m increase in aquifer thickness was used) the resultant hydraulic conductivity was slightly lower. Varying the slope or curve to incorporate later time data (after the water level had stopped oscillating in some wells such as MW4, February 2012) also lowered the estimated hydraulic conductivity values.

To assess the likely variation in hydraulic conductivity due to variation in the vertical and horizontal directions (anisotropy), the anisotropy ratios were varied for tests completed in MW5. MW5 is installed in Quaternary sediments; therefore the hydraulic conductivity in the horizontal direction is likely to be higher than in the vertical direction. Changing the anisotropy ratio to 0.1 for MW5 increased the hydraulic conductivity results by approximately 25%, for example from approximately 7.5 m/day to approximately 9.5 m/day.

Overall, the results of the sensitivity analyses were within the same range as the results of the primary analyses.

Comparison with Existing Data

Golder (2011) also completed slug tests at BH01, BH05 and BH07 (see *Figure 2.1*) as part of their geotechnical assessment. Higher hydraulic conductivities were measured in BH05 and BH07 (0.2 and 0.5 m/day respectively) which was considered by Golder to be consistent with the observed highly fractured zones within the granophyre. BH01 had a lower hydraulic conductivity (0.01-0.001 m/day) consistent with the field observations of the average defect spacing being above 100 mm (Golder, 2011).

The results for BH05 and BH07 (Golder, 2011) are considered to be consistent with the results from MW1 and MW3 which are also installed in the granophyre. The estimated hydraulic conductivity values from MW2 (2-3x10^0 m/d) were higher than in the other granophyre wells; however, this is considered to reflect the natural variability of fracture occurrence and interconnectivity in the shallow fractured granophyre.

Summary

Overall the results indicated that the hydraulic conductivity value of the Quaternary sediments in the southern area of the site is likely to be higher (5-10 m/d) than in the fractured bedrock in the northern area of the site (0.001-3 m/d).

Slug tests, however, test only a small portion of the aquifer directly adjacent to the screened portion of the well, therefore conditions in other areas of the site may vary from the values presented here and in Golder (2011).

Literature Review

A review of relevant literature sources indicates that typically fractured rock aquifers have porosity ranges of between 5 and 50% (Kruseman & de Ridder, 1994) dependant on the frequency and width of the fractures. The hydraulic conductivity of fractured rock aquifers is typically reported as being between almost 0 and 1000 m/day, again dependant on the frequency, width, orientation and connectivity of the fractures. Specific yield in fractured rock aquifers is typically less than 0.05 (5%) due to most of the water being contained within fractures and the rock mass only having a very limited storage capacity.

The overlying superficial aquifer was observed to contain silts, sands and gravels in varying proportions and within various horizons. Unconsolidated aquifers typically have porosity values ranging between 10 and 50% depending on the proportions of finer grained materials. Hydraulic conductivity values typically range between 0.001 and 5 m/day, again dependant on the relative quantities and distribution of the fine grained materials.

3.6.4 *Groundwater Discharge and Recharge*

Groundwater flow rates can be determined by using a modified version of Darcy's Law such that:

$$V = (K * i)/n \qquad \text{(\textit{Equation 1})}$$

Where:

V = groundwater flow velocity (m/day).

K = hydraulic conductivity (m/day).

i = groundwater gradient parallel to groundwater flow (m/m).

n_e = effective porosity (dimensionless).

Figure 3.15 Estimated Groundwater Flow Rates

	MWs 1, 2, 3	**MW4 and MW5**
Geological Unit	Granophyre	Quaternary Sediments
Hydraulic Gradient (m/m)	0.009	0.001[1]
Estimated Minimum K[2] (m/day)	0.001	2
Estimated Maximum K (m/day)	3	10
Assumed Effective Porosity (n_e)	0.1	0.2
Estimated Velocity Range (m/day)	**0.0001-0.3**	**0.01-0.05**

[1] Assumed hydraulic gradient within supratidal flats

[2] K – Hydraulic Conductivity

The estimated groundwater flow rate results vary over a significant range due to the observed heterogeneity within the geological formations at the Site and the variability in hydraulic gradient that is likely to apply in the granophyre bedrock and in the sediments of the supratidal flats.

Based on groundwater elevation data from the site, groundwater appears to be being recharged predominately from the bedrock that crops out to the north of the site. Rainwater that infiltrates the fracture system within the bedrock will then discharge into the supratidal flat and the salt marsh areas prior to discharging to King Bay to the west. It is possible that some groundwater may ultimately discharge to Hearson Cove; however, insufficient local data is available at present to assess the potential discharge areas.

3.6.5 Groundwater Use

The primary water supplies for this area include the:

- West Pilbara Water Supply Scheme, which obtains water from outside the local area from Harding Dam (surface water) and the Millstream Aquifer (groundwater); and
- Burrup seawater supply scheme and desalination plant, which provides seawater and desalinated water to industry on the Burrup Peninsula, with the water sourced from King Bay.

These water sources indicate that local groundwater is unlikely to be used in significant volumes.

The Hydrogeological Atlas (DoW website) does not indicate the presence of water supply wells within and around the proposed site. This may be due to a limitation of the hydrogeological atlas system within WA. As such it is not currently known if any water supply wells (of any type) are located within the vicinity of the site. However, given the scarcity of development in this area it is likely that any water wells are located some distance away from the site and are unlikely to be impacted by any temporary dewatering associated with plant construction.

3.6.6 Groundwater Quality

Regional Data

The Hydrogeological Atlas (DoW website) represents a regionally based characterisation of the groundwater quality and indicates that the groundwater salinities within this area are likely to range between 1,000 and 3,000 mg/L.

Groundwater yields and quality within this area are currently not well delineated; however, given the lithology of the area, they are expected to be low, consistent with field observations at the site. Although not assessed directly, the potential receiving water bodies for groundwater discharge in this area are considered to be the supratidal flats, King Bay, and potentially, Hearson Cove.

Analysis of potential contaminants indicates that no hydrocarbons or organic compounds were detected in groundwater from the area (HLA-Envirosciences, 1999). Concentrations of metals and sulphate, and pH values were measured prior to the construction of the BFPL plant, and were found to be within regulatory guidelines, with sulphates concentrations being marginally higher than normal background concentrations (HLA-Envirosciences, 1999).

Total dissolved solids (TDS) concentrations in groundwater from the supratidal flats were about 77,000 mS/cm (HLA-Envirosciences, 1999) which is greater than the TDS concentration for seawater (40,000 – 50,000 mS/cm). This is typical of supratidal environments which are subject to greater evaporation rates.

Site Data

The field parameters measured during the groundwater sampling completed in late April 2011, September 2011 and February 2012 are presented in *Annex E, Table 2* and are summarised as follows:

- pH values were generally neutral in groundwater from all wells sampled, and ranged between 6.55 and 7.64. This was within the range of acceptable values specified in the ANZECC, 2000 drinking water guidelines;

- electrical conductivity (EC) values ranged between 2,510 µS/cm (MW1) and 16,000 µS/cm (MW3), however it is considered likely that the EC probe exceeded the measurable maximum concentration at MW5;

- dissolved oxygen (DO) values ranged between 1.8 mg/L (MW5) and 4.7 mg/L (MW1). This range is considered to be typical of groundwater, which generally has lower values than surface water;

- temperature ranged between 27 and 32.6 °C; and

- redox potential (Eh) ranged between -100 mV, which is indicative of reducing conditions and 289 mV, which is indicative of oxidising conditions.

Although the measured field parameters varied slightly between monitoring rounds, seasonal variation does not appear to have a significant effect on the groundwater quality at the Site.

The groundwater sampling analytical results are presented in *Annex E* and T*ables 3, 4* and *5*; *Annex F* presents the laboratory reports. While there is no requirement to screen groundwater results for this baseline study, a summary is provided below comparing results against guidelines to provide an indication of groundwater quality. General observations are as follows:

- chromium (hexavalent) (MW5, 0.01 mg/L, April 2011) was measured in groundwater at a concentration above the threshold criterion (0.0044 mg/L). Analysis for chromium (hexavalent) was not completed during the September 2011 and February 2012 monitoring rounds;

- zinc was present in groundwater from MW1 and MW3 at concentrations above the threshold criteria of 0.015 mg/L (protective of 95% of marine water species, WA DEC 2010) in all three sampling rounds. Groundwater from MW2 and MW4 also contained zinc at concentrations above the criterion in the September 2011 and February 2012 monitoring rounds;

- sulphate was present in groundwater at concentrations (MW3, maximum 940 mg/L and MW5 maximum 5,200 mg/L) exceeding the Australian drinking water guidelines (500 mg/L) (NHMRC, 2004);

- chloride was present in groundwater from some wells at concentrations (MW3, maximum 5,400 mg/L, MW4, maximum 3,900 mg/L and MW5, maximum 87,000 mg/L) exceeding the DoH 2006 domestic non-potable groundwater guidelines (2,500 mg/L);

- nitrate as NO_3^- was present in at concentrations that exceeded the ANZECC 2000 95% guideline (0.7 mg/L as NO3) in groundwater from all five monitoring wells during the February 2012 monitoring event (MW1, maximum 8.7 mg/L). Nitrate was not measured during the first two monitoring rounds;

- total recoverable hydrocarbon (TRH) (C_{10}-C_{14}) was measured in groundwater from MW5 at 81 µg/L, however no guideline value is available as a comparison;

- all other analytes measured either had no threshold criteria or were below the relevant guidelines; and

- dissolved major cations and anions concentrations varied across the site, with combined totals ranging from 2,000 mg/L in groundwater from MW1 to 130,000 mg/L in groundwater from MW5. These combined totals are indicative of total dissolved solids concentrations and indicate that the groundwater is not of potable water quality. The elevated concentrations in groundwater from MW5 are consistent with evaporation / evapotranspiration in the supratidal flat environment.

Overall, the field chemical parameters and analytical results indicate that the water quality is not suitable for drinking water purposes due to the high salt content.

Vegetation identified during the 2009 survey is considered to be consistent with the groundwater geochemistry noted during this investigation; salt tolerant species were identified in the south-eastern areas of the site which are supratidal flats characterised by high groundwater and soil salinity.

Piper plots presented in *Annex G* indicate that the water quality varies between MW1 and MW2, which are located on the up hydraulic gradient side of the site, and MW3, MW4 and MW5 which are located further down hydraulic gradient; however, in all samples, the groundwater remains dominated by sodium and chloride. The three data sets from April 2011, September 2011 and April 2012 show good correlation with all three showing variation in groundwater chemistry dependant on the monitoring wells locations. This observed variation in geochemistry is consistent the presence of the supratidal flats in the south of the site. Seawater inundation and groundwater discharge by evaporation and evapotranspiration in the supratidal flat area would concentrate chloride in groundwater in the south of the site, while groundwater in the northern area is recharged by precipitation and therefore has lower salinities and higher HCO_3/Cl ratios. This variation in geochemistry does not indicate the presence of two distinct and unconnected aquifer systems as the water table intersects the different hydrogeological settings.

3.7 *DEWATERING*

ERM understands that cut and fill earthworks will be required at the site to level the site to approximately 5.5 mAHD. Following review of the groundwater levels measured in January 2011 during well installation works, April 2011, September 2011 and February 2012, the requirement for dewatering is likely to be dependent on the frequency and volume of rainfall prior to and during ground works and construction.

Golder (2011) report that based on their geotechnical investigation minimal to no active dewatering should generally be required during construction, other than after cyclonic rainfall events when groundwater elevations may rise above the base of excavation which is understood to be 2.5 m AHD (Golder, 2011). The time period for groundwater to return to pre-cyclone levels is unknown, however groundwater levels observed in April 2011 were noted to be generally elevated when compared to January 2011 data. It should be noted, however, that no direct comparison can be made between groundwater elevations from BH01, BH05, BH07 and MW1-MW5 as the data were collected at different times.

4 POTENTIAL IMPACTS & MANAGEMENT MEASURES

Based on the hydrological and hydrogeological investigations, the key potential impacts associated with the development are discussed below.

4.1 SITE LEVELS AND FLOODING

Flooding is a potential risk to the development and warrants careful consideration. The modelling undertaken by Golder (2001) predicts a maximum water surface level of 5.6 mAHD for storm events with recurrence intervals ranging from 10 to 100 years. However, this value may be an overestimate. The KSSIS (BoM, 1996) predicts maximum water surface levels in the vicinity of the site of 5.0 mAHD based on a 100-year return interval. Based on the information available, ERM considers that this is a more reliable estimate.

The final site level proposed for the TANPF is 5.5 mAHD and, as such, is located above the 100 year ARI storm surge level predicted in the KSSIS (BoM, 1996).

Filling of the site for construction of the TANPF will reduce the flood storage capacity of the supratidal flats to the south. This could affect flood levels both onsite and in adjacent areas during flood events, and may be particularly pronounced during extreme rain events and high catchment runoff. Increasing the level of the site could help prevent impacts associated with this, though further investigations would be required (see *Section 4.2*).

4.2 STORMWATER DIVERSION CONSIDERATIONS

The proposed TANPF site can experience significant stormwater run-on from the north. This is likely to comprise a combination of sheet flow as well as concentrated flow within defined drainage lines. There are at least three prominent intermittent watercourses (gullies) that intersect the site's northern boundary.

Suitable diversion works should be constructed to collect and convey upslope clean stormwater around and/or through the development site and to the low lying supratidal flats in the south. This is necessary to minimise the risk of inundation and stormwater damage to infrastructure, and will also be important for water quality control both during construction and when the TANPF site is operational. Preventing mixing of clean and potentially contaminated stormwater at the TANPF site will be an important component of the water management plan.

A possible solution to managing stormwater is construction of a drain along the northern side of the development, close to the property boundary, that captures and drains upslope stormwater to the east and around the development site. Similar drains may be required to convey stormwater around the western and eastern boundaries.

These drains should be designed to convey stormwater flows and remain stable (i.e. erosion resistant) in flows up to the 100-year ARI storm event. Golder (2011) have undertaken preliminary sizing of the perimeter drains; however, detailed design will be required, which includes the design of channel stabilisation, selecting the preferred location and alignment based on local topography, and design of outlet structures.

Consideration should also be given to the impact of the proposed development on the flood conveyance capacity of the supratidal flats, which the proposed development is currently planned to partially fill. It may be necessary to construct additional waterway capacity to manage local catchment peak flows as well as to prevent an unacceptable increase in flooding hazard both at the subject site and on surrounding lands. HEC-RAS modelling has been undertaken by Golder (2011) although the implications of this modelling require further consideration. It is recommended that the modelling be extended to assess the relative increase in flood magnitude, frequency and flow velocities caused by filling the floodplain. This should be undertaken in isolation of storm surge influences to gain a true picture of impacts on local catchment drainage. Issues to be considered should include:

- impacts on surrounding land, ecosystems and developments (both existing developments and any proposed or foreseen developments within the area);

- assessment of compliance with relevant legislation and flood planning controls;

- impacts on groundwater conditions (quality and levels) and soil salinity; and

- review of mitigation options to reduce any identified impacts.

5 *CONCLUSIONS*

5.1 *HYDROLOGICAL ASSESSMENT*

A desktop assessment and field investigation were completed to develop a preliminary conceptual understanding of the hydrology and hydrogeology of the site so that key potential impacts of the proposed TANPF development on surrounding groundwater and surface water features could be identified.

With respect to surface waters, the proposed TANPF intersects a number of ephemeral watercourses which drain the slopes to the north. Diversion of these flows will be required. A suitable option would be construction of diversion drains along the northern, western and eastern perimeters of the site. Peak flows for the affected catchments have been calculated for rain events with recurrence intervals ranging from two to 50 years, and should be used to design any new diversion structures.

Flood modelling undertaken by Golder (2011) indicates that water levels would rise to approximately 5.6 m AHD due to storm surge in a 100 year return interval event. This exceeds the proposed site level of 5.5 m AHD suggesting that some parts of the site could be inundated in such an event. However, ERM's review of the Golder (2011) modelling suggests the data may be unreliable, with the maximum storm surge height used by Golder (2011) not being well explained or justified. In particular, questions are raised relating to the designated downstream water level (5.6 m AHD). ERM believes this value may overestimate the potential storm surge levels. It is recommended that the client discuss these issues with Golder and if necessary, the modelling should be revised.

ERM has estimated 24-hour detention requirements for site-generated stormwater, for both clean and dirty stormwater catchments, for one to 100 year ARI storm events. For the clean water catchment with an estimated area of 2.1 hectares, the 24-hour detention volumes are approximately 6.8 ML for a 50-year ARI event and 8.3 ML for a 100-year ARI event. For the dirty water catchment with an estimated area of 0.6 hectares, the 24-hour detention volumes are approximately 1.9 ML for a 50-year ARI event and 2.4 ML for a 100-year ARI event. The proposed ponds should be of sufficient capacity to accommodate the predicted volumes generated, if managed appropriately.

5.1.1 *Uncertainties - Hydrology*

Several uncertainties still exist with respect to the potential flood risk, requirements for stormwater detention and the interactions between surface and groundwater at the site. As indicated above, ERM has identified the use of the 5.6 mAHD storm surge and maximum tide water level by Golders in the flood modelling may be over-estimating the likely peak flood levels.

Consultation with Golder is recommended to address this issue and if necessary, the modelling should be revised.

The modelling undertaken to date does not appear to assess potential impacts associated with filling of the floodplain to allow for the construction of the site. A review of the HEC-RAS model developed by Golder should be undertaken to quantify this issue. If the impacts are significant, the following flood mitigation measures may need to be developed:

- flood planning for existing and proposed developments;
- infrastructure designed with consideration to flood levels;
- structures such as retention basins and/or floodways; and
- creating additional waterway capacity.

Short term (24-hour) runoff volumes from the developed site have been calculated; however, further liaison with relevant government agencies would be required to determine detention requirements for compliance with industry best practice guidelines and any conditions of consent. Detention requirements may be greater for dirty water than clean water catchments, due to the increased pollution risks and the greater detention times required to achieve effective water treatment and any discharge targets.

Golder (2011) indicated that the estimated flood velocities were likely to be low and erosion would likely be negligible, however the use of rip-rap for erosion control and improved stability along the southern side of the TANPF was still recommended. This is considered to be an uncertainty by ERM and further discussions are warranted following release of design criteria for the stormwater management system.

Detailed design of the stormwater management system is still to be undertaken. It is expected that this would address, among other things:

- stormwater treatment measures to prevent adverse impacts on the quality of receiving waters (groundwater and surface water);
- use of stormwater detention structures to minimise the potential increase in site stormwater peak flows bought about by the increase in impervious surfaces and installation of hydraulically efficient stormwater drainage infrastructure;
- opportunities for stormwater capture and reuse; and
- design of and specification of discharge limits for any stormwater discharge locations, including design of outlet structures that minimise potential for offsite impacts such as flooding and erosion.

5.2 *HYDROGEOLOGICAL ASSESSMENT*

The average groundwater elevations across the site were 3.6 mAHD in late April 2011, and 3.4 mAHD in September 2011 and February 2012. The inferred groundwater flow direction was to the south-easterly direction across the portion of the site proposed to be developed during all three monitoring events. The hydraulic gradient was noted to be slightly steeper in the north-west than in the south of the site and groundwater elevation was generally noted to mimic surface topography.

Groundwater elevations observed in April 2011 had risen significantly from those observed during installation of the monitoring wells and the geotechnical assessment reported that groundwater elevation showed a strong response to the significant rainfall events associated with Cyclone Bianca. A significant decrease in groundwater elevation (from 6.46 to 5.86 mAHD in MW1) in the north-western area of the site was observed between the April 2011 and the September 2011 monitoring events.

Tidal monitoring completed as part of the geotechnical assessment indicated that groundwater in bedrock beneath the central and western portion of the site is unlikely to be tidally influenced.

Geochemical parameters indicate that the water quality is variable across the site, predominantly resulting from groundwater recharge on the hills where the granophyre crops out and from groundwater discharge due to evaporation and evapotranspiration in the supratidal flats in the south of the site. Based on the groundwater elevation and chemistry assessment it is considered likely that groundwater in the granophyre and the supratidal flats is connected, with the water table intersecting the different hydrogeological settings.

Vegetation identified during the 2009 survey is considered to be consistent with the groundwater geochemical results recorded during this investigation; salt tolerate species were identified in the south-eastern areas of the site which are considered to be supratidal flats with high soil and groundwater salinity levels.

5.2.1 *Uncertainties – Hydrogeology/Groundwater*

Several uncertainties still exist with respect to the condition and presence of groundwater at the site.

Although groundwater was observed during the monitoring period in April 2011 to be below the anticipated depth of excavation for the TANPF, it is also noted that during and following Cyclone Bianca significant groundwater elevation rises were observed; however the monitoring frequency over that period was insufficient to establish the maximum groundwater elevations that occurred in response to the cyclone. The duration of monitoring after the cyclone has also been insufficient to assess whether groundwater elevations have decreased compared to pre-cyclone conditions. Further information is required to assess the persistence of elevated groundwater levels to assist with determining the need for dewatering at the site during construction.

Uncertainties are also present with respect to the available tidal monitoring data. The duration of the test period is considered insufficient to draw conclusions with respect to the influence of neap or spring tides at the site and the effect this may have on groundwater elevations in the supratidal flats at the site.

Although dewatering is not at this time considered likely at the site, should this change in future, further information on the likely effects of dewatering and saline intrusion will be required. The potential impact of discharge of groundwater from dewatering on the local groundwater quality is also unknown at this time.

Requirements for the assessment and management of groundwater at the site were formally conditioned in Ministerial Statement No. 870 published on 7 July 2011. Condition 8 of the ministerial approval indicates that detailed hydrogeological studies shall be commenced at least 12 months prior to the commencement of construction to quantify groundwater quality, groundwater flow directions, and the depth to groundwater beneath the TANPF site and in surrounding areas. It is considered that the preliminary data collected at the site is sufficient to discharge Condition 8-1, however that uncertainties with regard to dewatering requirements remain.

6 RECOMMENDATIONS

Based on the preliminary assessments completed and the uncertainties presented above, the following recommendations are made for further hydrological and hydrogeological assessment:

- Further detailed design is required of upslope clean water diversion drains;

- Review flood modelling to address uncertainties with respect to assumed downstream water levels;

- Conduct additional flood modelling to assess the relative increase in flood magnitude, frequency and flow velocities caused by filling the floodplain. Related issues to be addressed include:

    - assess impacts on surrounding land, ecosystems and developments (both existing developments and any proposed or foreseen developments within the area);

    - assess impacts on groundwater conditions (quality and levels) and soil salinity;

    - assess compliance with relevant legislation and flood planning controls; and

    - review of mitigation options to reduce potential impacts.

- Determine onsite stormwater detention requirements for clean and dirty water catchments based on final site design and development conditions;

- Prepare stormwater management plans that address the management of clean and dirty stormwater, including any discharge procedures and water quality targets;

- If dewatering is to be considered for the site, pumping tests and assessment of groundwater elevation and quality in nearby observation bores should be conducted; and

- As part of detailed design, develop management plans for control of potential sources of on-site contamination. Such sources might include water, chemical and fuel storage facilities, waste water treatment facilities, and water and waste discharge processes.

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Annex A

Photo Logs

Photograph 1

Monitoring Well MW5 near southern flood pan. Staining on standpipe indicates height of flooding at this location after heavy rainfall.

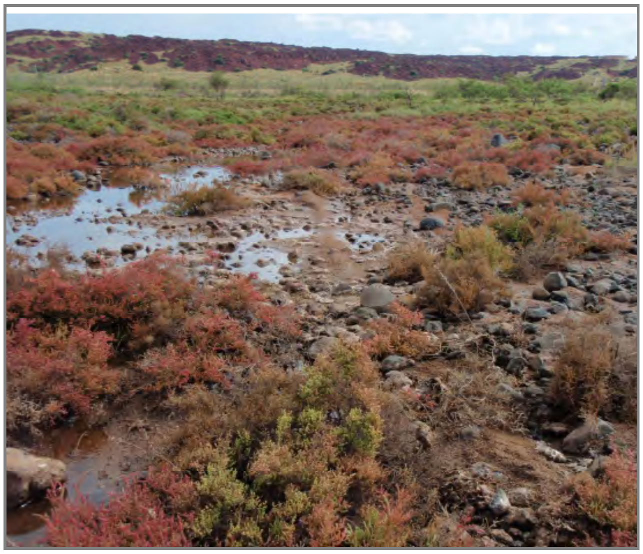
Photograph 2

View from southern boundary of site (facing North) illustrating presence of standing water in southern flood pan during May groundwater investigation.

Photograph 3

Monitoring Well MW4 located in the south western corner of the Site. Evidence of flood levels were visible on standpipe

Photographs from May 2011



Photograph 4

Evidence of flooding and standing water in the vicinity of SB3 (located near centre of Site).

Photograph 5

Evidence of flooding and standing water in the vicinity of SB4 (located slightly east of proposed development location).

Photograph 6

View west, taken from centre of Site indicating general ground cover.

Photograph 7

Photograph taken from south western corner of site looking towards centre. Evidence of flooding is indicated on the rock wall pictured.

Photograph 8

Photo graph illustrating standing water present in southern portion of the Site at the time of the May groundwater investigation.

Photograph 9

Photograph from eastern boundary of Site indicating Site topography.

Annex B

Calculation Spreadsheets

Burrup Peninsula, WA - IFD Chart
Location: 20.625 S RUSLE *R-factor* = 1828
116.8 E

Simple	**I (mm/hr) for ARI (yrs)**						
Time	1 Year	2 years	5 years	10 years	20 years	50 years	100 years
5 mins	79.2	107	159	194	237	298	346
6 mins	73.8	100	149	181	222	279	325
10 mins	60.1	81.9	123	150	185	233	273
20 mins	44.3	60.6	92.1	113	140	178	209
30 mins	36	49.4	75.7	93.7	116	148	174
1 hr	23.8	32.9	51.3	64	80.1	103	122
2 hrs	14.6	20.4	32.6	41.3	52.2	67.9	81
3 hrs	10.8	15.1	24.6	31.4	40	52.5	62.9
6 hrs	6.31	8.94	15	19.4	25	33.4	40.4
12 hrs	3.79	5.4	9.25	12.1	15.8	21.2	25.9
24 hrs	2.39	3.4	5.85	7.69	10	13.5	16.5
48 hrs	1.51	2.15	3.67	4.81	6.26	8.42	10.3
72 hrs	1.1	1.57	2.69	3.52	4.57	6.15	7.5

Extended	**I (mm/hr) for ARI (yrs)**						
Time (mins)	1	2	5	10	20	50	100
5	79.2	107.4	159.4	193.7	237.1	297.6	346.3
6	73.8	100.1	148.8	181.2	222.1	279.0	324.8
7	69.4	94.3	140.6	171.4	210.2	264.4	308.1
8	65.8	89.5	133.7	163.3	200.5	252.5	294.4
9	62.8	85.5	127.9	156.4	192.2	242.3	282.8
10	60.1	81.9	122.9	150.4	185.0	233.4	272.6
11	57.8	78.8	118.4	145.0	178.6	225.5	263.5
12	55.7	76.0	114.4	140.3	172.8	218.4	255.4
13	53.9	73.5	110.8	135.9	167.6	212.0	248.0
14	52.1	71.2	107.5	131.9	162.8	206.1	241.2
15	50.6	69.1	104.4	128.3	158.3	200.6	234.9
16	49.1	67.2	101.6	124.9	154.2	195.5	229.1
17	47.8	65.3	99.0	121.8	150.4	190.8	223.6
18	46.5	63.7	96.5	118.8	146.9	186.4	218.5
19	45.4	62.1	94.2	116.0	143.5	182.2	213.7
20	44.3	60.6	92.1	113.4	140.3	178.3	209.2
21	43.2	59.2	90.1	111.0	137.4	174.6	204.9
22	42.2	57.9	88.1	108.7	134.5	171.1	200.8
23	41.3	56.6	86.3	106.5	131.9	167.7	197.0
24	40.4	55.5	84.6	104.4	129.3	164.6	193.3
25	39.6	54.3	82.9	102.4	126.9	161.5	189.8
26	38.8	53.2	81.3	100.5	124.6	158.7	186.5
27	38.1	52.2	79.8	98.7	122.4	155.9	183.3
28	37.3	51.2	78.4	96.9	120.3	153.3	180.2
29	36.6	50.3	77.0	95.3	118.2	150.7	177.3
30	36.0	49.4	75.7	93.7	116.3	148.3	174.5
31	35.3	48.5	74.4	92.1	114.4	146.0	171.8
32	34.7	47.7	73.2	90.7	112.6	143.7	169.2
33	34.1	46.9	72.1	89.2	110.9	141.6	166.7
34	33.6	46.2	70.9	87.9	109.2	139.5	164.3
35	33.0	45.4	69.8	86.6	107.6	137.5	161.9
36	32.5	44.7	68.8	85.3	106.1	135.6	159.7
37	32.0	44.0	67.8	84.1	104.6	133.7	157.5
38	31.5	43.4	66.8	82.9	103.1	131.9	155.4
39	31.0	42.7	65.9	81.7	101.7	130.1	153.4
40	30.6	42.1	64.9	80.6	100.4	128.4	151.4
41	30.1	41.5	64.1	79.5	99.1	126.8	149.5
42	29.7	40.9	63.2	78.5	97.8	125.2	147.7
43	29.3	40.4	62.4	77.5	96.6	123.7	145.9
44	28.9	39.8	61.6	76.5	95.4	122.2	144.2
45	28.5	39.3	60.8	75.6	94.2	120.7	142.5
46	28.1	38.8	60.0	74.6	93.1	119.3	140.8
47	27.8	38.3	59.3	73.7	92.0	117.9	139.2
48	27.4	37.8	58.6	72.9	90.9	116.6	137.7
49	27.1	37.3	57.9	72.0	89.9	115.3	136.2
50	26.7	36.8	57.2	71.2	88.9	114.0	134.7
51	26.4	36.4	56.5	70.4	87.9	112.8	133.3
52	26.1	36.0	55.9	69.6	86.9	111.6	131.9
53	25.8	35.5	55.2	68.9	86.0	110.4	130.5
54	25.5	35.1	54.6	68.1	85.1	109.3	129.2
55	25.2	34.7	54.0	67.4	84.2	108.2	127.9
56	24.9	34.3	53.5	66.7	83.4	107.1	126.7
57	24.6	34.0	52.9	66.0	82.5	106.0	125.4
58	24.3	33.6	52.3	65.3	81.7	105.0	124.2
59	24.0	33.2	51.8	64.7	80.9	104.0	123.0
60	23.8	32.9	51.3	64.0	80.1	103.0	121.9

Peak Flow Calculations

Index Flood Method

$$QY = 6.73 \times 10^{-4} \times A^{0.72} \times P^{1.51} \times Q_Y/Q_5$$ (from AR&R)

where:

Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years

A is the catchment area in km^2

P is the average annual rainfall over the catchment area

Site	A (km^2)	Frequency Factor (Q_Y/Q_5)					
		$2_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$
S1	0.35	0.56	1.00	1.50	2.25	3.40	n/a
S2	0.06	0.60	1.00	1.48	2.20	3.00	n/a
S3	0.34	0.56	1.00	1.50	2.25	3.40	n/a
S4	1.36	0.54	1.00	1.62	2.50	4.20	n/a
S5	0.02	0.60	1.00	1.48	2.20	3.00	n/a
S6	0.03	0.60	1.00	1.48	2.20	3.00	n/a

Site	A (km^2)	Peak flows (m^3/s)					
		$2_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$
S1	0.35	0.885	1.580	2.371	3.556	5.373	n/a
S2	0.06	0.254	0.424	0.628	0.933	1.272	n/a
S3	0.34	0.872	1.557	2.336	3.504	5.295	n/a
S4	1.36	2.271	4.205	6.813	10.514	17.663	n/a
S5	0.02	0.121	0.202	0.299	0.445	0.606	n/a
S6	0.03	0.154	0.257	0.381	0.566	0.772	n/a

Peak Flow Calculations

Rational Method calculations

$Qy = 0.278 \times C_2 \times (C_Y/C_2) \times I_{Y,\,tc} \times A$ (from AR&R)

where: Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years

A is the catchment area in km^2

$I_{Y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.56 \times A^{0.38}$ hrs (from AR&R)

C_Y runoff coefficient for ARI of Y years

$C_2 = 3.07 \times 10^{-1} \times L^{-0.2}$

L is the mainstream length (km) measured from the catchment outlet to the most remote point on the catchment boundary

$F_Y = C_Y/C_2$ (frequency factor)

Rainfall intensities

Site	A (km^2)	L (km)	Place an x here to halve tc	tc (mins)	Rainfall intensity, I, mm/hr						C_2
					$2_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
S1	0.35	1.02		22	57.9	88.1	108.7	134.5	171.1	200.8	0.31
S2	0.06	0.34		11	78.7	118.4	145.0	178.6	225.5	263.5	0.38
S3	0.34	1.15		22	57.9	88.1	108.7	134.5	171.1	200.8	0.30
S4	1.36	1.68		38	43.4	66.8	82.9	103.1	131.9	155.4	0.28
S5	0.02	0.18		8	89.5	133.7	163.3	200.5	252.5	294.4	0.43
S6	0.03	0.18		9	85.5	127.9	156.4	192.2	242.3	282.8	0.43

Peak flow calculations

	Peak flows (m^3/s)						Comments
ARI (yrs)	$2_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
Fy (C_Y/C_2)	1	1.46	2.21	3.6	5.2	n/a	
S1	1.713	3.806	7.105	14.329	26.316	n/a	
S2	0.467	1.025	1.901	3.812	6.955	n/a	
S3	1.639	3.641	6.797	13.708	25.176	n/a	
S4	4.524	10.167	19.093	38.706	71.489	n/a	
S5	0.215	0.470	0.868	1.736	3.158	n/a	
S6	0.288	0.629	1.164	2.330	4.243	n/a	

Site Data Sheet

Site Name: **Burrup Nitrates**

Site Location: **Burrup Peninsula WA**

Precinct: **North West Region, Pilbara**

Description of Site:

Average annual rainfall, P (mm) **282.4** Karratha Aero (Station No. 004083)

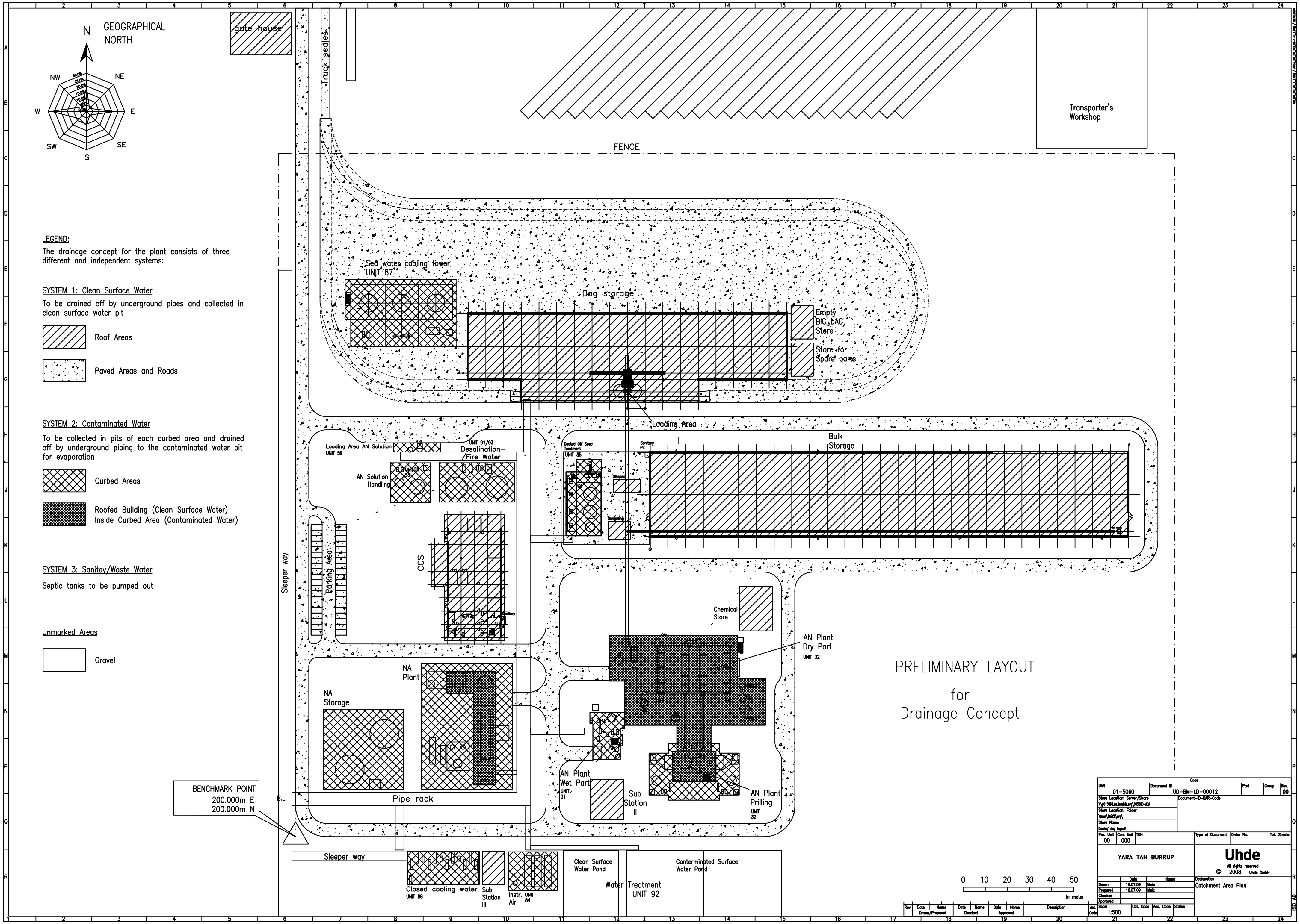
Site area	Sub-catchments						Remarks
	S1	S2	S3	S4	S5	S6	
Total catchment area, A (ha)	34.8	5.6	34.1	135.5	2.0	2.8	
Disturbed catchment area (ha)	0.0	0.0	0.0	0.0	0.0	0.0	
Clearing pecentage, C_L (%)	0.0	0.0	0.0	0.0	0.0	0.0	
Mainstream length, L (km)	1.02	0.34	1.15	1.68	0.18	0.18	
Stream slope, Se (m/km)							

Annex C

TANPF Layout Plan

Annex F

Proposed Drainage Design



LEGEND:

The drainage concept for the plant consists of three different and independent systems:

SYSTEM 1: Clean Surface Water

To be drained off by underground pipes and collected in clean surface water pit

▨ Roof Areas

░ Paved Areas and Roads

SYSTEM 2: Contaminated Water

To be collected in pits of each curbed area and drained off by underground piping to the contaminated water pit for evaporation

▩ Curbed Areas

▦ Roofed Building (Clean Surface Water)
Inside Curbed Area (Contaminated Water)

SYSTEM 3: Sanitay/Waste Water

Septic tanks to be pumped out

Unmarked Areas

☐ Gravel

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Drawing1.dwg Layout1
Document-ID-BAR-Code

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YARA TAN BURRUP

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Drawn	16.07.09	Muic
Prepared	16.07.09	Muic
Checked		
Approved		

Scale	Cat. Code	Acc. Code	Status
1:500			

Designation
Catchment Area Plan

ISO A0

Annex D

Bore Logs

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW1

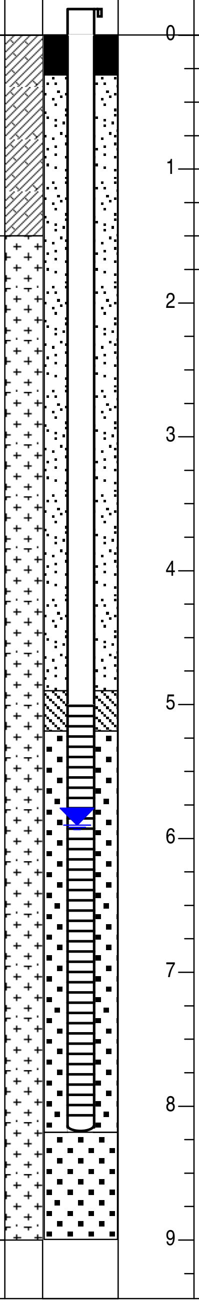
ERM

ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **EnviroTech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Monitoring Well**

Total Depth (m): **9.0**
Hole Diam. / Width (mm): **200**
Casing Type: **PVC Type 16**
Casing Diam. (mm): **52**
Surface Completion: **Standpipe**
Water Strike:

Water Level (Final): **5.8**
RL Ground:
RL Case:
East MGA: **477750.267**
North MGA: **7719618.897**



Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Orange brown, slightly damp, loose, fine to medium grain size, poorly sorted, sub-angular. Some gravel. Gravel content increasing from 0.25m depth. Some cobbles from 1.0m depth.			0		DS			MW1_0.0	
					DS			MW1_0.25	
					DS			MW1_0.5	
					DS			MW1_0.75	
			1		DS			MW1_1.0	
Granophyre Grey, fractured, bedrock Soft weathered material at 4.5 to 4.8m					DS			MW1_1.5	Air rotary from 0.5m due to SSA rejection on rocks.
			2 – 9						Slow Recharge. Slightly turbid brown water. Purged dry 3 times during development.
End of Log									

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW2

ERM

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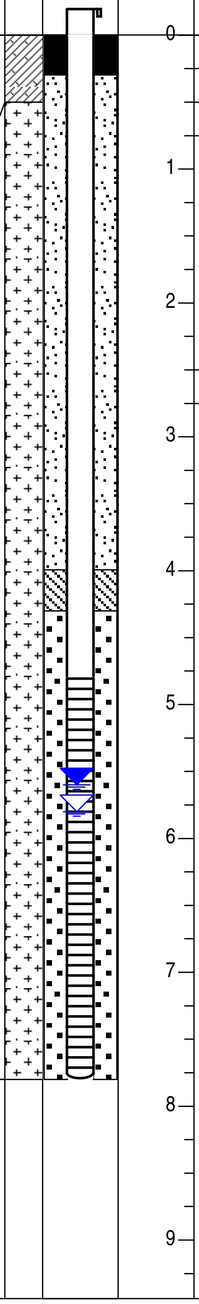
Drill Start Date: **18/1/2011**	Total Depth (m): **7.8**	Water Level (Final): **5.6**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **PVC Type 16**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **52**	East MGA: **477982.134**
Drill Method: **SSA, AR**	Surface Completion: **Standpipe**	North MGA: **7719632.321**
Hole Type: **Monitoring Well**	Water Strike: **5.8**	



Lithology	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface						
Clayey Sandy Gravel Brown, dry, loose, fine to medium grain size, poorly sorted, sub-angular.		DS			MW2_0.0	
		DS			MW2_0.25	
		DS			MW2_0.5	
Granophyre Grey, hard, bedrock. Soft weathered material at 2.5 - 2.8m						Air rotary from 0.5m due to SSA rejection on rock.
		DS			MW2_2.5	
						Moderate Recharge. Very turbid, becoming slightly turbid brown water. Purged dry 3 times during development.
End of Log						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW3

ERM

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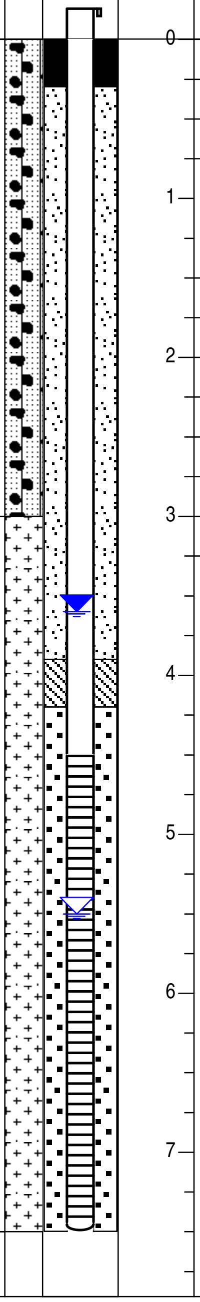
Drill Start Date: **18/1/2011**	Total Depth (m): **7.6**	Water Level (Final): **3.6**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **PVC Type 16**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **52**	East MGA: **478228.561**
Drill Method: **SSA, AR**	Surface Completion: **Standpipe**	North MGA: **7719614.980**
Hole Type: **Monitoring Well**	Water Strike: **5.5**	



Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Brown, dry, loose, fine grain size, poorly sorted, sub-angular. Some Boulders between 0.5 and 0.9m depth. Gravel content increasing from 0.25m depth.			0		DS			MW3_0.0	(DUP03)
					DS			MW3_0.25	(DUP04)
					DS			MW3_0.9	
			1						
					DS			MW3_1.5	Air rotary from 0.5 m due to SSA rejection on rock.
			2		DS			MW3_2.0	
					DS			MW3_2.5	
Granophyre Grey, hard.			3		DS			MW3_3.0	
			4						
			5						
			6						Moderate Recharge. Slightly turbid, becoming very turbid brown water. Purged dry 2 times during development.
			7						
End of Log									

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW4

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Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **Envirotech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Monitoring Well**

Total Depth (m): **4.5**
Hole Diam. / Width (mm): **200**
Casing Type: **PVC Type 16**
Casing Diam. (mm): **52**
Surface Completion: **Standpipe**
Water Strike: **3.0**

Water Level (Final): **1.6**
RL Ground:
RL Case:
East MGA: **477721.886**
North MGA: **7719306.205**

Lithology

Ground Surface

Silty Sand
Brown, dry, loose, fine to medium grain size, poorly sorted, sub-angular to angular. With some cobbles.

Fine shell fragments in upper 100mm of profile.

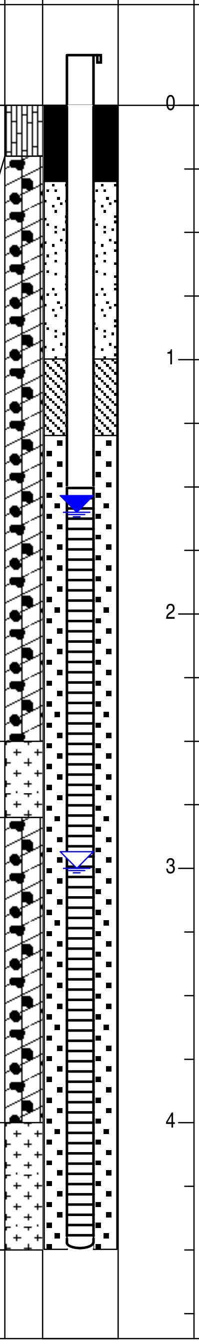
Clayey Gravel
Brown, moist, loose, poorly sorted, sub-angular gravels. With cobbles and boulders.

Rock
Grey. Probable boulder.

Clayey Gravel
Brown, moist, loose, moderately plastic, poorly sorted, sub-angular gravels. Some cobbles and boulders.

Granophyre

End of Log



Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
	DS			MW4_0.0	
	DS			MW4_0.5	
	DS			MW4_1.0	
	DS			MW4_1.5	Unable to penetrate beyond 0.1m with SSA. Air rotary from surface.
	DS			MW4_2.0	
	DS			MW4_2.5	
					Fast - moderate Recharge. Very turbid red brown water.

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW5

ERM
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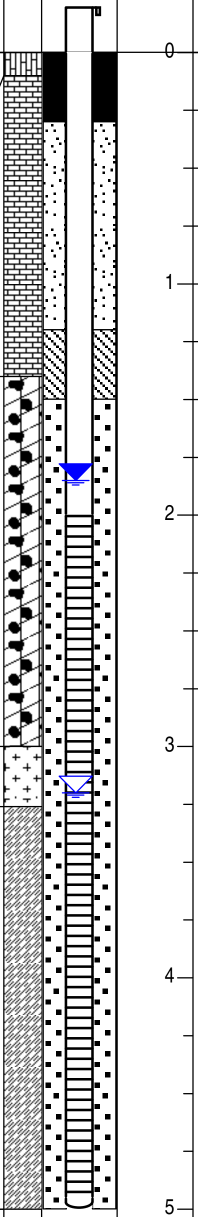
Drill Start Date: **18/1/2011**	Total Depth (m): **5.0**	Water Level (Final): **1.85**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **PVC Type 16**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **52**	East MGA: **477976.901**
Drill Method: **SSA, AR**	Surface Completion: **Standpipe**	North MGA: **7719306.205**
Hole Type: **Monitoring Well**	Water Strike: **3.2**	



Lithology	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface							
Clayey Sand Brown, damp, loose, fine to course grain size, poorly sorted, sub-angular to angular. Some cobbles.	0		DS			MW5_0.0	(DUP06) Salt crusting at surface.
Rock Hard brown, ferricrete/silcrete cemented.			DS			MW5_0.5	
	1		DS			MW5_1.0	
Clayey Gravel Red brown, damp, loose, fine to medium grain size, poorly sorted, sub-angular to angular gravels.			DS			MW5_1.5	Unable to penetrate beyond 0.1 with SSA. Air rotary from surface.
	2		DS			MW5_2.0	
			DS			MW5_2.5	
Rock Grey, hard. Probable boulder.	3						
Silty Clay Brown, moist, firm, plastic, traces of gravel.	4						Fast - moderate Recharge. Very turbid red brown water, becoming clear.
End of Log	5						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB1

ERM Australia Pty Ltd

Drill Start Date: **17/1/2011**	Total Depth (m): **3.0**	Water Level (Final): **NA**
Drill Finish Date: **17/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **NA**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **NA**	East MGA:
Drill Method: **SSA, AR**	Surface Completion: **NA**	North MGA:
Hole Type: **Soil Bore**	Water Strike: **NA**	

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Brown, dry, loose, fine to medium grain size, sub-angular. Some grains <120mm. Increasing grains <120mm content at 0.5m.			0		DS			SB1_0.0	Air Rotary from 0.5m due to rejection of SSA on unconsolidated rock.
					DS			SB1_0.25	
					DS			SB1_0.50	
					DS			SB1_0.75	
Rock Fractured bedrock.			1		DS			SB1_1.0	
			2						
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB2

ERM

ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**	Total Depth (m): **3.0**	Water Level (Final): **NA**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **Envirotech Drilling**	Casing Type: **NA**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **NA**	East MGA:
Drill Method: **SSA, AR**	Surface Completion: **NA**	North MGA:
Hole Type: **Soil Bore**	Water Strike: **NA**	

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Brown, dry, loose, low plasticity, fine-medium grain size, poorly sorted, sub-angular. Some grains <120mm. Increasing rocks <180mm content at 0.5m	▨		0		DS			SB2_0.0	(Dup 02)
					DS			SB2_0.25	
					DS			SB2_0.5	Air Rotary from 0.5 due to SSA rejection on unconsolidated rock.
					DS			SB2_0.75	
			1		DS			SB2_1.0	
Rock Grey, hard, fractured.	+				DS			SB2_1.2	
			2						
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB3

ERM

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Drill Start Date: **18/1/2011**	Total Depth (m): **3.0**	Water Level (Final): **NA**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **NA**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **NA**	East MGA:
Drill Method: **SSA, AR**	Surface Completion: **NA**	North MGA:
Hole Type: **Soil Bore**	Water Strike: **NA**	

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Orange brown, slightly damp, loose, fine to medium grain size, poorly sorted, sub-angular. Some gravel.			0		DS			SB3_0.0	(DUP01) Salt crusting at surface.
Gravelly Clayey Sand Orange brown, slightly damp, loose, low plasticity, fine to medium grain size, poorly sorted. Some grains <150mm.					DS			SB3_0.25	
					DS			SB3_0.5	Air rotary from 0.5 m due to SSA rejection on rocks.
			1		DS			SB3_1.0	
Granophyre Grey, hard, bedrock.					DS			SB3_1.25	
			2						
			3						
End of Log									

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Page **1 of 1**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB4

ERM

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Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **EnviroTech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Soil Bore**

Total Depth (m): **3.0**
Hole Diam. / Width (mm): **200**
Casing Type: **NA**
Casing Diam. (mm): **NA**
Surface Completion: **NA**
Water Strike: **NA**

Water Level (Final): **NA**
RL Ground:
RL Case:
East MGA:
North MGA:

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Gravely Red brown, fine to coarse grain size, sub-angular to angular. Some sand. Trace cobbles at the surface.			0		DS			SB4_0.0	Surficial rocky outcrops in surrounding areas (Black and Green).
					DS			SB4_0.25	
Rock Red brown, hard ferricrete/silcrete cemented layer. Well cemented.									Air Rotary from 0.3 due to SSA rejection on unconsolidated rock.
			1						
Clayey Sand Red brown, fine to coarse grain size, poorly sorted, sub-angular.									
					DS			SB4_1.5	
			2		DS			SB4_2.0	
					DS			SB4_2.5	
Granophyre Grey, bedrock.									
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB5

ERM

ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**	Total Depth (m): **3.0**	Water Level (Final): **NA**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **NA**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **NA**	East MGA:
Drill Method: **SSA, AR**	Surface Completion: **NA**	North MGA:
Hole Type: **Soil Bore**	Water Strike: **NA**	

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Silty Sand Brown, dry, loose, fine to medium grain size, moderately sorted, sub-angular. Shell fragments to 0.65m depth. Damp at 1.0m depth.			0		DS			SB5_0.0	Shell fragments to 0.65m. No evidence of corrosion.
					DS			SB5_0.25	
					DS			SB5_0.5	
Rock Red brown, hard ferrocrete/silcrete cemented layer.									
Clayey Sand Red brown, low plasticity, fine - coarse grains, poorly sorted, sub-angular.			1		DS			SB5_1.0	(DUP05)
					DS			SB5_1.5	Air Rotary from 1.0m due to SSA rejection on unconsolidated rock.
			2		DS			SB5_2.0	
					DS			SB5_2.5	
					DS			SB5_3.0	
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Annex E

Tables

Table 1: Groundwater Gauging Data Table
0086269 - Burrup Nitrates

Monitoring Well	Date	Easting	Northing	TOC (mAHD)	Bore Depth (m ToC)	Depth to Groundwater (m ToC)	Groundwater Elevation (mAHD)
MW1	29-Apr-11	477750.267	7719618.897	9.236	8.735	2.774	6.462
MW1	20-Sep-11	477750.267	7719618.897	9.236	8.725	3.379	5.857
MW1	28-Feb-12	477750.267	7719618.897	9.236	8.725	3.400	5.836
MW2	29-Apr-11	477982.134	7719632.321	6.85	8.210	2.926	3.924
MW2	20-Sep-11	477982.134	7719632.321	6.85	8.195	3.096	3.754
MW2	28-Feb-12	477982.134	7719632.321	6.85	8.195	3.184	3.666
MW3	29-Apr-11	478228.561	7719614.98	4.832	8.200	2.007	2.825
MW3	20-Sep-11	478228.561	7719614.98	4.832	8.185	1.975	2.857
MW3	28-Feb-12	478228.561	7719614.98	4.832	8.185	1.948	2.884
MW4	29-Apr-11	477721.886	7719289.889	3.453	4.780	0.898	2.555
MW4	20-Sep-11	477721.886	7719289.889	3.453	4.675	1.095	2.358
MW4	28-Feb-12	477721.886	7719289.889	3.453	4.675	1.025	2.428
MW5	29-Apr-11	477976.901	7719306.205	2.732	5.100	0.566	2.166
MW5	20-Sep-11	477976.901	7719306.205	2.732	5.040	0.733	1.999
MW5	28-Feb-12	477976.901	7719306.205	2.732	5.04	0.544	2.188

Notes:

TOC - Top of Casing

mAHD - Metres Australian Height Datum

Table 2. Groundwater Field Parameters Table
0086269
Burrup Nitrates

Monitoring Well	Date	Elecctrical Conductivity (uS/cm)	TDS (mg/L) Calculated)	Dissolved Oxygen (mg/L)	pH	Redox (mV)	Temp (oC)	Sample Comments
MW1	29/04/2011	3,100	2,000*	2.43	6.95	-74	31.51	Slightly turbid, no odour, very pale brown
MW1	20/09/2011	2,510	1600	3.3	6.86	146	28.9	Becoming slightly turbid/white at 27 litres
MW1	28/02/2012	2,750	1800	4.67	6.9	153	30.13	Becoming pale brown, slow recharge, dry purched at 33L
MW2	29/04/2011	3,540	2,000*	2.74	7.16	57	31.98	Turbid, pale brown, no odour, moderate recharge, good yield
MW2	20/09/2011	4,160	2400	2.93	6.78	125	29.23	Good yield
MW2	28/02/2012	4,450	2500	2.4	6.83	149	31.52	Clear, colourless, no odour, becomes slightly turbid, pale grey, good recharge
MW3	29/04/2011	16,000	9,800*	2.8	7.3	-100	30.6	Pungent odour (fishy), slightly turbid, grey becoming pale brown, moderate recharge, good yield
MW3	20/09/2011	11,200	6900	2.37	7.22	50	27.18	Good yield
MW3	28/02/2012	13,640	8400	2.68	7.18	83	30.3	Clear, colourless, no odour, becoming slightly turbid, pale brown, good recharge
MW4	29/04/2011	12,160	6,700*	2.23	7.64	125	30.59	Highly turbid, silty, orange, no odour, good recharge/ yield
MW4	21/09/2011	7,660	4200	4.4	7.58	104	27.00	Good yield
MW4	28/02/2012	10,610	5800	2.48	7.5	79	31.8	Clear, colourless, becoming turbid, red-brown. No odour. Becoming very turbid
MW5	29/04/2011	10,000**	130000*	2.12	6.73	237	31.62	Orange, turbid, no odour, moderate recharge
MW5	21/09/2011	10,000**	-	3.82	6.55	270	28.00	Slightly turbid, lightly brown in colour
MW5	28/02/2012	10,000**	-	1.86	6.62	289	32.58	Clear, colourless, becoming turbid, pale brown, no odour.

Note:
* - Laboratory TDS (mg/L)
** - Considered to be erroneous data points based on major ion data. It is likely that the maximum measurable concentration of the probe was exceeded.

Table 3. Groundwater Analytical Summary Table
086269
Burrup Nitrates

					Inorganics																							Lead		
					Alkalinity (Bicarbonate)	Alkalinity (total) as CaCO3	Ammonia	Ammonia as N	Chloride	Fluoride	Hydrogen sulfide	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrate (as NO3-)	Nitrite (as N)	Nitrite (as NO2-)	Nitrogen (Total Oxidised)	Nitrogen (Total)	Reactive Phosphorus as P	Silica (Filtered)	Sodium (Filtered)	Sulphate	Sulphide	TDS	Hardness as CaCO3 (Filtered)	TSS	Lead (Filtered)	Aluminium	Aluminium (Filtered)
					mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL					5	5	0.005	5	1	0.1	0.5	-100	0.05	0.005	0.05	0.005	0.05	0.005	50	0.002	50	0.5	1	0.5	10	5	5	0.001	0.005	0.001
ADW 2004										1.5					50		3						500					0.01		
ANZECC 2000 95%							0.9				0.001				0.7													0.0034		
ANZECC 2000 Marine 95%							0.91																					0.0044		
Field_ID	**LocCode**	**Sampled_Date-Time**	**SampleComments**	**Monitoring_Round**																										
MW1	MW1	30/04/2011			420	350	-	38	780	-	<0.5	-3	-	1.7	-	<0.005	-	1.7	2500	<0.002	30,000	350	170	-	2000	760	-	<0.001	-	0.01
MW1	MW1	20/09/2011			390	320	-	18	710	0.4	-	-6	0.28	-	-	-	-	3.1	3400	0.008	28000	300	150	<0.5	-	-	180	-	1.8	0.002
MW1	MW1	27/02/2012			370	300	<0.005	<5	670	0.5	-	-	0.17	2	8.7	<0.005	<0.05	2	2100	<0.002	29000	340	140	<0.5	-	-	220	-	3.6	0.002
MW2	MW2	30/04/2011			340	280	-	200	930	-	<0.5	1	-	3.3	-	<0.005	-	3.3	3900	0.004	26000	570	170	-	2000	520	-	<0.001	-	0.005
MW2	MW2	20/09/2011			350	290	-	<5	1200	0.6	-	-3	0.2	-	-	-	-	1.2	1400	0.004	24000	610	210	<0.5	-	-	190	-	4.2	0.002
MW2	MW2	27/02/2012			370	300	0.036	30	1400	0.7	-	-	0.26	0.62	2.7	<0.005	<0.05	0.62	880	<0.002	24000	1000	220	<0.5	-	-	84	-	3.6	0.005
MW3	MW3	30/04/2011			490	400	-	54	5400	-	<0.5	1	-	1.9	-	<0.005	-	1.9	2600	0.003	34000	3400	800	-	9800	1500	-	<0.005	-	0.013
MW3	MW3	20/09/2011			530	450	-	57	3700	1.4	-	2	0.18	-	-	-	-	0.033	220	0.006	32000	2500	810	<0.5	-	-	280	-	5.8	0.019
MW3	MW3	27/02/2012			560	460	<0.005	<5	4000	1.5	-	-	0.29	0.32	1.4	<0.005	<0.05	0.32	610	<0.002	33000	3200	940	<0.5	-	-	230	-	6.5	0.005
MW4	MW4	30/04/2011			630	510	-	740	3900	-	<0.5	0	-	0.82	-	<0.005	-	0.82	2100	0.008	19000	2700	350	-	6700	520	-	<0.005	-	<0.005
MW4	MW4	21/09/2011			420	370	-	18	2500	0.7	-	1	0.31	-	-	-	-	0.24	540	0.009	16000	1800	280	<0.5	-	-	670	-	21	<0.005
MW4	MW4	28/02/2012			480	390	<0.005	<5	3200	0.6	-	-	0.59	0.17	0.74	<0.005	<0.05	0.17	760	0.007	19000	2700	410	<0.5	-	-	1900	-	82	<0.005
MW5	MW5	30/04/2011			450	370	-	56	87000	-	<0.5	-1	-	1.1	-	<0.005	-	1.1	5100	0.007	10000	48000	5200	-	130000	19000	-	<0.05	-	<0.05
MW5	MW5	21/09/2011			250	210	-	47	87000	0.3	-	0	2.7	-	-	-	-	0.02	2700	0.01	9900	48000	4100	<0.5	-	-	1100	-	11	<0.1
MW5	MW5	28/02/2012			180	150	<0.005	<5	80000	0.4	-	-	2.2	1.2	5.5	<0.005	<0.05	1.2	3400	0.006	9800	57000	4400	<0.5	-	-	1400	-	18	<0.1

Statistical Summary

Number of Results	15	15	5	15	15	10	5	10	10	10	5	10	5	15	15	15	15	15	15	10	5	5	10	5	10	15
Number of Detects	15	15	1	10	15	10	0	10	10	10	5	0	0	15	15	11	15	15	15	0	5	5	10	0	10	9
Minimum Concentration	180	150	<0.005	<5	670	0.3	<0.5	-6	0.17	0.17	0.74	<0.005	<0.05	0.02	220	<0.002	9800	300	140	<0.5	2000	520	84	<0.001	1.8	0.002
Minimum Detect	180	150	0.036	18	670	0.3	ND	ND	0.17	0.17	0.74	ND	ND	0.02	220	0.003	9800	300	140	ND	2000	520	84	ND	1.8	0.002
Maximum Concentration	630	510	0.036	740	87,000	1.5	<0.5	2	2.7	3.3	8.7	<0.005	<0.05	3.3	5100	0.01	34,000	57,000	5200	<0.5	130,000	19,000	1900	<0.05	82	<0.1
Maximum Detect	630	510	0.036	740	87,000	1.5	ND	2	2.7	3.3	8.7	ND	ND	3.3	5100	0.01	34,000	57,000	5200	ND	130,000	19,000	1900	ND	82	0.019
Average Concentration	415	343	0.0092	85	18,826	0.71	0.25	-0.8	0.72	1.3	3.8	0.0025	0.025	1.2	2147	0.0051	22,913	11,498	1223	0.25	30,100	4460	625	0.0062	16	0.013
Median Concentration	420	350	0.0025	30	3200	0.6	0.25	0	0.285	1.15	2.7	0.0025	0.025	1.1	2100	0.006	24,000	2500	350	0.25	6700	760	255	0.0025	6.15	0.005
Standard Deviation	116	95	0.015	188	34,141	0.41	0	2.5	0.93	0.94	3.3	0	0	1	1422	0.0032	8530	20,567	1763	0	55,944	8138	630	0.011	24	0.017
Number of Guideline Exceedances	0	0	0	0	0	1	5	0	0	0	5	0	0	0	0	0	0	0	6	0	0	0	0	3	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	1	0	0	0	0	5	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0

Comments

#1 ESDAT Combined with Non-Detect Multiplier of 0.5.

#2 ESDAT Combined.

Table 3. Groundwater Analytical Summary Table
086269
Burrup Nitrates

					Metals																	Organic	TPH				
					Arsenic (Filtered)	**Cadmium (Filtered)**	**Calcium (Filtered)**	**Chromium (hexavalent)**	**Chromium (III+VI) (Filtered)**	**Chromium (Trivalent)**	**Iron**	**Iron (Filtered)**	**Magnesium (Filtered)**	**Manganese (Filtered)**	**Mercury**	**Nickel (Filtered)**	**Phosphorus**	**Potassium (Filtered)**	**Selenium (Filtered)**	**Silicon (Filtered)**	**Zinc (Filtered)**	**Alkalinity (Carbonate)**	**C6 - C9**	**C10 - C14**	**C15 - C28**	**C29-C36**	**+C10 - C36 (Sum of total)**
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.001	0.0001	0.2	0.002	0.001	0.005	0.005	0.005	0.1	0.001	0.00005	0.001	0.01	0.1	0.002	20	0.001	1	40	50	200	200	
ADW 2004					0.007	0.002		0.05						0.5	0.001	0.02			0.01								
ANZECC 2000 95%						0.0002		0.001						1.9	0.0006	0.011			0.011		0.008						
ANZECC 2000 Marine 95%						0.0055		0.0044		0.0274					0.0004	0.07					0.015						
Field_ID	**LocCode**	**Sampled_Date-Time**	**SampleComments**	**Monitoring_Round**																							
MW1	MW1	30/04/2011			<0.001	<0.0001	200	<0.002	<0.001	<0.005	-	0.008	63	0.17	<0.00005	-	0.06	10	<0.002	14,000	0.016	<1	<40	<50	<200	<200	<450[#2]
MW1	MW1	20/09/2011			<0.001	<0.0001	170	-	<0.001	-	1.8	<0.005	54	0.046	-	<0.001	0.05	7.9	<0.002	13000	0.027	<1	-	-	-	-	-
MW1	MW1	27/02/2012			<0.001	<0.0001	180	-	<0.001	-	4.2	<0.005	53	0.088	-	<0.001	0.08	7.7	<0.002	-	0.038	<1	-	-	-	-	-
MW2	MW2	30/04/2011			<0.001	<0.0001	99	<0.002	<0.001	<0.005	-	<0.005	66	<0.005 - 0.005	<0.00005	-	0.09	19	0.003	12000	0.013	<1	<40	<50	<200	<200	<450[#2]
MW2	MW2	20/09/2011			<0.001	<0.0001	150	-	<0.001	-	6	<0.005	98	0.001	-	<0.001	0.06	20	<0.002	11000	0.021	<1	-	-	-	-	-
MW2	MW2	27/02/2012			<0.001	<0.0001	240	-	<0.001	-	4.6	0.24	140	0.22	-	<0.001	0.03	24	<0.002	-	0.047	<1	-	-	-	-	-
MW3	MW3	30/04/2011			<0.005	<0.0005	120	<0.002	<0.005	<0.005	-	<0.025	300	0.02 - 0.022	<0.00005	-	0.16	130	<0.01	16000	0.02	<1	<40	<50	<200	<200	<450[#2]
MW3	MW3	20/09/2011			<0.005	<0.0005	85	-	<0.005	-	7.4	<0.025	210	0.014	-	<0.005	0.05	90	<0.01	15000	0.047	8	-	-	-	-	-
MW3	MW3	27/02/2012			<0.005	<0.0005	95	-	<0.005	-	6.8	<0.025	210	0.026	-	<0.005	0.05	120	<0.01	-	0.032	<1	-	-	-	-	-
MW4	MW4	30/04/2011			<0.005	<0.0005	39	<0.002	<0.005	<0.005	-	<0.025	100	0.013 - 0.014	<0.00005	-	0.79	110	<0.01	8700	0.01	<1	<40	<50	<200	<200	<450[#2]
MW4	MW4	21/09/2011			<0.005	<0.0005	28	-	<0.005	-	31	<0.025	68	0.011	-	<0.005	0.14	69	<0.01	7500	0.029	12	-	-	-	-	-
MW4	MW4	28/02/2012			<0.005	<0.0005	49	-	<0.005	-	130	<0.025	96	0.033	-	<0.005	0.48	110	<0.01	-	0.047	<1	-	-	-	-	-
MW5	MW5	30/04/2011			<0.05	<0.005	1000	0.01	<0.05	<0.005	-	<0.25	4100	0.2 - 0.22	0.00011	-	0.11	1900	<0.1	4900	<0.05	<1	<40	81	<200	<200	281[#1]
MW5	MW5	21/09/2011			<0.1	<0.01	1100	-	<0.1	-	12	<0.5	4300	<0.1	-	<0.1	0.04	1700	<0.2	4600	<0.1	<1	-	-	-	-	-
MW5	MW5	28/02/2012			<0.1	<0.01	1100	-	<0.1	-	25	<0.5	4700	<0.1	-	<0.1	0.21	2100	<0.2	-	<0.1	<1	-	-	-	-	-

Statistical Summary

	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (hexavalent)	Chromium (III+VI) (Filtered)	Chromium (Trivalent)	Iron	Iron (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury	Nickel (Filtered)	Phosphorus	Potassium (Filtered)	Selenium (Filtered)	Silicon (Filtered)	Zinc (Filtered)	Alkalinity (Carbonate)	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)
Number of Results	15	15	15	5	15	5	10	15	15	15	5	10	15	15	15	10	15	15	5	5	5	5	5
Number of Detects	0	0	15	1	0	0	10	2	15	13	1	0	15	15	1	10	12	2	0	1	0	0	1
Minimum Concentration	<0.001	<0.0001	28	<0.002	<0.001	<0.005	1.8	<0.005	53	0.001	<0.00005	<0.001	0.03	7.7	<0.002	4600	0.01	<1	<40	<50	<200	<200	281
Minimum Detect	ND	ND	28	0.01	ND	ND	1.8	0.008	53	0.001	0.00011	ND	0.03	7.7	0.003	4600	0.01	8	ND	81	ND	ND	281
Maximum Concentration	<0.1	<0.01	1100	0.01	<0.1	<0.005	130	<0.5	4700	0.22	0.00011	<0.1	0.79	2100	<0.2	16,000	<0.1	12	<40	81	<200	<200	<450
Maximum Detect	ND	ND	1100	0.01	ND	ND	130	0.24	4700	0.22	0.00011	ND	0.79	2100	0.003	16,000	0.047	12	ND	81	ND	ND	281
Average Concentration	0.0095	0.00095	310	0.0028	0.0095	0.0025	23	0.064	971	0.064	0.000042	0.011	0.16	428	0.019	10,670	0.031	1.8	20	36	100	100	236
Median Concentration	0.0025	0.00025	150	0.001	0.0025	0.0025	7.1	0.0125	100	0.033	0.000025	0.0025	0.08	90	0.005	11,500	0.029	0.5	20	25	100	100	225
Standard Deviation	0.018	0.0018	397	0.004	0.018	0	39	0.099	1763	0.075	0.000038	0.02	0.21	767	0.035	4077	0.014	3.4	0	25	0	0	25
Number of Guideline Exceedances	3	9	0	5	0	0	0	0	0	0	0	2	0	0	3	0	15	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0

Comments

#1 ESDAT Combined with Non-Detect Multiplier of 0.5.

#2 ESDAT Combined.

Table 4. QAQC Rinsate and Trip Blank Samples 0086269
Burrup Nitrate

			SDG	PE057307-1	PE057307-1	PE060993-1	PE060993-1	PE060993-1	PE065491-1	PE065491-1
			Field_ID	RIN 1	Trip Blank	RIN01	TRIP01	TRIP02	RIN01	TRIP01
			Sample Date	30-Apr-11	30-Apr-11	21-Sep-11	21-Sep-11	21-Sep-11	28-Feb-12	28-Feb-12
			Sample_Type	Rinsate	Trip_B	Rinsate	Trip_B	Trip_B	Rinsate	Trip_B
Chem_Group	**ChemName**	**Units**	**LOR**							
	Acidity	mg/L	5							
BTEX	Benzene	µg/L	0.5				<0.5	<0.5		<0.5
	Toluene	µg/L	0.5				**0.6**	<0.5		<0.5
	Ethylbenzene	µg/L	0.5				<0.5	<0.5		<0.5
	Xylene (m & p)	µg/L	1				<1	<1		<1
	Xylene (o)	µg/L	0.5				<0.5	<0.5		<0.5
Inorganics	Alkalinity (Bicarbonate)	mg/l	5			<5			<5	
	Alkalinity (Hydroxide)	mg/l	5							
	Alkalinity (total) as CaCO3	mg/l	5			<5			<5	
	Ammonia	mg/l	0.005							
	Ammonia as N	µg/l	5							
	Chloride	mg/l	1			<1			<1	
	Fluoride	mg/l	0.1							
	Hydrogen sulfide	mg/l	0.5							
	Kjeldahl Nitrogen Total	mg/l	0.05							
	Nitrate (as N)	mg/l	0.005							
	Nitrate (as NO3-)	mg/l	0.05							
	Nitrite (as N)	mg/l	0.005							
	Nitrite (as NO2-)	mg/l	0.05							
	Nitrogen (Total Oxidised)	mg/l	0.005							
	Nitrogen (Total)	µg/l	50							
	Reactive Phosphorus as P	mg/l	0.002							
	Silica (Filtered)	µg/l	50							
	Sodium (Filtered)	mg/l	0.5			<0.5			**2**	
	Sulphate	mg/l	1			<1			<1	
	Sulphide	mg/l	0.5							
	TDS	mg/l	10							
	Hardness as CaCO3 (Filtered)	mg/L	5							
	TSS	mg/l	5							
Lead	Lead (Filtered)	mg/l	0.000001	<0.001	<0.001	<0.001			<0.001	
Metals	Aluminium	mg/l	0.005							
	Aluminium (Filtered)	mg/l	0.000001	**0.002**	<0.001					
	Arsenic (Filtered)	mg/l	0.000001	<0.001	<0.001	<0.001			<0.001	
	Cadmium (Filtered)	mg/l	0.0001	<0.0001	<0.0001	<0.0001			<0.0001	
	Calcium (Filtered)	mg/l	0.2			<0.2			<0.2	
	Chromium (hexavalent)	mg/l	0.002							
	Chromium (III+VI) (Filtered)	mg/l	0.000001	<0.001	<0.001	<0.001			<0.001	
	Chromium (Trivalent)	mg/l	0.005							
	Copper (Filtered)	mg/l	0.000001			<0.001			<0.001	
	Iron	mg/l	0.005							
	Iron (Filtered)	mg/l	0.000005	<0.005	<0.005					
	Magnesium (Filtered)	mg/l	0.1			<0.1			**0.1**	
	Manganese (Filtered)	mg/l	0.000001	<0.001	<0.001					
	Mercury	mg/l	0.00005	<0.00005	<0.00005				<0.0001	
	Nickel (Filtered)	mg/l	0.000001			<0.001			<0.001	
	Phosphorus	mg/l	0.01							
	Potassium (Filtered)	mg/l	0.1			<0.1			<0.1	
	Selenium (Filtered)	mg/l	0.002	<0.002	<0.002					
	Silicon (Filtered)	µg/l	20							
	Zinc (Filtered)	mg/l	0.000001	**0.009**	**0.012**	**0.005**			**0.007**	
Organic	Alkalinity (Carbonate)	mg/l	1			<1			<1	
Solvents	MTBE	mg/l	0.0005							<0.0005
TPH	C6 - C9	µg/L	40	<40	<40		<40	<40		<50
	C10 - C14	µg/L	50							
	C15 - C28	µg/L	200							
	C29-C36	µg/L	200							

Table 5. QAQC Duplicate Samples
0086269
Burrup Nitrate

			SDG	PE057307-1	PE057307-1		PE060993-1	PE060993-1		PE065491-1	PE065491-1	
			Field_ID	MW1	DUP01	**RPD**	MW5	DUP01	**RPD**	MW5	DUP01	**RPD**
			Sample Date	30-Apr-11	30-Apr-11		21-Sep-11	21-Sep-11		28-Feb-12	28-Feb-12	
Chem_Group	**ChemName**	**Units**	**LOR**									
	Acidity	mg/L	5				**55.0**	**55.0**	**0**	**180.0**	**180.0**	**0**
Inorganics	Alkalinity (Bicarbonate)	mg/l	5	**420.0**	**380.0**	**10**	**250.0**	**270.0**	**8**	**180.0**	**200.0**	**11**
	Alkalinity (total) as CaCO3	mg/l	5	**350.0**	**310.0**	**12**	**210.0**	**220.0**	**5**	**150.0**	**170.0**	**13**
	Ammonia	mg/l	0.005							<0.005	<0.005	~
	Ammonia as N	µg/l	5	**38.0**	**47.0**	**21**	**47.0**	**42.0**	**11**	<5.0	<5.0	~
	Chloride	mg/l	1	**780.0**	**800.0**	**3**	**87000.0**	**87000.0**	**0**	**80000.0**	**81000.0**	**1**
	Fluoride	mg/l	0.1				**0.3**	**0.3**	**0**	**0.4**	**0.4**	**0**
	Hydrogen sulfide	mg/l	0.5	<0.5	<0.5	~						
	Kjeldahl Nitrogen Total	mg/l	0.05				**2.7**	**2.7**	**0**	**2.2**	**3.3**	**40**
	Nitrate (as N)	mg/l	0.005	**1.7**	**1.4**	**19**				**1.2**	**1.2**	**0**
	Nitrate (as NO3-)	mg/l	0.05							**5.5**	**5.5**	**0**
	Nitrite (as N)	mg/l	0.005	<0.005	<0.005	~				<0.005	<0.005	~
	Nitrite (as NO2-)	mg/l	0.05							<0.05	<0.05	~
	Nitrogen (Total Oxidised)	mg/l	0.005	**1.7**	**1.4**	**19**	**0.02**	**0.02**	**0**	**1.2**	**1.2**	**0**
	Nitrogen (Total)	µg/l	50	**2500.0**	**2000.0**	**22**	**2700.0**	**2700.0**	**0**	**3400.0**	**4500.0**	**28**
	Reactive Phosphorus as P	mg/l	0.002	<0.002	<0.002	~	**0.01**	**0.009**	**11**	**0.006**	**0.008**	**29**
	Silica (Filtered)	µg/l	50	**30000.0**	**31000.0**	**3**				**9800.0**	**9800.0**	**0**
	Silica (Filtered)	µg/l	1000				**9900.0**	**9700.0**	**2**			
	Sodium (Filtered)	mg/l	10				**48000.0**	**48000.0**	**0**			
	Sodium (Filtered)	mg/l	0.5	**350.0**	**390.0**	**11**				**57000.0**	**52000.0**	**9**
	Sulphate	mg/l	1	**170.0**	**170.0**	**0**	**4100.0**	**5000.0**	**20**	**4400.0**	**4600.0**	**4**
	Sulphide	mg/l	0.5				<0.5	<0.5	~	<0.5	<0.5	~
	TDS	mg/l	10	**2000.0**	**2000.0**	**0**						
	Hardness as CaCO3 (Filtered)	mg/L	5	**760.0**	**730.0**	**4**						
	TSS	mg/l	5				**1100.0**	**1000.0**	**10**	**1400.0**	**2200.0**	**44**
Lead	Lead (Filtered)	mg/l	0.001	<0.001	<0.001	~						
Metals	Aluminium (Filtered)	mg/l	0.1				<0.1	<0.1	~	<0.1	<0.1	~
	Aluminium (Filtered)	mg/l	0.001	**0.01**	**0.009**	**11**						
	Aluminium	mg/l	0.5							**18.0**	**18.0**	**0**
	Aluminium	mg/l	0.02				**11.0**	**11.0**	**0**			
	Arsenic (Filtered)	mg/l	0.1				<0.1	<0.1	~	<0.1	<0.1	~
	Arsenic (Filtered)	mg/l	0.001	<0.001	<0.001	~						
	Cadmium (Filtered)	mg/l	0.01				<0.01	<0.01	~	<0.01	<0.01	~
	Cadmium (Filtered)	mg/l	0.0001	<0.0001	<0.0001	~						
	Calcium (Filtered)	mg/l	4				**1100.0**	**1100.0**	**0**			
	Calcium (Filtered)	mg/l	0.2	**200.0**	**190.0**	**5**				**1100.0**	**1000.0**	**10**
	Chromium (hexavalent)	mg/l	0.002	<0.002	<0.002	~						
	Chromium (III+VI) (Filtered)	mg/l	0.1				<0.1	<0.1	~	<0.1	<0.1	~
	Chromium (III+VI) (Filtered)	mg/l	0.001	<0.001	<0.001	~						
	Chromium (Trivalent)	mg/l	0.005	<0.005	<0.005	~						
	Iron (Filtered)	mg/l	0.5				<0.5	<0.5	~	<0.5	<0.5	~
	Iron (Filtered)	mg/l	0.005	**0.008**	**0.008**	**0**						
	Iron	mg/l	0.5							**25.0**	**23.0**	**8**
	Iron	mg/l	0.02				**12.0**	**13.0**	**8**			
	Magnesium (Filtered)	mg/l	2				**4300.0**	**4300.0**	**0**			
	Magnesium (Filtered)	mg/l	0.1	**63.0**	**62.0**	**2**				**4700.0**	**4300.0**	**9**
	Manganese (Filtered)	mg/l	0.1				<0.1	<0.1	~	<0.1	<0.1	~
	Manganese (Filtered)	mg/l	0.005	**0.17**	**0.18**	**6**						
	Manganese (Filtered)	mg/l	0.001	**0.17**	**0.19**	**11**						
	Mercury	mg/l	0.00005	<0.0001	<0.0001	~						
	Nickel (Filtered)	mg/l	0.1				<0.1	<0.1	~	<0.1	<0.1	~
	Phosphorus	mg/l	0.01	**0.06**	**0.05**	**18**	**0.04**	**0.04**	**0**	**0.21**	**0.25**	**17**
	Potassium (Filtered)	mg/l	2				**1700.0**	**1700.0**	**0**			
	Potassium (Filtered)	mg/l	0.1	**10.0**	**10.0**	**0**				**2100.0**	**2000.0**	**5**
	Selenium (Filtered)	mg/l	0.2				<0.2	<0.2	~	<0.2	<0.2	~
	Selenium (Filtered)	mg/l	0.002	<0.002	<0.002	~						
	Silicon (Filtered)	µg/l	400				**4600.0**	**4500.0**	**2**			
	Silicon (Filtered)	µg/l	20	**14000.0**	**14000.0**	**0**						
	Zinc (Filtered)	mg/l	0.1				<0.1	<0.1	~	<0.1	<0.1	~
	Zinc (Filtered)	mg/l	0.001	**0.016**	**0.02**	**22**						
Organic	Alkalinity (Carbonate)	mg/l	1	<1.0	<1.0	~	<1.0	<1.0	~	<1.0	<1.0	~
TPH	C6 - C9	µg/L	40	<40.0	<40.0	~						
	C10 - C14	µg/L	50	<50.0	<50.0	~						
	C15 - C28	µg/L	200	<200.0	<200.0	~						
	C29-C36	µg/L	200	<200.0	<200.0	~						

*RPDs have only been considered where the concentrations of both the primary and duplicate sample are greater than the laboratory LOR

**RPD values that exceed the adopted assessment criteria of 30% have been shaded in grey

Annex F

Laboratory Data

ANALYTICAL REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Brent Carter	Manager	Said Hirad
Client	ERM Australia Pty Ltd	Laboratory	SGS Newburn Environmental
Address	PO Box 7338 Cloisters Square PERTH WA 6850	Address	10 Reid Rd Newburn WA 6105
Telephone	08 9321 5200	Telephone	(08) 9373 3500
Facsimile	08 9321 5262	Facsimile	(08) 9373 3556
Email	brent.carter@erm.com	Email	au.environmental.perth@sgs.com
Project	**0086269 Burrup TANPF Dampier**	SGS Reference	PE057307 R0
Order Number	**A06631**	Report Number	0000019717
Samples	8	Date Reported	17 May 2011
		Date Received	02 May 2011

COMMENTS

The document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Samples `MW3`, `MW4` and `MW5` were diluted due to high conductivity for metals. Hence the LORs were raised for these samples.

Samples received outside recommended technical holding times for Alkalinity and Hexavalent Chromium.

SIGNATORIES

Hue Thanh Ly
Spectroscopy Chemist

Jeremy Truong
Inorganics Co-ordinator

Pamela Adams
Organic Team Leader

Said Hirad
Laboratory Manager

		Sample Number	PE057307.001	PE057307.002	PE057307.003	PE057307.004	PE057307.005
		Sample Matrix	Water	Water	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	MW1	MW2	MW3	MW4	MW5
Parameter	**Units**	**LOR**					
Total Dissolved Solids (TDS) in water Method: AN113							
Total Dissolved Solids Dried at 180°C	mg/L	10	2000	2000	9800	6700	130000
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5	350	280	400	510	370
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as HCO3	mg/L	5	420	340	490	630	450
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1	780	930	5400	3900	87000
Sulphate in water Method: AN275							
Sulphate	mg/L	1	170	170	800	350	5200
Sulphide by Titration in Water Method: AN149							
Hydrogen Sulphide at 20 C	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Filterable Reactive Phosphorus (FRP) Method: AN278							
Filterable Reactive Phosphorus	mg/L	0.002	<0.002	0.004	0.003	0.008	0.007
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293							
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.06	0.09	0.16	0.79	0.11
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	1.7	3.3	1.9	0.82	1.1
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate Nitrogen, NO_3 as N	mg/L	0.005	1.7	3.3	1.9	0.82	1.1
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281							
Total Nitrogen (calc)	mg/L	0.05	2.5	3.9	2.6	2.1	5.1
Low Level Ammonia Nitrogen by FIA Method: AN261							
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.038	0.20	0.054	0.74	0.056
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321							
Calcium, Ca	mg/L	0.2	200	99	120	39	1000
Magnesium, Mg	mg/L	0.1	63	66	300	100	4100
Manganese, Mn	mg/L	0.005	0.17	<0.005	0.020	0.014	0.20
Potassium, K	mg/L	0.1	10	19	130	110	1900
Silica, Soluble	mg/L	0.05	30	26	34	19	10
Silicon, Si	mg/L	0.02	14	12	16	8.7	4.9
Sodium, Na	mg/L	0.5	350	570	3400	2700	48000
Hardness by Calculation	mg CaCO3/L	5	760	520	1500	520	19000

Parameter	Units	LOR					
		Sample Number	PE057307.001	PE057307.002	PE057307.003	PE057307.004	PE057307.005
		Sample Matrix	Water	Water	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	MW1	MW2	MW3	MW4	MW5

Trace Metals (Dissolved) in Water by ICPMS   Method: AN318

Aluminium, Al	µg/L	1	**10**	**5**	**13**	<5↑	<50↑
Arsenic, As	µg/L	1	<1	<1	<5↑	<5↑	<50↑
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.5↑	<0.5↑	<5.0↑
Chromium, Cr	µg/L	1	<1	<1	<5↑	<5↑	<50↑
Iron, Fe	µg/L	5	**8**	<5	<25↑	<25↑	<250↑
Lead, Pb	µg/L	1	<1	<1	<5↑	<5↑	<50↑
Manganese, Mn	µg/L	1	**170**	**5**	**22**	**13**	**220**
Selenium, Se	µg/L	2	<2	**3**	<10↑	<10↑	<100↑
Zinc, Zn	µg/L	1	**16**	**13**	**20**	**10**	<50↑

Mercury (dissolved) in Water   Method: AN311/AN312

Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	**0.00011**

Hexavalent Chromium in water by Discrete Analyser   Method: AN283

Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	**0.010**
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Calculation of Anion-Cation Balance (SAR Calc)   Method: AN121

Sum of Ions*	mg/L	-	**1920**	**2120**	**10600**	**7710**	**148000**
Anion-Cation Balance	%	-100	**-3**	**1**	**1**	**0**	**-1**

Volatile Petroleum Hydrocarbons in Water   Method: AN433/AN434

TRH C6-C9	µg/L	40	<40	<40	<40	<40	<40

Surrogates

Dibromofluoromethane (Surrogate)	%	-	**103**	**107**	**103**	**102**	**106**
d4-1,2-dichloroethane (Surrogate)	%	-	**104**	**119**	**112**	**100**	**109**
d8-toluene (Surrogate)	%	-	**102**	**104**	**101**	**98**	**96**
Bromofluorobenzene (Surrogate)	%	-	**104**	**109**	**99**	**97**	**99**

TRH (Total Recoverable Hydrocarbons) in Water   Method: AN403

TRH C10-C14	µg/L	50	<50	<50	<50	<50	**81**
TRH C15-C28	µg/L	200	<200	<200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200	<200

Surrogates

TRH (Surrogate)	%	-	**75**	**76**	**82**	**75**	**93**

		Sample Number	PE057307.006	PE057307.007	PE057307.008
		Sample Matrix	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	DUP01	Trip Blank	RIN 1
Parameter	Units	LOR			

Total Dissolved Solids (TDS) in water Method: AN113

Total Dissolved Solids Dried at 180°C	mg/L	10	**2000**	-	-

Alkalinity Method: AN135

Total Alkalinity as CaCO3	mg/L	5	**310**	-	-
Carbonate Alkalinity as CO3	mg/L	1	<1	-	-
Bicarbonate Alkalinity as HCO3	mg/L	5	**380**	-	-

Chloride by Discrete Analyser in Water Method: AN274

Chloride	mg/L	1	**800**	-	-

Sulphate in water Method: AN275

Sulphate	mg/L	1	**170**	-	-

Sulphide by Titration in Water Method: AN149

Hydrogen Sulphide at 20 C	mg/L	0.5	<0.5	-	-

Filterable Reactive Phosphorus (FRP) Method: AN278

Filterable Reactive Phosphorus	mg/L	0.002	<0.002	-	-

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	**0.05**	-	-

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**1.4**	-	-
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	-	-
Nitrate Nitrogen, NO_3 as N	mg/L	0.005	**1.4**	-	-

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Total Nitrogen (calc)	mg/L	0.05	**2.0**	-	-

Low Level Ammonia Nitrogen by FIA Method: AN261

Ammonia Nitrogen, NH_3 as N	mg/L	0.005	**0.047**	-	-

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Calcium, Ca	mg/L	0.2	**190**	-	-
Magnesium, Mg	mg/L	0.1	**62**	-	-
Manganese, Mn	mg/L	0.005	**0.18**	-	-
Potassium, K	mg/L	0.1	**10**	-	-
Silica, Soluble	mg/L	0.05	**31**	-	-
Silicon, Si	mg/L	0.02	**14**	-	-
Sodium, Na	mg/L	0.5	**390**	-	-
Hardness by Calculation	mg CaCO3/L	5	**730**	-	-

		Sample Number	PE057307.006	PE057307.007	PE057307.008
		Sample Matrix	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	DUP01	Trip Blank	RIN 1
Parameter	Units	LOR			

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Aluminium, Al	µg/L	1	**9**	<1	**2**
Arsenic, As	µg/L	1	<1	<1	<1
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	<1	<1	<1
Iron, Fe	µg/L	5	**8**	<5	<5
Lead, Pb	µg/L	1	<1	<1	<1
Manganese, Mn	µg/L	1	**190**	<1	<1
Selenium, Se	µg/L	2	<2	<2	<2
Zinc, Zn	µg/L	1	**20**	**12**	**9**

Mercury (dissolved) in Water Method: AN311/AN312

Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005

Hexavalent Chromium in water by Discrete Analyser Method: AN283

Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002	-	-
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	-	-

Calculation of Anion-Cation Balance (SAR Calc) Method: AN121

Sum of Ions*	mg/L	-	**1930**	-	-
Anion-Cation Balance	%	-100	**-1**	-	-

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

TRH C6-C9	µg/L	40	<40	<40	<40

Surrogates

Dibromofluoromethane (Surrogate)	%	-	**103**	**104**	**107**
d4-1,2-dichloroethane (Surrogate)	%	-	**100**	**105**	**108**
d8-toluene (Surrogate)	%	-	**95**	**98**	**97**
Bromofluorobenzene (Surrogate)	%	-	**98**	**100**	**97**

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403

TRH C10-C14	µg/L	50	<50	-	-
TRH C15-C28	µg/L	200	<200	-	-
TRH C29-C36	µg/L	200	<200	-	-

Surrogates

TRH (Surrogate)	%	-	**74**	-	-

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB018729	mg/L	5	<5	0 - 3%	110%
Carbonate Alkalinity as CO3	LB018729	mg/L	1	<1		
Bicarbonate Alkalinity as HCO3	LB018729	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Chloride	LB018886	mg/L	1	<1	0 - 2%	104 - 105%	110 - 119%

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Filterable Reactive Phosphorus	LB018710	mg/L	0.002	<0.002	2 - 4%	105%	103%

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Hexavalent Chromium, Cr6+	LB018860	mg/L	0.002	<0.002	0%	110%	114%
Trivalent Chromium, Cr3+	LB018860	mg/L	0.005	<0.005	0%		

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Ammonia Nitrogen, NH_3 as N	LB018769	mg/L	0.005	<0.005	0 - 2%	95 - 97%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB018744	mg/L	0.00005	<0.00005	0%	103%	103%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB018752	mg/L	0.2	<0.2	1%	101%	81%
Magnesium, Mg	LB018752	mg/L	0.1	<0.1	1%	106%	93%
Manganese, Mn	LB018752	mg/L	0.005	<0.005	0%	102%	93%
Potassium, K	LB018752	mg/L	0.1	<0.1	0%	114%	101%
Silica, Soluble	LB018752	mg/L	0.05	<0.05			
Silicon, Si	LB018752	mg/L	0.02	<0.02	1%	117%	81%
Sodium, Na	LB018752	mg/L	0.5	<0.5	0%	107%	95%
Hardness by Calculation	LB018752	mg	5	<5			

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB018769	mg/L	0.005	<0.005	1 - 2%	97 - 100%
Nitrite Nitrogen, NO_2 as N	LB018769	mg/L	0.005	<0.005	0 - 17%	99 - 105%
Nitrate Nitrogen, NO_3 as N	LB018769	mg/L	0.005	<0.005		

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Sulphate in water Method: ME-(AU)-[ENV]AN275

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sulphate	LB018886	mg/L	1	<1	2 - 8%	97 - 99%	NA

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Nitrogen (calc)	LB018702	mg/L	0.05	<0.05	15%	NA

Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Dissolved Solids Dried at 180°C	LB018766	mg/L	10	<10	0 - 5%	99%
	LB018911	mg/L	10	<10	0 - 1%	88 - 89%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB018702	mg/L	0.01	<0.01	4 - 18%	80%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB018757	µg/L	1	<1		114%	114%
Arsenic, As	LB018757	µg/L	1	<1	0 - 4%	114%	111%
Cadmium, Cd	LB018757	µg/L	0.1	<0.1		109%	102%
Chromium, Cr	LB018757	µg/L	1	<1		114%	115%
Iron, Fe	LB018757	µg/L	5	<5		101%	119%
Lead, Pb	LB018757	µg/L	1	<1	11 - 175%	107%	107%
Manganese, Mn	LB018757	µg/L	1	<1		117%	56%
Selenium, Se	LB018757	µg/L	2	<2	3%	110%	96%
Zinc, Zn	LB018757	µg/L	1	<1		101%	88%

TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C10-C14	LB018780	µg/L	50	<50	95%
TRH C15-C28	LB018780	µg/L	200	<200	110%
TRH C29-C36	LB018780	µg/L	200	<200	114%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH (Surrogate)	LB018780	%	-	88%	91%

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C6-C9	LB018699	µg/L	40	<40	99%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Dibromofluoromethane (Surrogate)	LB018699	%	-	96%	101%
d4-1,2-dichloroethane (Surrogate)	LB018699	%	-	99%	109%
d8-toluene (Surrogate)	LB018699	%	-	96%	102%
Bromofluorobenzene (Surrogate)	LB018699	%	-	93%	106%

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN075	This method uses an alkaline digestion to solubilise both water-soluble and waterinsoluble forms of hexavalent chromium in solids. The solution is then pH adjusted and the hexavalent chromium concentration in solution determined colourimetrically. Please refer to method AN283. The addition of magnesium chloride in a phosphate buffer at the digestion stage assists with preventing oxidation of trivalent chromium to hexavalent chromium.
AN083	Separatory funnels are used for aqueous samples and extracted by transferring an appropriate volume (mass) of liquid into a separatory funnel and adding 3 serial aliquots of dichloromethane. Samples receive a single extraction at pH 7 to recover base / neutral analytes and two extractions at pH < 2 to recover acidic analytes. QC samples are prepared by spiking organic free water with target analytes and extracting as per samples.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN149	Sulphide by Iodometric Titration: Sulphide is precipitated as zinc sulphide to overcome interferences with sulphite and thiosulphate. After filtration, sulphide is determined titrimetrically. Reference APHA 4500-S2-
AN258	Nitrate and Nitrite by FIA: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN261	Ammonia by Continuous Flow Analyser: Ammonium in a basic medium forms ammonia gas, which is separated from the sample matrix by diffusion through a polypropylene membrane. The ammonia is reacted with phenol and hypochlorite to form indophenol blue at an intensity proportional to the ammonia concentration. The blue colour is intensified with sodium nitroprusside and the absorbance measured at 630 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-NH3 H.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN275	Suphate by Aquakem DA: Sulphate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.
AN278	Reactive Phosphorus by Aquakem DA: Orthophosphate reacts with ammonium molybdate (Mo VI) and potassium antimonyl tartrate (Sb III) in acid medium to form an antimony-phosphomolybdate complex. This complex is subsequently reduced with ascorbic acid to form a blue colour and the absorbance is read at 880 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-P F
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the Aquakem 250 discrete analyser for colorimetric analysis.

METHOD	METHODOLOGY SUMMARY
AN283	Hexavalent Chromium via Aquakem DA: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr6+. If total chromium is also measured the trivalent form of chromium Cr3+ can be calculated from the difference (Total Cr - Cr6+). Reference APHA3500CrB.
AN288	Digestion of the sample to convert amino nitrogen present in many organic materials to ammonium sulphate. Free ammonia and ammonium nitrogen also are converted to ammonium sulphate. Colorimetric determination of ammonium nitrogen using the Phenate-Hypochlorite Method (APHA, 2005). Ammonia, phenol and hypochlorite react in an alkaline buffered medium to form a blue coloured compound, indophenol. This reaction is catalysed by sodium nitroprusside. The intensity of the colour development is directly proportional to the concentration of ammonia-nitrogen.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with diffential polarity of the elluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependant on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

IS	Insufficient sample for analysis.	QFH	QC result is above the upper tolerance
LNR	Sample listed, but not received.	QFL	QC result is below the lower tolerance
*	This analysis is not covered by the scope of accreditation.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.		
LOR	Limit of Reporting		
↑↓	Raised or Lowered Limit of Reporting		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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STATEMENT OF QA/QC PERFORMANCE AGAINST DATA QUALITY OBJECTIVES

PE057307 R0

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Brent Carter	Manager	Said Hirad
Client	ERM Australia Pty Ltd	Laboratory	SGS Newburn Environmental
Address	PO Box 7338 Cloisters Square PERTH WA 6850	Address	10 Reid Rd Newburn WA 6105
Telephone	08 9321 5200	Telephone	(08) 9373 3500
Facsimile	08 9321 5262	Facsimile	(08) 9373 3556
Email	brent.carter@erm.com	Email	au.environmental.perth@sgs.com
Project	**0086269 Burrup TANPF Dampier**	SGS Reference	PE057307 R0
Order Number	**A06631**	Report Number	0000019716
Samples	8	Date Reported	17 May 2011

COMMENTS

All the laboratory data for each environmental matrix was compared to the SGS Environmental Services' stated data quality objectives (DQO).
Comments arising from the comparison were made and are reported below.
The data relating to sampling was taken from the chain of custody document and was supplied by the client.
This QA/QC statement must be read in conjunction with the referenced analytical report.
The statement and the analytical report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Alkalinity	6 Items
	Hexavalent Chromium in water by Discrete Analyser	8 Items
Analysis Date	Alkalinity	6 Items
	Hexavalent Chromium in water by Discrete Analyser	8 Items
MS	Trace Metals (Dissolved) in Water by ICPMS	1 Item

SAMPLE SUMMARY

Sample counts by matrix	8 Water	Type of documentation received	COC
Date documentation received	2/5/2011	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	2.5
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	1

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Alkalinity Method: ME-(AU)-[ENV]AN135

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW2	PE057307.002	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW3	PE057307.003	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW4	PE057307.004	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW5	PE057307.005	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
DUP01	PE057307.006	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
DUP01	PE057307.006	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW2	PE057307.002	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW3	PE057307.003	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW4	PE057307.004	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW5	PE057307.005	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
DUP01	PE057307.006	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW2	PE057307.002	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW3	PE057307.003	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW4	PE057307.004	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW5	PE057307.005	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
DUP01	PE057307.006	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
Trip Blank	PE057307.007	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
RIN 1	PE057307.008	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
DUP01	PE057307.006	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW2	PE057307.002	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW3	PE057307.003	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW4	PE057307.004	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW5	PE057307.005	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
DUP01	PE057307.006	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
Trip Blank	PE057307.007	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
RIN 1	PE057307.008	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321								
MW1	PE057307.001	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW2	PE057307.002	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW3	PE057307.003	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW4	PE057307.004	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW5	PE057307.005	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
DUP01	PE057307.006	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
Trip Blank	PE057307.007	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
RIN 1	PE057307.008	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258								
MW1	PE057307.001	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
DUP01	PE057307.006	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
Sulphate in water Method: ME-(AU)-[ENV]AN275								
MW1	PE057307.001	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
DUP01	PE057307.006	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
Sulphide by Titration in Water Method: ME-(AU)-[ENV]AN149								
MW1	PE057307.001	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW2	PE057307.002	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW3	PE057307.003	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW4	PE057307.004	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW5	PE057307.005	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
DUP01	PE057307.006	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281								
MW1	PE057307.001	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW2	PE057307.002	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW3	PE057307.003	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW4	PE057307.004	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW5	PE057307.005	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
DUP01	PE057307.006	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113								
MW1	PE057307.001	LB018766	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	07 May 2011	06 May 2011
MW2	PE057307.002	LB018766	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	07 May 2011	06 May 2011
MW3	PE057307.003	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011
MW4	PE057307.004	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011
MW5	PE057307.005	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011
DUP01	PE057307.006	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011

HOLDING TIME SUMMARY

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293								
MW1	PE057307.001	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW2	PE057307.002	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW3	PE057307.003	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW4	PE057307.004	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW5	PE057307.005	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
DUP01	PE057307.006	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318								
MW1	PE057307.001	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW2	PE057307.002	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW3	PE057307.003	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW4	PE057307.004	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW5	PE057307.005	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
DUP01	PE057307.006	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
Trip Blank	PE057307.007	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
RIN 1	PE057307.008	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403								
MW1	PE057307.001	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW2	PE057307.002	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW3	PE057307.003	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW4	PE057307.004	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW5	PE057307.005	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
DUP01	PE057307.006	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434								
MW1	PE057307.001	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW2	PE057307.002	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW3	PE057307.003	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW4	PE057307.004	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW5	PE057307.005	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
DUP01	PE057307.006	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
Trip Blank	PE057307.007	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
RIN 1	PE057307.008	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011

Samples received outside recommended technical holding times for Alkalinity and Hexavalent Chromium.

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
TRH (Surrogate)	MW1	PE057307.001	%	40 - 130%	75
	MW2	PE057307.002	%	40 - 130%	76
	MW3	PE057307.003	%	40 - 130%	82
	MW4	PE057307.004	%	40 - 130%	75
	MW5	PE057307.005	%	40 - 130%	93
	DUP01	PE057307.006	%	40 - 130%	74

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	MW1	PE057307.001	%	60 - 130%	104
	MW2	PE057307.002	%	60 - 130%	109
	MW3	PE057307.003	%	60 - 130%	99
	MW4	PE057307.004	%	60 - 130%	97
	MW5	PE057307.005	%	60 - 130%	99
	DUP01	PE057307.006	%	60 - 130%	98
	Trip Blank	PE057307.007	%	60 - 130%	100
	RIN 1	PE057307.008	%	60 - 130%	97
d4-1,2-dichloroethane (Surrogate)	MW1	PE057307.001	%	60 - 130%	104
	MW2	PE057307.002	%	60 - 130%	119
	MW3	PE057307.003	%	60 - 130%	112
	MW4	PE057307.004	%	60 - 130%	100
	MW5	PE057307.005	%	60 - 130%	109
	DUP01	PE057307.006	%	60 - 130%	100
	Trip Blank	PE057307.007	%	60 - 130%	105
	RIN 1	PE057307.008	%	60 - 130%	108
d8-toluene (Surrogate)	MW1	PE057307.001	%	60 - 130%	102
	MW2	PE057307.002	%	60 - 130%	104
	MW3	PE057307.003	%	60 - 130%	101
	MW4	PE057307.004	%	60 - 130%	98
	MW5	PE057307.005	%	60 - 130%	96
	DUP01	PE057307.006	%	60 - 130%	95
	Trip Blank	PE057307.007	%	60 - 130%	98
	RIN 1	PE057307.008	%	60 - 130%	97
Dibromofluoromethane (Surrogate)	MW1	PE057307.001	%	60 - 140%	103
	MW2	PE057307.002	%	60 - 140%	107
	MW3	PE057307.003	%	60 - 140%	103
	MW4	PE057307.004	%	60 - 140%	102
	MW5	PE057307.005	%	60 - 140%	106
	DUP01	PE057307.006	%	60 - 140%	103
	Trip Blank	PE057307.007	%	60 - 140%	104
	RIN 1	PE057307.008	%	60 - 140%	107

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR	BLK MB

Alkalinity Method: ME-(AU)-[ENV]AN135

LB018729.001

Parameter	Units	Control LOR	BLK MB
Total Alkalinity as CaCO3	mg/L	5	<5

LB018729.027

Parameter	Units	Control LOR	BLK MB
Total Alkalinity as CaCO3	mg/L	5	<5

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

LB018886.001

Parameter	Units	Control LOR	BLK MB
Chloride	mg/L	1	<1

LB018886.026

Parameter	Units	Control LOR	BLK MB
Chloride	mg/L	1	<1

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

LB018710.001

Parameter	Units	Control LOR	BLK MB
Filterable Reactive Phosphorus	mg/L	0.002	<0.002

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

LB018860.001

Parameter	Units	Control LOR	BLK MB
Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

LB018769.001

Parameter	Units	Control LOR	BLK MB
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005

LB018769.027

Parameter	Units	Control LOR	BLK MB
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

LB018744.001

Parameter	Units	Control LOR	BLK MB
Mercury	mg/L	0.00005	<0.00005

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

LB018752.001

Parameter	Units	Control LOR	BLK MB
Calcium, Ca	mg/L	0.2	<0.2
Magnesium, Mg	mg/L	0.1	<0.1
Manganese, Mn	mg/L	0.005	<0.005
Potassium, K	mg/L	0.1	<0.1
Silicon, Si	mg/L	0.02	<0.02
Sodium, Na	mg/L	0.5	<0.5

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA   Method: ME-(AU)-[ENV]AN258

LB018769.001

Parameter	Units	Control LOR	BLK MB
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005

LB018769.024

Parameter	Units	Control LOR	BLK MB
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005

Sulphate in water   Method: ME-(AU)-[ENV]AN275

LB018886.001

Parameter	Units	Control LOR	BLK MB
Sulphate	mg/L	1	<1

LB018886.026

Parameter	Units	Control LOR	BLK MB
Sulphate	mg/L	1	<1

Total Dissolved Solids (TDS) in water   Method: ME-(AU)-[ENV]AN113

LB018766.001

Parameter	Units	Control LOR	BLK MB
Total Dissolved Solids Dried at 180°C	mg/L	10	<10

LB018766.024

Parameter	Units	Control LOR	BLK MB
Total Dissolved Solids Dried at 180°C	mg/L	10	<10

LB018911.001

Parameter	Units	Control LOR	BLK MB
Total Dissolved Solids Dried at 180°C	mg/L	10	<10

LB018911.025

Parameter	Units	Control LOR	BLK MB
Total Dissolved Solids Dried at 180°C	mg/L	10	<10

Trace Metals (Dissolved) in Water by ICPMS   Method: ME-(AU)-[ENV]AN318

LB018757.001

Parameter	Units	Control LOR	BLK MB
Aluminium, Al	µg/L	1	<1
Arsenic, As	µg/L	1	<1
Cadmium, Cd	µg/L	0.1	<0.1
Chromium, Cr	µg/L	1	<1
Iron, Fe	µg/L	5	<5
Lead, Pb	µg/L	1	<1
Manganese, Mn	µg/L	1	<1
Selenium, Se	µg/L	2	<2
Zinc, Zn	µg/L	1	<1

TRH (Total Recoverable Hydrocarbons) in Water   Method: ME-(AU)-[ENV]AN403

LB018780.001

Parameter	Units	Control LOR	BLK MB
TRH C10-C14	µg/L	50	<50
TRH C15-C28	µg/L	200	<200
TRH C29-C36	µg/L	200	<200

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Continued... TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403
LB018780.001
Surrogates

Parameter	Units	Control LOR	BLK MB
TRH (Surrogate)	%	-	88

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434
LB018699.001

Parameter	Units	Control LOR	BLK MB
TRH C6-C9	µg/L	40	<40

Surrogates

Parameter	Units	Control LOR	BLK MB
Dibromofluoromethane (Surrogate)	%	-	96
d4-1,2-dichloroethane (Surrogate)	%	-	99
d8-toluene (Surrogate)	%	-	96
Bromofluorobenzene (Surrogate)	%	-	93

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057287.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135 LB018729.005						
Total Alkalinity as CaCO3	mg/L	5	21	21	39	2

		Sample Name		PE057291.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135 LB018729.011						
Total Alkalinity as CaCO3	mg/L	5	84	82	21	2
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB018886.041						
Chloride	mg/L	1	7500	7500	15	0
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB018886.041						
Sulphate	mg/L	1	670	650	15	3

		Sample Name		PE057291.004-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB018886.043						
Chloride	mg/L	1	6300	6300	15	1
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB018886.043						
Sulphate	mg/L	1	570	550	15	5

		Sample Name		PE057296.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113 LB018766.013						
Total Dissolved Solids Dried at 180°C	mg/L	10	152.000000000001	140	22	5

		Sample Name		PE057296.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281 LB018702.018						
Total Nitrogen (calc)	mg/L	0.05	0.107	0.09	60	15

Duplicates are calculated as relative percent difference (RPD) using the formula   RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057296.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293 LB018702.018						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.012	<0.01	126	18

		Sample Name		PE057298.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293 LB018702.004						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.05	0.05	37	4

		Sample Name		PE057302.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB018769.013						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.66	0.68	16	2
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB018769.013						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.018	0.020	41	11
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0	<0.005	200	0

		Sample Name		PE057307.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113 LB018766.026						
Total Dissolved Solids Dried at 180°C	mg/L	10	2000	2000	15	0

		Sample Name		PE057307.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312 LB018744.009						
Mercury	µg/L	0.00005	0.00011	0.11	62	5

		Sample Name		PE057307.006-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283 LB018860.014						
Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002	<0.002	200	0
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	<0.005	200	0

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Sample Name: PE057320.001-DUP

Alkalinity Method: ME-(AU)-[ENV]AN135
LB018729.030

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Total Alkalinity as CaCO3	mg/L	5	310	300	17	3

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274
LB018886.015

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Chloride	mg/L	1	1400	1400	15	1

Sulphate in water Method: ME-(AU)-[ENV]AN275
LB018886.015

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Sulphate	mg/L	1	800	870	15	8

Sample Name: PE057320.004-DUP

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261
LB018769.029

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.072	0.061	23	17

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258
LB018769.026

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.31	0.31	17	1
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.05	0.050	25	0

Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113
LB018911.014

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Total Dissolved Solids Dried at 180°C	mg/L	10	4100	4100	15	1

Sample Name: PE057320.010-DUP

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278
LB018710.015

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Filterable Reactive Phosphorus	mg/L	0.002	0.045	0.047	19	4

Sample Name: PE057320.011-DUP

Alkalinity Method: ME-(AU)-[ENV]AN135
LB018729.041

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Total Alkalinity as CaCO3	mg/L	5	360	360	16	0

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274
LB018886.029

Parameter	Units	LOR	Original Result	Duplicate Result	Criteria %	RPD %
Chloride	mg/L	1	710	730	15	2

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057320.011-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.029						
Sulphate	mg/L	1	380	380	15	2

		Sample Name		PE057320.012-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278						
LB018710.024						
Filterable Reactive Phosphorus	mg/L	0.002	0.006	0.006	51	2

		Sample Name		PE057322.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261						
LB018769.040						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	6.1	6.1	15	0
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113						
LB018911.027						
Total Dissolved Solids Dried at 180°C	mg/L	10	1390	1400	16	0

		Sample Name		PE057322.007-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258						
LB018769.043						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	1.8	1.8	15	2
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.011	0.013	57	17

		Sample Name		PE057334.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312						
LB018744.015						
Mercury	µg/L	0.00005	<0.0001	<0.00005	200	0
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
LB018752.014						
Calcium, Ca	mg/L	0.2	64	65	15	1
Magnesium, Mg	mg/L	0.1	43	43	15	1
Manganese, Mn	mg/L	0.005	<0.005	<0.005	200	0
Potassium, K	mg/L	0.1	24	24	15	0
Silicon, Si	mg/L	0.02	8.2	8.2	15	1
Sodium, Na	mg/L	0.5	140	140	15	0

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

			Sample Name		PE057334.002-DUP	
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

LB018757.014

Arsenic, As	µg/L	1	<0.002	<1	200	0
Lead, Pb	µg/L	1	0.002	2	59	11
Selenium, Se	µg/L	2	0.003	3	79	3

			Sample Name		PE057335.004-DUP	
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

LB018744.023

Mercury	µg/L	0.00005	<0.0001	<0.00005	200	0

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

LB018757.022

Arsenic, As	µg/L	1	0.005	5	35	4
Lead, Pb	µg/L	1	<0.001	<1	200	175
Selenium, Se	µg/L	2	0.003	3	74	3

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

	Control		LCS STD			
Parameter	**Units**	**LOR**	**Result**	**Expected Result**	**Criteria %**	**Recovery %**

Alkalinity   Method: ME-(AU)-[ENV]AN135

LB018729.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Total Alkalinity as CaCO3	mg/L	5	49	45	85 - 115	108

LB018729.028

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Total Alkalinity as CaCO3	mg/L	5	49	45	85 - 115	110

Chloride by Discrete Analyser in Water   Method: ME-(AU)-[ENV]AN274

LB018886.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Chloride	mg/L	1	10	10	85 - 115	105

LB018886.027

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Chloride	mg/L	1	10	10	85 - 115	104

Filterable Reactive Phosphorus (FRP)   Method: ME-(AU)-[ENV]AN278

LB018710.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Filterable Reactive Phosphorus	mg/L	0.002	0.21	0.2	80 - 120	105

Hexavalent Chromium in water by Discrete Analyser   Method: ME-(AU)-[ENV]AN283

LB018860.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Hexavalent Chromium, Cr6+	mg/L	0.002	0.11	0.1	80 - 120	110

Low Level Ammonia Nitrogen by FIA   Method: ME-(AU)-[ENV]AN261

LB018769.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.78	0.8	85 - 115	97

LB018769.028

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.76	0.8	85 - 115	95

Mercury (dissolved) in Water   Method: ME-(AU)-[ENV]AN311/AN312

LB018744.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Mercury	mg/L	0.00005	0.0026	0	NA	103

Metals in Water (Dissolved) by ICPOES   Method: ME-(AU)-[ENV]AN320/AN321

LB018752.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Calcium, Ca	mg/L	0.2	200	200	80 - 120	101
Magnesium, Mg	mg/L	0.1	210	200	80 - 120	106
Manganese, Mn	mg/L	0.005	2.0	2	80 - 120	102
Potassium, K	mg/L	0.1	2.3	2	80 - 120	114
Silicon, Si	mg/L	0.02	2.3	2	80 - 120	117
Sodium, Na	mg/L	0.5	210	200	80 - 120	107

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA   Method: ME-(AU)-[ENV]AN258

LB018769.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.80	0.8	85 - 115	100
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.84	0.8	85 - 115	105

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Control Units	Control LOR	LCS STD Result	LCS STD Expected Result	LCS STD Criteria %	LCS STD Recovery %
Continued... Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258						
LB018769.025						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.77	0.8	85 - 115	97
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.79	0.8	85 - 115	99
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.002						
Sulphate	mg/L	1	10	10	80 - 120	99
LB018886.027						
Sulphate	mg/L	1	10	10	80 - 120	97
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113						
LB018766.002						
Total Dissolved Solids Dried at 180°C	mg/L	10	260	300	80 - 120	87
LB018766.025						
Total Dissolved Solids Dried at 180°C	mg/L	10	300	300	80 - 120	99
LB018911.002						
Total Dissolved Solids Dried at 180°C	mg/L	10	270	300	80 - 120	89
LB018911.026						
Total Dissolved Solids Dried at 180°C	mg/L	10	260	300	80 - 120	88
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293						
LB018702.002						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.40	0.5	80 - 120	80
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB018757.002						
Aluminium, Al	µg/L	1	11	10	80 - 120	114
Arsenic, As	µg/L	1	11	10	80 - 120	114
Cadmium, Cd	µg/L	0.1	11	10	80 - 120	109
Chromium, Cr	µg/L	1	11	10	80 - 120	114
Iron, Fe	µg/L	5	10	10	80 - 120	101
Lead, Pb	µg/L	1	11	10	80 - 120	107
Manganese, Mn	µg/L	1	12	10	80 - 120	117
Selenium, Se	µg/L	2	11	10	80 - 120	110
Zinc, Zn	µg/L	1	10	10	80 - 120	101
TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403						
LB018780.002						
TRH C10-C14	µg/L	50	470	500	60 - 130	95
TRH C15-C28	µg/L	200	550	500	60 - 130	110
TRH C29-C36	µg/L	200	570	500	60 - 130	114
Surrogates						
TRH (Surrogate)	%	-	91.0	100	50 - 150	91

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

	Control		LCS STD			
Parameter	**Units**	**LOR**	**Result**	**Expected Result**	**Criteria %**	**Recovery %**

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434
LB018699.002

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
TRH C6-C9	µg/L	40	<40	30	70 - 130	99

Surrogates

Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Dibromofluoromethane (Surrogate)	µg/L	-	5.1	5	60 - 130	101
d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.5	5	60 - 130	109
d8-toluene (Surrogate)	µg/L	-	5.1	5	60 - 130	102
Bromofluorobenzene (Surrogate)	µg/L	-	5.3	5	60 - 130	106

Matrix spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of the report. Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Control		MS		
Parameter	**Units**	**LOR**	**Result**	**Original Result**	**Spike Added**	**Recovery %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB018886.005						
Chloride	mg/L	1	200	82	100	119
LB018886.031						
Chloride	mg/L	1	300	192.333	100	110
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278						
LB018710.004						
Filterable Reactive Phosphorus	mg/L	0.002	0.21	<0.002	0.2	103
Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283						
LB018860.012						
Hexavalent Chromium, Cr6+	mg/L	0.002	0.11	<0.002	0.1	114
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312						
LB018744.004						
Mercury	mg/L	0.00005	0.0021	<0.00005	0.0025	103
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
LB018752.004						
Calcium, Ca	mg/L	0.2	360	200	200	81
Magnesium, Mg	mg/L	0.1	250	63	200	93
Manganese, Mn	mg/L	0.005	2.0	0.17	2	93
Potassium, K	mg/L	0.1	12	10	2	101
Silicon, Si	mg/L	0.02	16	14	2	81
Sodium, Na	mg/L	0.5	540	350	200	95
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.005						
Sulphate	mg/L	1	160	29	-	NA
LB018886.031						
Sulphate	mg/L	1	160	30.462	100	127
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB018757.004						
Aluminium, Al	µg/L	1	21	10	10	114
Arsenic, As	µg/L	1	12	<1	10	111
Cadmium, Cd	µg/L	0.1	10	<0.1	10	102
Chromium, Cr	µg/L	1	11	<1	10	115
Iron, Fe	µg/L	5	20	8	10	119
Lead, Pb	µg/L	1	11	<1	10	107
Manganese, Mn	µg/L	1	170	170	10	**56†**
Selenium, Se	µg/L	2	10	<2	10	96
Zinc, Zn	µg/L	1	25	16	10	88

Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as relative percent difference using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The original result is the analyte concentration of the matrix spike and the replicate result is the analyte concentration of the matrix spike duplicate.
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spike Duplicates were required for this job.

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	NATA Accreditation does not cover this analysis.
^	Performed by outside laboratory.
LOR	Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
NA	The sample was not analysed for this analyte

Samples analysed as received.
Solid samples expressed on a dry weight basis.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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Grnd Floor, 33 Saunders Street, Pyrmont, NSW, 2009. (ph) 02 8584 8888 (fax) 02 8584 8800
Level 3, Yarra Tower, WTC, 18-38 Siddeley Street, Docklands, VIC, 3005. (ph) 03 9696 8011 (fax) 03 9696 8022
Level 1, 60 Leichhardt Street, Spring Hill, QLD, 4004. (ph) 07 3839 8393 (fax) 07 3839 8381
Level 6, Grain Pool Bld, 172 St Georges Tce, WA, 6850. (ph) 08 9321 5200 (fax) 08 9321 5262
53 Bonville Avenue, Thornton, NSW, 2322. (ph) 02 4964 2150 (fax) 02 4964 2152
Suite 3/146 Gordon Street, Port Macquarie, NSW, 2444. (ph) 02 6584 7155 (fax) 02 6584 7160

Project No: 0086269
Project Name: BNPL
Project Location: Burrup, WA
Project Manager: Brent Carter
Sampler: JG + CG

COC Number: A 07485
Laboratory: SGS

General Analysis Requirements	Yes (tick)
1. Turn Around Time (please tick: ☐1 Day ☐2 Days ☐3 Days ☐Normal TAT)	
2. Do you wish any sediment layers in water to be exluded from extractions?	
3. Additional QA/QC reported where sample batches are < 10 samples?	
4. % of extraneous material removed from samples to be reported as per NEPM 5.1.1?	

Laboratory Number	Sample ID	Sample Depth	Sample Date	Sample Time	Matrix			Preservation				Containers (number/type)	BTEX	TPH (C6-C9 P & T) + TPH (C10-C36)	Speciated TPH	VOC Scan (USEPA 8260 List)	SVOC Scan (USEPA 8270 List)	OC OP Pesticides	PAH	Phenols	PCB	Metals* (dissolved / total)	SGS extended ASS suite * ✓	HCO3 ✓	CO3 ✓	SiO2 ✓	F ✓	major anions	major cations		Other Comments on sample (eg: high voc, highly contaminated, special detection limits etc etc) PE060993
					Soil	Water	Other	Ice	Acid	Filter	Other																				
1	MW1		20-9-11			X		X															X	X	X	X	X				*Extended ASS
2	MW2		20.9-11			X		X															X	X	X	X	X				suite (except
3	MW3		20-9-11			X		X															X	X	X	X	X				Ph, EC, TDS,
4	MW4		21-9-11			X		X															X	X	X	X	X				DO & redox
5	MW5		21-9-11			X		X						X	-Disregard as per								X	X	X	X	X			7x1L P(G)	(#1-7)
6	DUP01		21-9-11			X		X						X	James Gawshon								X	X	X	X	X			6x500P(Y)	(#1-6)
7	RIN01		21-9-11			X		X							-MT & DB							X						X	X	6x250P(G)	
8	TRIP01	}	21-9-11			X		X															X	X	X	X	X			6x125P(R) filt	
9	TRIP02	}	21-9-11			X		X				→ labelled as TRIP01											X	X	X	X	X			6x125P(R) unfilt	
																														2x100 G unp	(#7) x2
		Analysed for C6-C9 + BTEX																							ALS metals bottles ->					2x70 P unp.	filt (#7) x2
																														2x40 vial	(#8, 9)
																													2x 1L	P(G)	'rinsate' received
																															2 eskies, IB
																															14°C
																															DB 22/9/11

Comments: Please email invoice & results to James.Gawshon@erm.com

*Metals (circle) Dissolved
As Cd Cr Cu Hg Ni Pb Zn

W-256-258, V-48

Relinquished by: Carrie Gorman   Signed: Carrie Gorman   Date/Time: 22-9-11   Received by: DB   Date/Time: 22/9/11 1615

Relinquished by: Signed: Date/Time: Received by: Date/Time:

ANALYTICAL REPORT

CLIENT DETAILS / LABORATORY DETAILS

Contact	James Gavshon	Manager	Said Hirad
Client	ERM Australia Pty Ltd	Laboratory	SGS Newburn Environmental
Address	PO Box 7338 Cloisters Square Level 6, Grain Pool Bld, 172 St Georges Tce PERTH WA 6850	Address	10 Reid Rd Newburn WA 6105
Telephone	08 9321 5200	Telephone	(08) 9373 3500
Facsimile	08 9321 5262	Facsimile	(08) 9373 3556
Email	james.gavshon@erm.com	Email	au.environmental.perth@sgs.com
Project	**0086269 BNPL Burrup**	SGS Reference	PE060993 R0
Order Number	(Not specified)	Report Number	0000027829
Samples	9	Date Reported	03 Oct 2011
		Date Received	22 Sep 2011

COMMENTS

The document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Samples diluted for Trace Metals; hence the LOR's were raised.

Spike recovery for Total Al and Fe on sample "MW1" outside acceptance criteria due to matrix interference. Confirmed by re-analysis.

Chloride and sulphate spike recoveries were outside acceptance criteria due to high background.

Ion Balance for sample "RIN01" outside acceptance criteria due to low Conductivity.

SIGNATORIES

Hue Thanh Ly
Spectroscopy Chemist

Jeremy Truong
Inorganics Co-ordinator

Michael McKay
Inorganic Team Leader - Waters

Ohmar David
Spectroscopy Chemist

Pamela Adams
Organic Team Leader

		Sample Number	PE060993.001	PE060993.002	PE060993.003	PE060993.004	PE060993.005
		Sample Matrix	Water	Water	Water	Water	Water
		Sample Date	20 Sep 2011	20 Sep 2011	20 Sep 2011	21 Sep 2011	21 Sep 2011
		Sample Name	MW1	MW2	MW3	MW4	MW5
Parameter	Units	LOR					

Alkalinity Method: AN135

Total Alkalinity as CaCO3	mg/L	5	320	290	450	370	210
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	8	12	<1
Bicarbonate Alkalinity as HCO3	mg/L	5	390	350	530	420	250

Total and Volatile Suspended Solids (TSS / VSS) Method: AN114

Total Suspended Solids Dried at 105°C	mg/L	5	180	190	280	670	1100

Acidity and Free CO2 Method: AN140

Acidity to pH 8.3	mg CaCO3/L	5	25	18	20	<5	55

Chloride by Discrete Analyser in Water Method: AN274

Chloride	mg/L	1	710	1200	3700	2500	87000

Sulphate in water Method: AN275

Sulphate	mg/L	1	150	210	810	280	4100

Fluoride by Ion Selective Electrode in Water Method: AN141

Fluoride by ISE	mg/L	0.1	0.4	0.6	1.4	0.7	0.3

Sulphide by Titration in Water Method: AN149

Sulphide	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	3.1	1.2	0.033	0.24	0.020

Low Level Ammonia Nitrogen by FIA Method: AN261

Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.018	<0.005	0.057	0.018	0.047

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Total Kjeldahl Nitrogen	mg/L	0.05	0.28	0.20	0.18	0.31	2.7
Total Nitrogen (calc)	mg/L	0.05	3.4	1.4	0.22	0.54	2.7

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.05	0.06	0.05	0.14	0.04

Filterable Reactive Phosphorus (FRP) Method: AN278

Filterable Reactive Phosphorus	mg/L	0.002	0.008	0.004	0.006	0.009	0.010

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Calcium, Ca	mg/L	0.2	170	150	85	28	1100
Magnesium, Mg	mg/L	0.1	54	98	210	68	4300
Potassium, K	mg/L	0.1	7.9	20	90	69	1700
Silica, Soluble	mg/L	0.05	28	24	32	16	9.9
Silicon, Si	mg/L	0.02	13	11	15	7.5	4.6
Sodium, Na	mg/L	0.5	300	610	2500	1800	48000

Sample Number			PE060993.001	PE060993.002	PE060993.003	PE060993.004	PE060993.005
Sample Matrix			Water	Water	Water	Water	Water
Sample Date			20 Sep 2011	20 Sep 2011	20 Sep 2011	21 Sep 2011	21 Sep 2011
Sample Name			MW1	MW2	MW3	MW4	MW5
Parameter	Units	LOR					

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Aluminium, Al	µg/L	1	**2**	**2**	**19**	<5↑	<100↑
Arsenic, As	µg/L	1	<1	<1	<5↑	<5↑	<100↑
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.5↑	<0.5↑	<10↑
Chromium, Cr	µg/L	1	<1	<1	<5↑	<5↑	<100↑
Copper, Cu	µg/L	1	-	-	-	-	-
Iron, Fe	µg/L	5	<5	<5	<25↑	<25↑	<500↑
Lead, Pb	µg/L	1	-	-	-	-	-
Manganese, Mn	µg/L	1	**46**	**1**	**14**	**11**	<100↑
Nickel, Ni	µg/L	1	<1	<1	<5↑	<5↑	<100↑
Selenium, Se	µg/L	2	<2	<2	<10↑	<10↑	<200↑
Zinc, Zn	µg/L	1	**27**	**21**	**47**	**29**	<100↑

Metals in Water (Total) by ICPOES Method: AN022/AN320/AN321

Total Aluminium	mg/L	0.02	**1.8**	**4.2**	**5.8**	**21**	**11**
Total Iron	mg/L	0.02	**1.8**	**6.0**	**7.4**	**31**	**12**

Calculation of Anion-Cation Balance (SAR Calc) Method: AN121

Anion-Cation Balance	%	-100	**-6**	**-3**	**2**	**1**	**0**

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

TRH C6-C9	µg/L	40	-	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-	-

VOCs in Water Method: AN433/AN434

Monocyclic Aromatic Hydrocarbons

Benzene	µg/L	0.5	-	-	-	-	-
Toluene	µg/L	0.5	-	-	-	-	-
Ethylbenzene	µg/L	0.5	-	-	-	-	-
m/p-xylene	µg/L	1	-	-	-	-	-
o-xylene	µg/L	0.5	-	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-	-

		Sample Number	PE060993.006	PE060993.007	PE060993.008	PE060993.009
		Sample Matrix	Water	Water	Water	Water
		Sample Date	21 Sep 2011	21 Sep 2011	21 Sep 2011	21 Sep 2011
		Sample Name	DUP01	RIN01	TRIP01	TRIP02
Parameter	**Units**	**LOR**				

Alkalinity Method: AN135

Total Alkalinity as CaCO3	mg/L	5	**220**	<5	-	-
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	-	-
Bicarbonate Alkalinity as HCO3	mg/L	5	**270**	<5	-	-

Total and Volatile Suspended Solids (TSS / VSS) Method: AN114

Total Suspended Solids Dried at 105°C	mg/L	5	**1000**	-	-	-

Acidity and Free CO2 Method: AN140

Acidity to pH 8.3	mg CaCO3/L	5	**55**	-	-	-

Chloride by Discrete Analyser in Water Method: AN274

Chloride	mg/L	1	**87000**	<1	-	-

Sulphate in water Method: AN275

Sulphate	mg/L	1	**5000**	<1	-	-

Fluoride by Ion Selective Electrode in Water Method: AN141

Fluoride by ISE	mg/L	0.1	**0.3**	-	-	-

Sulphide by Titration in Water Method: AN149

Sulphide	mg/L	0.5	<0.5	-	-	-

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.020**	-	-	-

Low Level Ammonia Nitrogen by FIA Method: AN261

Ammonia Nitrogen, NH_3 as N	mg/L	0.005	**0.042**	-	-	-

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Total Kjeldahl Nitrogen	mg/L	0.05	**2.7**	-	-	-
Total Nitrogen (calc)	mg/L	0.05	**2.7**	-	-	-

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	**0.04**	-	-	-

Filterable Reactive Phosphorus (FRP) Method: AN278

Filterable Reactive Phosphorus	mg/L	0.002	**0.009**	-	-	-

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Calcium, Ca	mg/L	0.2	**1100**	<0.2	-	-
Magnesium, Mg	mg/L	0.1	**4300**	<0.1	-	-
Potassium, K	mg/L	0.1	**1700**	<0.1	-	-
Silica, Soluble	mg/L	0.05	**9.7**	-	-	-
Silicon, Si	mg/L	0.02	**4.5**	-	-	-
Sodium, Na	mg/L	0.5	**48000**	<0.5	-	-

		Sample Number	PE060993.006	PE060993.007	PE060993.008	PE060993.009
		Sample Matrix	Water	Water	Water	Water
		Sample Date	21 Sep 2011	21 Sep 2011	21 Sep 2011	21 Sep 2011
		Sample Name	DUP01	RIN01	TRIP01	TRIP02
Parameter	Units	LOR				

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
Aluminium, Al	µg/L	1	<100↑	-	-	-
Arsenic, As	µg/L	1	<100↑	<1	-	-
Cadmium, Cd	µg/L	0.1	<10↑	<0.1	-	-
Chromium, Cr	µg/L	1	<100↑	<1	-	-
Copper, Cu	µg/L	1	-	<1	-	-
Iron, Fe	µg/L	5	<500↑	-	-	-
Lead, Pb	µg/L	1	-	<1	-	-
Manganese, Mn	µg/L	1	<100↑	-	-	-
Nickel, Ni	µg/L	1	<100↑	<1	-	-
Selenium, Se	µg/L	2	<200↑	-	-	-
Zinc, Zn	µg/L	1	<100↑	**5**	-	-

Metals in Water (Total) by ICPOES Method: AN022/AN320/AN321

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
Total Aluminium	mg/L	0.02	**11**	-	-	-
Total Iron	mg/L	0.02	**13**	-	-	-

Calculation of Anion-Cation Balance (SAR Calc) Method: AN121

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
Anion-Cation Balance	%	-100	**-1**	**-100**	-	-

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
TRH C6-C9	µg/L	40	-	-	<40	<40

Surrogates

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
Dibromofluoromethane (Surrogate)	%	-	-	-	**100**	**91**
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	**101**	**93**
d8-toluene (Surrogate)	%	-	-	-	**98**	**86**
Bromofluorobenzene (Surrogate)	%	-	-	-	**96**	**86**

VOCs in Water Method: AN433/AN434

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
Benzene	µg/L	0.5	-	-	<0.5	<0.5
Toluene	µg/L	0.5	-	-	**0.6**	<0.5
Ethylbenzene	µg/L	0.5	-	-	<0.5	<0.5
m/p-xylene	µg/L	1	-	-	<1	<1
o-xylene	µg/L	0.5	-	-	<0.5	<0.5

Surrogates

Parameter	Units	LOR	PE060993.006	PE060993.007	PE060993.008	PE060993.009
Dibromofluoromethane (Surrogate)	%	-	-	-	**100**	**91**
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	**101**	**93**
d8-toluene (Surrogate)	%	-	-	-	**98**	**86**
Bromofluorobenzene (Surrogate)	%	-	-	-	**96**	**86**

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Acidity to pH 8.3	LB027991	mg	5	<5	0 - 14%

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB027789	mg/L	5	<5	0 - 3%	97 - 104%
Carbonate Alkalinity as CO3	LB027789	mg/L	1	<1		
Bicarbonate Alkalinity as HCO3	LB027789	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Chloride	LB027947	mg/L	1	<1	1 - 3%	105 - 106%	NA

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Filterable Reactive Phosphorus	LB027850	mg/L	0.002	<0.002	6%	114%	97%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Fluoride by ISE	LB028015	mg/L	0.1	<0.1	1%	93%	99%

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Ammonia Nitrogen, NH_3 as N	LB027870	mg/L	0.005	<0.005	0 - 43%	103 - 105%

Metals in Water (Total) by ICPOES Method: ME-(AU)-[ENV]AN022/AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Aluminium	LB027767	mg/L	0.02	<0.02	3%	105%	435%
Total Iron	LB027767	mg/L	0.02	<0.02	3%	104%	333%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB027769	mg/L	0.2	<0.2	0%	92%	72%
	LB027771	mg/L	0.2	<0.2	3%	88%	82%
Magnesium, Mg	LB027769	mg/L	0.1	<0.1	0%	95%	85%
	LB027771	mg/L	0.1	<0.1	2%	91%	91%
Potassium, K	LB027769	mg/L	0.1	<0.1	0%	96%	86%
	LB027771	mg/L	0.1	<0.1	2%	92%	89%
Silica, Soluble	LB027769	mg/L	0.05	<0.05			
Silicon, Si	LB027769	mg/L	0.02	<0.02		96%	94%
Sodium, Na	LB027769	mg/L	0.5	<0.5	0%	100%	105%
	LB027771	mg/L	0.5	<0.5	3%	96%	96%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA   Method: ME-(AU)-[ENV]AN258

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB027870	mg/L	0.005	<0.005	0 - 2%	98%

Sulphate in water   Method: ME-(AU)-[ENV]AN275

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sulphate	LB027947	mg/L	1	<1	6 - 13%	106 - 109%	92 - 108%

Sulphide by Titration in Water   Method: ME-(AU)-[ENV]AN149

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Sulphide	LB027859	mg/L	0.5	<0.5	82%

TKN Kjeldahl Digestion by Discrete Analyser   Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Kjeldahl Nitrogen	LB027803	mg/L	0.05	<0.05	2 - 5%	90%
Total Nitrogen (calc)	LB027803	mg/L	0.05	<0.05		NA

Total and Volatile Suspended Solids (TSS / VSS)   Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 105°C	LB027948	mg/L	5	<5	0 - 5%	91%

Total Phosphorus by Kjeldahl Digestion DA in Water   Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB027803	mg/L	0.01	<0.01	1 - 6%	107%

Trace Metals (Dissolved) in Water by ICPMS   Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB027773	µg/L	1	<1		102%	
Arsenic, As	LB027773	µg/L	1	<1	0%	102%	99%
Cadmium, Cd	LB027773	µg/L	0.1	<0.1	0%	101%	101%
Chromium, Cr	LB027773	µg/L	1	<1	0%	99%	95%
Copper, Cu	LB027773	µg/L	1	<1	0%	97%	94%
Iron, Fe	LB027773	µg/L	5	<5		97%	
Lead, Pb	LB027773	µg/L	1	<1	0%	103%	98%
Manganese, Mn	LB027773	µg/L	1	<1		101%	
Nickel, Ni	LB027773	µg/L	1	<1	0%	100%	98%
Selenium, Se	LB027773	µg/L	2	<2		85%	
Zinc, Zn	LB027773	µg/L	1	<1	10%	100%	124%

VOCs in Water   Method: ME-(AU)-[ENV]AN433/AN434

Monocyclic Aromatic Hydrocarbons

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Benzene	LB027792	µg/L	0.5	<0.5	86%
Toluene	LB027792	µg/L	0.5	<0.5	92%
Ethylbenzene	LB027792	µg/L	0.5	<0.5	87%
m/p-xylene	LB027792	µg/L	1	<1	
o-xylene	LB027792	µg/L	0.5	<0.5	

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Dibromofluoromethane (Surrogate)	LB027792	%	-	95%	108%
d4-1,2-dichloroethane (Surrogate)	LB027792	%	-	94%	115%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434 (continued)

				MB	LCS %Recovery
d8-toluene (Surrogate)	LB027792	%	-	95%	102%
Bromofluorobenzene (Surrogate)	LB027792	%	-	93%	100%

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C6-C9	LB027792	µg/L	40	<40	83%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Dibromofluoromethane (Surrogate)	LB027792	%	-	95%	108%
d4-1,2-dichloroethane (Surrogate)	LB027792	%	-	94%	115%
d8-toluene (Surrogate)	LB027792	%	-	95%	102%
Bromofluorobenzene (Surrogate)	LB027792	%	-	93%	100%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN022	Sample is prepared for metals analysis by digestion with Nitric Acid and made up to known volume.
AN022/AN320/AN321	Total (acid soluble) Metals by ICP-OES: Samples are digested in nitric or nitric and hydrochloric acids prior to analysis for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN140	Acidity by Tritration: The water sample is titrated with sodium hydroxide to designated pH end point. In a sample containing only carbon dioxide, bicarbonates and carbonates, titration to pH 8.3 at 25°C corresponds to stoichiometric neutralisation of carbonic acid to bicarbonate. Method reference APHA 2310 B.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN149	Sulphide by Iodometric Titration: Sulphide is precipitated as zinc sulphide to overcome interferences with sulphite and thiosulphate. After filtration, sulphide is determined titrimetrically. Reference APHA 4500-S2-
AN258	Nitrate and Nitrite by FIA: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN261	Ammonia by Continuous Flow Analyser: Ammonium in a basic medium forms ammonia gas, which is separated from the sample matrix by diffusion through a polypropylene membrane. The ammonia is reacted with phenol and hypochlorite to form indophenol blue at an intensity proportional to the ammonia concentration. The blue colour is intensified with sodium nitroprusside and the absorbance measured at 630 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-NH3 H.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN275	Suphate by Aquakem DA: Sulphate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN278	Reactive Phosphorus by Aquakem DA: Orthophosphate reacts with ammonium molybdate (Mo VI) and potassium antimonyl tartrate (Sb III) in acid medium to form an antimony-phosphomolybdate complex. This complex is subsequently reduced with ascorbic acid to form a blue colour and the absorbance is read at 880 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-P F
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the Aquakem 250 discrete analyser for colorimetric analysis.
AN281	Digestion of the sample to convert amino nitrogen present in many organic materials to ammonium sulphate. Free ammonia and ammonium nitrogen also are converted to ammonium sulphate. Colorimetric determination of ammonium nitrogen using the Phenate-Hypochlorite Method (APHA, 2005). Ammonia, phenol and hypochlorite react in an alkaline buffered medium to form a blue coloured compound, indophenol. This reaction is catalysed by sodium nitroprusside. The intensity of the colour development is directly proportional to the concentration of ammonia-nitrogen.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

IS	Insufficient sample for analysis.	QFH	QC result is above the upper tolerance
LNR	Sample listed, but not received.	QFL	QC result is below the lower tolerance
*	This analysis is not covered by the scope of accreditation.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated
LOR	Limit of Reporting		
↑↓	Raised or Lowered Limit of Reporting		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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STATEMENT OF QA/QC PERFORMANCE AGAINST DATA QUALITY OBJECTIVES

PE060993 R0

CLIENT DETAILS

Contact	James Gavshon
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square Level 6, Grain Pool Bld, 172 St Georges Tce PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	james.gavshon@erm.com
Project	**0086269 BNPL Burrup**
Order Number	(Not specified)
Samples	9

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE060993 R0
Report Number	0000027837
Date Reported	03 Oct 2011

COMMENTS

All the laboratory data for each environmental matrix was compared to the SGS Environmental Services' stated data quality objectives (DQO).
Comments arising from the comparison were made and are reported below.
The data relating to sampling was taken from the chain of custody document and was supplied by the client.
This QA/QC statement must be read in conjunction with the referenced analytical report.
The statement and the analytical report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Acidity and Free CO2	3 Items
	Alkalinity	3 Items
Analysis Date	Acidity and Free CO2	3 Items
	Alkalinity	3 Items
MS	Metals in Water (Total) by ICPOES	2 Items
	Sulphate in water	1 Item

SAMPLE SUMMARY

Sample counts by matrix	9 Water	Type of documentation received	COC
Date documentation received	22/9/2011	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	14°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	**No**	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	2

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE060993.001	LB027991	20 Sep 2011	22 Sep 2011	21 Sep 2011	**22 Sep 2011†**	21 Sep 2011	**22 Sep 2011†**
MW2	PE060993.002	LB027991	20 Sep 2011	22 Sep 2011	21 Sep 2011	**22 Sep 2011†**	21 Sep 2011	**22 Sep 2011†**
MW3	PE060993.003	LB027991	20 Sep 2011	22 Sep 2011	21 Sep 2011	**22 Sep 2011†**	21 Sep 2011	**22 Sep 2011†**
MW4	PE060993.004	LB027991	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
MW5	PE060993.005	LB027991	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
DUP01	PE060993.006	LB027991	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011

Alkalinity Method: ME-(AU)-[ENV]AN135

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE060993.001	LB027789	20 Sep 2011	22 Sep 2011	21 Sep 2011	**22 Sep 2011†**	21 Sep 2011	**22 Sep 2011†**
MW2	PE060993.002	LB027789	20 Sep 2011	22 Sep 2011	21 Sep 2011	**22 Sep 2011†**	21 Sep 2011	**22 Sep 2011†**
MW3	PE060993.003	LB027789	20 Sep 2011	22 Sep 2011	21 Sep 2011	**22 Sep 2011†**	21 Sep 2011	**22 Sep 2011†**
MW4	PE060993.004	LB027789	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
MW5	PE060993.005	LB027789	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
DUP01	PE060993.006	LB027789	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
RIN01	PE060993.007	LB027789	21 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE060993.001	LB027947	20 Sep 2011	22 Sep 2011	18 Oct 2011	28 Sep 2011	18 Oct 2011	29 Sep 2011
MW2	PE060993.002	LB027947	20 Sep 2011	22 Sep 2011	18 Oct 2011	28 Sep 2011	18 Oct 2011	29 Sep 2011
MW3	PE060993.003	LB027947	20 Sep 2011	22 Sep 2011	18 Oct 2011	28 Sep 2011	18 Oct 2011	29 Sep 2011
MW4	PE060993.004	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011
MW5	PE060993.005	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011
DUP01	PE060993.006	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011
RIN01	PE060993.007	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE060993.001	LB027850	20 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
MW2	PE060993.002	LB027850	20 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
MW3	PE060993.003	LB027850	20 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011	22 Sep 2011
MW4	PE060993.004	LB027850	21 Sep 2011	22 Sep 2011	23 Sep 2011	22 Sep 2011	23 Sep 2011	22 Sep 2011
MW5	PE060993.005	LB027850	21 Sep 2011	22 Sep 2011	23 Sep 2011	22 Sep 2011	23 Sep 2011	22 Sep 2011
DUP01	PE060993.006	LB027850	21 Sep 2011	22 Sep 2011	23 Sep 2011	22 Sep 2011	23 Sep 2011	22 Sep 2011

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE060993.001	LB028015	20 Sep 2011	22 Sep 2011	18 Oct 2011	29 Sep 2011	18 Oct 2011	29 Sep 2011
MW2	PE060993.002	LB028015	20 Sep 2011	22 Sep 2011	18 Oct 2011	29 Sep 2011	18 Oct 2011	29 Sep 2011
MW3	PE060993.003	LB028015	20 Sep 2011	22 Sep 2011	18 Oct 2011	29 Sep 2011	18 Oct 2011	29 Sep 2011
MW4	PE060993.004	LB028015	21 Sep 2011	22 Sep 2011	19 Oct 2011	29 Sep 2011	19 Oct 2011	29 Sep 2011
MW5	PE060993.005	LB028015	21 Sep 2011	22 Sep 2011	19 Oct 2011	29 Sep 2011	19 Oct 2011	29 Sep 2011
DUP01	PE060993.006	LB028015	21 Sep 2011	22 Sep 2011	19 Oct 2011	29 Sep 2011	19 Oct 2011	29 Sep 2011

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE060993.001	LB027870	20 Sep 2011	22 Sep 2011	18 Oct 2011	27 Sep 2011	18 Oct 2011	28 Sep 2011
MW2	PE060993.002	LB027870	20 Sep 2011	22 Sep 2011	18 Oct 2011	27 Sep 2011	18 Oct 2011	28 Sep 2011
MW3	PE060993.003	LB027870	20 Sep 2011	22 Sep 2011	18 Oct 2011	27 Sep 2011	18 Oct 2011	28 Sep 2011
MW4	PE060993.004	LB027870	21 Sep 2011	22 Sep 2011	19 Oct 2011	27 Sep 2011	19 Oct 2011	28 Sep 2011
MW5	PE060993.005	LB027870	21 Sep 2011	22 Sep 2011	19 Oct 2011	27 Sep 2011	19 Oct 2011	30 Sep 2011
DUP01	PE060993.006	LB027870	21 Sep 2011	22 Sep 2011	19 Oct 2011	27 Sep 2011	19 Oct 2011	28 Sep 2011

HOLDING TIME SUMMARY

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed

Metals in Water (Total) by ICPOES   Method: ME-(AU)-[ENV]AN022/AN320/AN321

MW1	PE060993.001	LB027767	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	29 Sep 2011
MW2	PE060993.002	LB027767	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	29 Sep 2011
MW3	PE060993.003	LB027767	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	29 Sep 2011
MW4	PE060993.004	LB027767	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011
MW5	PE060993.005	LB027767	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	30 Sep 2011
DUP01	PE060993.006	LB027767	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	30 Sep 2011

Metals in Water (Dissolved) by ICPOES   Method: ME-(AU)-[ENV]AN320/AN321

MW1	PE060993.001	LB027769	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	27 Sep 2011
MW2	PE060993.002	LB027769	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	27 Sep 2011
MW3	PE060993.003	LB027769	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	27 Sep 2011
MW4	PE060993.004	LB027769	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	27 Sep 2011
MW5	PE060993.005	LB027769	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	28 Sep 2011
DUP01	PE060993.006	LB027769	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	28 Sep 2011
RIN01	PE060993.007	LB027769	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	27 Sep 2011
TRIP01	PE060993.008	LB027771	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011
TRIP02	PE060993.009	LB027771	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA   Method: ME-(AU)-[ENV]AN258

MW1	PE060993.001	LB027870	20 Sep 2011	22 Sep 2011	18 Oct 2011	27 Sep 2011	18 Oct 2011	28 Sep 2011
MW2	PE060993.002	LB027870	20 Sep 2011	22 Sep 2011	18 Oct 2011	27 Sep 2011	18 Oct 2011	28 Sep 2011
MW3	PE060993.003	LB027870	20 Sep 2011	22 Sep 2011	18 Oct 2011	27 Sep 2011	18 Oct 2011	28 Sep 2011
MW4	PE060993.004	LB027870	21 Sep 2011	22 Sep 2011	19 Oct 2011	27 Sep 2011	19 Oct 2011	28 Sep 2011
MW5	PE060993.005	LB027870	21 Sep 2011	22 Sep 2011	19 Oct 2011	27 Sep 2011	19 Oct 2011	28 Sep 2011
DUP01	PE060993.006	LB027870	21 Sep 2011	22 Sep 2011	19 Oct 2011	27 Sep 2011	19 Oct 2011	28 Sep 2011

Sulphate in water   Method: ME-(AU)-[ENV]AN275

MW1	PE060993.001	LB027947	20 Sep 2011	22 Sep 2011	18 Oct 2011	28 Sep 2011	18 Oct 2011	29 Sep 2011
MW2	PE060993.002	LB027947	20 Sep 2011	22 Sep 2011	18 Oct 2011	28 Sep 2011	18 Oct 2011	29 Sep 2011
MW3	PE060993.003	LB027947	20 Sep 2011	22 Sep 2011	18 Oct 2011	28 Sep 2011	18 Oct 2011	29 Sep 2011
MW4	PE060993.004	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011
MW5	PE060993.005	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011
DUP01	PE060993.006	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011
RIN01	PE060993.007	LB027947	21 Sep 2011	22 Sep 2011	19 Oct 2011	28 Sep 2011	19 Oct 2011	29 Sep 2011

Sulphide by Titration in Water   Method: ME-(AU)-[ENV]AN149

MW1	PE060993.001	LB027859	20 Sep 2011	22 Sep 2011	27 Sep 2011	27 Sep 2011	27 Sep 2011	27 Sep 2011
MW2	PE060993.002	LB027859	20 Sep 2011	22 Sep 2011	27 Sep 2011	27 Sep 2011	27 Sep 2011	27 Sep 2011
MW3	PE060993.003	LB027859	20 Sep 2011	22 Sep 2011	27 Sep 2011	27 Sep 2011	27 Sep 2011	27 Sep 2011
MW4	PE060993.004	LB027859	21 Sep 2011	22 Sep 2011	28 Sep 2011	27 Sep 2011	28 Sep 2011	27 Sep 2011
MW5	PE060993.005	LB027859	21 Sep 2011	22 Sep 2011	28 Sep 2011	27 Sep 2011	28 Sep 2011	27 Sep 2011
DUP01	PE060993.006	LB027859	21 Sep 2011	22 Sep 2011	28 Sep 2011	27 Sep 2011	28 Sep 2011	27 Sep 2011

TKN Kjeldahl Digestion by Discrete Analyser   Method: ME-(AU)-[ENV]AN281

MW1	PE060993.001	LB027803	20 Sep 2011	22 Sep 2011	27 Sep 2011	26 Sep 2011	27 Sep 2011	26 Sep 2011
MW2	PE060993.002	LB027803	20 Sep 2011	22 Sep 2011	27 Sep 2011	26 Sep 2011	27 Sep 2011	26 Sep 2011
MW3	PE060993.003	LB027803	20 Sep 2011	22 Sep 2011	27 Sep 2011	26 Sep 2011	27 Sep 2011	26 Sep 2011
MW4	PE060993.004	LB027803	21 Sep 2011	22 Sep 2011	28 Sep 2011	26 Sep 2011	28 Sep 2011	26 Sep 2011
MW5	PE060993.005	LB027803	21 Sep 2011	22 Sep 2011	28 Sep 2011	26 Sep 2011	28 Sep 2011	26 Sep 2011
DUP01	PE060993.006	LB027803	21 Sep 2011	22 Sep 2011	28 Sep 2011	26 Sep 2011	28 Sep 2011	26 Sep 2011

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114								
MW1	PE060993.001	LB027948	20 Sep 2011	22 Sep 2011	27 Sep 2011	27 Sep 2011	04 Oct 2011	27 Sep 2011
MW2	PE060993.002	LB027948	20 Sep 2011	22 Sep 2011	27 Sep 2011	27 Sep 2011	04 Oct 2011	27 Sep 2011
MW3	PE060993.003	LB027948	20 Sep 2011	22 Sep 2011	27 Sep 2011	27 Sep 2011	04 Oct 2011	27 Sep 2011
MW4	PE060993.004	LB027948	21 Sep 2011	22 Sep 2011	28 Sep 2011	27 Sep 2011	04 Oct 2011	27 Sep 2011
MW5	PE060993.005	LB027948	21 Sep 2011	22 Sep 2011	28 Sep 2011	27 Sep 2011	04 Oct 2011	27 Sep 2011
DUP01	PE060993.006	LB027948	21 Sep 2011	22 Sep 2011	28 Sep 2011	27 Sep 2011	04 Oct 2011	27 Sep 2011
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293								
MW1	PE060993.001	LB027803	20 Sep 2011	22 Sep 2011	27 Sep 2011	26 Sep 2011	27 Sep 2011	26 Sep 2011
MW2	PE060993.002	LB027803	20 Sep 2011	22 Sep 2011	27 Sep 2011	26 Sep 2011	27 Sep 2011	26 Sep 2011
MW3	PE060993.003	LB027803	20 Sep 2011	22 Sep 2011	27 Sep 2011	26 Sep 2011	27 Sep 2011	26 Sep 2011
MW4	PE060993.004	LB027803	21 Sep 2011	22 Sep 2011	28 Sep 2011	26 Sep 2011	28 Sep 2011	26 Sep 2011
MW5	PE060993.005	LB027803	21 Sep 2011	22 Sep 2011	28 Sep 2011	26 Sep 2011	28 Sep 2011	26 Sep 2011
DUP01	PE060993.006	LB027803	21 Sep 2011	22 Sep 2011	28 Sep 2011	26 Sep 2011	28 Sep 2011	26 Sep 2011
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318								
MW1	PE060993.001	LB027773	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	29 Sep 2011
MW2	PE060993.002	LB027773	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	29 Sep 2011
MW3	PE060993.003	LB027773	20 Sep 2011	22 Sep 2011	18 Mar 2012	26 Sep 2011	18 Mar 2012	29 Sep 2011
MW4	PE060993.004	LB027773	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011
MW5	PE060993.005	LB027773	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011
DUP01	PE060993.006	LB027773	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011
RIN01	PE060993.007	LB027773	21 Sep 2011	22 Sep 2011	19 Mar 2012	26 Sep 2011	19 Mar 2012	29 Sep 2011
VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434								
TRIP01	PE060993.008	LB027792	21 Sep 2011	22 Sep 2011	28 Sep 2011	23 Sep 2011	02 Nov 2011	28 Sep 2011
TRIP02	PE060993.009	LB027792	21 Sep 2011	22 Sep 2011	28 Sep 2011	23 Sep 2011	02 Nov 2011	28 Sep 2011
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434								
TRIP01	PE060993.008	LB027792	21 Sep 2011	22 Sep 2011	28 Sep 2011	23 Sep 2011	02 Nov 2011	28 Sep 2011
TRIP02	PE060993.009	LB027792	21 Sep 2011	22 Sep 2011	28 Sep 2011	23 Sep 2011	02 Nov 2011	28 Sep 2011

Samples "MW1", "MW2" and "MW3" receive outside recommeded technical holding time for Alkalinity and Acidity analysis.

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434					
Bromofluorobenzene (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	96
	TRIP02	PE060993.009	%	60 - 130%	86
d4-1,2-dichloroethane (Surrogate)	TRIP01	PE060993.008	%	40 - 130%	101
	TRIP02	PE060993.009	%	40 - 130%	93
d8-toluene (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	98
	TRIP02	PE060993.009	%	60 - 130%	86
Dibromofluoromethane (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	100
	TRIP02	PE060993.009	%	60 - 130%	91
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434					
Bromofluorobenzene (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	96
	TRIP02	PE060993.009	%	60 - 130%	86
d4-1,2-dichloroethane (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	101
	TRIP02	PE060993.009	%	60 - 130%	93
d8-toluene (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	98
	TRIP02	PE060993.009	%	60 - 130%	86
Dibromofluoromethane (Surrogate)	TRIP01	PE060993.008	%	60 - 130%	100
	TRIP02	PE060993.009	%	60 - 130%	91

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR	BLK MB
Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140			
LB027991.001			
Acidity to pH 8.3	mg CaCO3/L	5	<5
LB027991.023			
Acidity to pH 8.3	mg CaCO3/L	5	<5
Alkalinity Method: ME-(AU)-[ENV]AN135			
LB027789.001			
Total Alkalinity as CaCO3	mg/L	5	<5
LB027789.025			
Total Alkalinity as CaCO3	mg/L	5	<5
LB027789.049			
Total Alkalinity as CaCO3	mg/L	5	<5
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274			
LB027947.001			
Chloride	mg/L	1	<1
LB027947.026			
Chloride	mg/L	1	<1
LB027947.050			
Chloride	mg/L	1	<1
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278			
LB027850.001			
Filterable Reactive Phosphorus	mg/L	0.002	<0.002
Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141			
LB028015.001			
Fluoride by ISE	mg/L	0.1	<0.1
LB028015.025			
Fluoride by ISE	mg/L	0.1	<0.1

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR	BLK MB
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261			
LB027870.001			
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005
LB027870.024			
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005
Metals in Water (Total) by ICPOES Method: ME-(AU)-[ENV]AN022/AN320/AN321			
LB027767.001			
Total Aluminium	mg/L	0.02	<0.02
Total Iron	mg/L	0.02	<0.02
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321			
LB027769.001			
Calcium, Ca	mg/L	0.2	<0.2
Magnesium, Mg	mg/L	0.1	<0.1
Potassium, K	mg/L	0.1	<0.1
Silicon, Si	mg/L	0.02	<0.02
Sodium, Na	mg/L	0.5	<0.5
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258			
LB027870.001			
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
LB027870.024			
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
Sulphate in water Method: ME-(AU)-[ENV]AN275			
LB027947.001			
Sulphate	mg/L	1	<1
LB027947.026			
Sulphate	mg/L	1	<1
LB027947.050			
Sulphate	mg/L	1	<1
Sulphide by Titration in Water Method: ME-(AU)-[ENV]AN149			
LB027859.001			
Sulphide	mg/L	0.5	<0.5
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281			
LB027803.001			

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR	BLK MB

Continued... TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281
LB027803.001

Parameter	Units	Control LOR	BLK MB
Total Kjeldahl Nitrogen	mg/L	0.05	<0.05

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114
LB027948.001

Parameter	Units	Control LOR	BLK MB
Total Suspended Solids Dried at 105°C	mg/L	5	<5

LB027948.024

Parameter	Units	Control LOR	BLK MB
Total Suspended Solids Dried at 105°C	mg/L	5	<5

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318
LB027773.001

Parameter	Units	Control LOR	BLK MB
Aluminium, Al	µg/L	1	<1
Arsenic, As	µg/L	1	<1
Cadmium, Cd	µg/L	0.1	<0.1
Chromium, Cr	µg/L	1	<1
Copper, Cu	µg/L	1	<1
Iron, Fe	µg/L	5	<5
Lead, Pb	µg/L	1	<1
Manganese, Mn	µg/L	1	<1
Nickel, Ni	µg/L	1	<1
Selenium, Se	µg/L	2	<2
Zinc, Zn	µg/L	1	<1

VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434
LB027792.001
Monocyclic Aromatic Hydrocarbons

Parameter	Units	Control LOR	BLK MB
Benzene	µg/L	0.5	<0.5
Toluene	µg/L	0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5
m/p-xylene	µg/L	1	<1
o-xylene	µg/L	0.5	<0.5

Surrogates

Parameter	Units	Control LOR	BLK MB
Dibromofluoromethane (Surrogate)	%	-	95
d4-1,2-dichloroethane (Surrogate)	%	-	94
d8-toluene (Surrogate)	%	-	95
Bromofluorobenzene (Surrogate)	%	-	93

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434
LB027792.001

Parameter	Units	Control LOR	BLK MB
TRH C6-C9	µg/L	40	<40

Surrogates

Parameter	Units	Control LOR	BLK MB
Dibromofluoromethane (Surrogate)	%	-	95
d4-1,2-dichloroethane (Surrogate)	%	-	94
d8-toluene (Surrogate)	%	-	95
Bromofluorobenzene (Surrogate)	%	-	93

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE060989.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB027870.013						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0	<0.005	200	0
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB027870.013						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.099	0.10	20	2

		Sample Name		PE060989.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135 LB027789.039						
Total Alkalinity as CaCO3	mg/L	5	520.3851	530	16	2

		Sample Name		PE060990.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB027870.026						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0	<0.005	200	0
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB027870.026						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0	<0.005	200	0

		Sample Name		PE060992.004-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB027947.041						
Chloride	mg/L	1	1700	1600	15	3
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB027947.041						
Sulphate	mg/L	1	180	170	16	5

		Sample Name		PE060992.006-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135 LB027789.060						
Total Alkalinity as CaCO3	mg/L	5	300	300	17	1

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE060993.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB027947.029						
Chloride	mg/L	1	1200	1300	15	1
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB027947.029						
Sulphate	mg/L	1	210	190	16	6

		Sample Name		PE060993.004-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140 LB027991.012						
Acidity to pH 8.3	mg CaCO3/L	5	<5	<5	179	0
Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114 LB027948.026						
Total Suspended Solids Dried at 105°C	mg/L	5	670	710	16	5

		Sample Name		PE060993.006-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278 LB027850.012						
Filterable Reactive Phosphorus	mg/L	0.002	0.009	0.010	67	6
Metals in Water (Total) by ICPOES Method: ME-(AU)-[ENV]AN022/AN320/AN321 LB027767.010						
Total Aluminium	mg/L	0.02	11	11	15	3
Total Iron	mg/L	0.02	13	13	15	3
Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114 LB027948.029						
Total Suspended Solids Dried at 105°C	mg/L	5	1000	1100	15	5

		Sample Name		PE060993.007-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321 LB027769.011						
Calcium, Ca	mg/L	0.2	<0.2	<0.2	200	0
Magnesium, Mg	mg/L	0.1	<0.1	<0.1	200	0
Potassium, K	mg/L	0.1	<0.1	<0.1	200	0
Sodium, Na	mg/L	0.5	<0.5	<0.5	200	0

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE060993.007-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB027773.013						
Arsenic, As	µg/L	1	<1	<1	200	0
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	200	0
Chromium, Cr	µg/L	1	<1	<1	200	0
Copper, Cu	µg/L	1	<1	<1	200	0
Lead, Pb	µg/L	1	<1	<1	200	0
Nickel, Ni	µg/L	1	<1	<1	200	0
Zinc, Zn	µg/L	1	5	4	38	10

		Sample Name		PE060995.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB027789.053						
Total Alkalinity as CaCO3	mg/L	5	150	150	18	0

		Sample Name		PE060998.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB027789.014						
Total Alkalinity as CaCO3	mg/L	5	363.22462	370	16	1

		Sample Name		PE060998.015-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB027789.028						
Total Alkalinity as CaCO3	mg/L	5	594.36756	570	16	3

		Sample Name		PE061004.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281						
LB027803.012						
Total Kjeldahl Nitrogen	mg/L	0.05	130	130	15	2
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293						
LB027803.012						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	14	14	15	4

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE061012.007-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281 LB027803.023						
Total Kjeldahl Nitrogen	mg/L	0.05	82	79	15	4
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293 LB027803.023						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	12	12	15	1

		Sample Name		PE061016.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281 LB027803.026						
Total Kjeldahl Nitrogen	mg/L	0.05	46	44	15	5
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293 LB027803.026						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	7.4	6.9	15	6

		Sample Name		PE061027.018-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141 LB028015.020						
Fluoride by ISE	mg/L	0.1	0.4	0.4	38	1

		Sample Name		PE061041.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB027870.037						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.017	0.011	51	43
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB027870.037						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	4.45	4.4	15	2

		Sample Name		PE061041.003-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB027870.039						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0	<0.005	200	0

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE061041.003-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB027870.039						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	5.426	5.5	15	2

		Sample Name		PE061044.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141 LB028015.039						
Fluoride by ISE	mg/L	0.1	0.9	0.8	27	1

		Sample Name		PE061061.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114 LB027948.013						
Total Suspended Solids Dried at 105°C	mg/L	5	1.33333333333319	<5	200	0

		Sample Name		PE061072.003-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB027947.055						
Chloride	mg/L	1	4119.652	4100	15	1
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB027947.055						
Sulphate	mg/L	1	716.217	630	15	13

		Sample Name		PE061072.008-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB027947.063						
Chloride	mg/L	1	3835.111	3900	15	2
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB027947.063						
Sulphate	mg/L	1	743.624	790	15	6

DUPLICATES

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

			Sample Name	PE061097.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140 LB027991.024						
Acidity to pH 8.3	mg CaCO3/L	5	19.6639	17	42	14

			Sample Name	PE061099.007-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140 LB027991.033						
Acidity to pH 8.3	mg CaCO3/L	5	1.52433333333333	<5	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

	Control		LCS STD			
Parameter	**Units**	**LOR**	**Result**	**Expected Result**	**Criteria %**	**Recovery %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB027789.002						
Total Alkalinity as CaCO3	mg/L	5	44	45	85 - 115	97
LB027789.026						
Total Alkalinity as CaCO3	mg/L	5	47	45	85 - 115	104
LB027789.050						
Total Alkalinity as CaCO3	mg/L	5	47	45	85 - 115	104
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB027947.002						
Chloride	mg/L	1	10	10	85 - 115	105
LB027947.027						
Chloride	mg/L	1	11	10	85 - 115	105
LB027947.051						
Chloride	mg/L	1	11	10	85 - 115	106
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278						
LB027850.002						
Filterable Reactive Phosphorus	mg/L	0.002	0.057	0.05	80 - 120	114
Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141						
LB028015.007						
Fluoride by ISE	mg/L	0.1	1.7	2	80 - 120	87
LB028015.037						
Fluoride by ISE	mg/L	0.1	1.9	2	80 - 120	93
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261						
LB027870.002						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.83	0.8	85 - 115	103
LB027870.025						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.84	0.8	85 - 115	105
Metals in Water (Total) by ICPOES Method: ME-(AU)-[ENV]AN022/AN320/AN321						
LB027767.002						
Total Aluminium	mg/L	0.02	1.1	1	80 - 120	105
Total Iron	mg/L	0.02	1.0	1	80 - 120	104
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
LB027769.002						
Calcium, Ca	mg/L	0.2	180	200	80 - 120	92
Magnesium, Mg	mg/L	0.1	190	200	80 - 120	95
Potassium, K	mg/L	0.1	19	20	80 - 120	96
Silicon, Si	mg/L	0.02	1.9	2	80 - 120	96
Sodium, Na	mg/L	0.5	200	200	80 - 120	100

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

	Control		LCS STD			
Parameter	Units	LOR	Result	Expected Result	Criteria %	Recovery %
Continued... Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258						
LB027870.002						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.79	0.8	85 - 115	98
LB027870.025						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.78	0.8	85 - 115	98
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB027947.002						
Sulphate	mg/L	1	11	10	80 - 120	106
LB027947.027						
Sulphate	mg/L	1	11	10	80 - 120	108
LB027947.051						
Sulphate	mg/L	1	11	10	80 - 120	109
Sulphide by Titration in Water Method: ME-(AU)-[ENV]AN149						
LB027859.002						
Sulphide	mg/L	0.5	0.8	1	80 - 120	82
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281						
LB027803.002						
Total Kjeldahl Nitrogen	mg/L	0.05	0.90	1	80 - 120	90
Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114						
LB027948.002						
Total Suspended Solids Dried at 105°C	mg/L	5	450	500	85 - 115	91
LB027948.025						
Total Suspended Solids Dried at 105°C	mg/L	5	450	500	85 - 115	90
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293						
LB027803.002						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.54	0.5	80 - 120	107
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB027773.002						
Aluminium, Al	µg/L	1	10	10	80 - 120	102
Arsenic, As	µg/L	1	10	10	80 - 120	102
Cadmium, Cd	µg/L	0.1	10	10	80 - 120	101
Chromium, Cr	µg/L	1	10	10	80 - 120	99
Copper, Cu	µg/L	1	10	10	80 - 120	97
Iron, Fe	µg/L	5	10	10	80 - 120	97
Lead, Pb	µg/L	1	10	10	80 - 120	103
Manganese, Mn	µg/L	1	10	10	80 - 120	101
Nickel, Ni	µg/L	1	10	10	80 - 120	100
Selenium, Se	µg/L	2	8	10	80 - 120	85
Zinc, Zn	µg/L	1	10	10	80 - 120	100

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Control Units	LOR	LCS STD Result	Expected Result	Criteria %	Recovery %
Continued... Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434						
LB027792.002						
Monocyclic Aromatic Hydrocarbons						
Benzene	µg/L	0.5	4.3	5	50 - 150	86
Toluene	µg/L	0.5	4.6	5	50 - 150	92
Ethylbenzene	µg/L	0.5	4.4	5	50 - 150	87
Surrogates						
Dibromofluoromethane (Surrogate)	µg/L	-	5.4	5	60 - 130	108
d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.8	5	60 - 130	115
d8-toluene (Surrogate)	µg/L	-	5.1	5	60 - 130	102
Bromofluorobenzene (Surrogate)	µg/L	-	5.0	5	60 - 130	100
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434						
LB027792.002						
TRH C6-C9	µg/L	40	<40	30	70 - 130	83
Surrogates						
Dibromofluoromethane (Surrogate)	µg/L	-	5.4	5	60 - 130	108
d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.8	5	60 - 130	115
d8-toluene (Surrogate)	µg/L	-	5.1	5	60 - 130	102
Bromofluorobenzene (Surrogate)	µg/L	-	5.0	5	60 - 130	100

Matrix spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of the report. Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

	Control		MS			
Parameter	**Units**	**LOR**	**Result**	**Original Result**	**Spike Added**	**Recovery %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB027947.004						
Chloride	mg/L	1	15000	149849.625	100	NA
Spike recovery is outside acceptance criteria due to high background.						
LB027947.031						
Chloride	mg/L	1	2600	2500	100	84
LB027947.057						
Chloride	mg/L	1	120	0.514	100	116
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278						
LB027850.015						
Filterable Reactive Phosphorus	mg/L	0.002	4.1	4.1	0.05	97
Sample is spiked with 0.100ml of high QC FRP solution 50mg/L.						
Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141						
LB028015.010						
Fluoride by ISE	mg/L	0.1	0.9	0.4	0.5	99
Metals in Water (Total) by ICPOES Method: ME-(AU)-[ENV]AN022/AN320/AN321						
LB027767.004						
Total Aluminium	mg/L	0.02	6.2	1.8	1	**435†**
Total Iron	mg/L	0.02	5.1	1.8	1	**333†**
Recovery for Al and Fe failed acceptance criteria due to matrix interference.						
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
LB027769.004						
Calcium, Ca	mg/L	0.2	320	170	200	72
Magnesium, Mg	mg/L	0.1	220	54	200	85
Potassium, K	mg/L	0.1	25	7.9	20	86
Silicon, Si	mg/L	0.02	15	13	2	94
Sodium, Na	mg/L	0.5	520	300	200	105
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB027947.004						
Sulphate	mg/L	1	18000	17555.355	100	**448†**
Spike recovery is outside acceptance criteria due to high background.						
LB027947.031						
Sulphate	mg/L	1	380	280	100	92
LB027947.057						
Sulphate	mg/L	1	110	2.029	100	108
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB027773.004						
Arsenic, As	µg/L	1	10	<1	10	99
Cadmium, Cd	µg/L	0.1	10	<0.1	10	101
Chromium, Cr	µg/L	1	10	<1	10	95
Copper, Cu	µg/L	1	9	<1	10	94
Lead, Pb	µg/L	1	10	<1	10	98
Nickel, Ni	µg/L	1	10	<1	10	98
Zinc, Zn	µg/L	1	18	6	10	124

Matrix spike duplicates are calculated as relative percent difference using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The original result is the analyte concentration of the matrix spike and the replicate result is the analyte concentration of the matrix spike duplicate.
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spike Duplicates were required for this job.

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	NATA Accreditation does not cover this analysis.
^	Performed by outside laboratory.
LOR	Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
NA	The sample was not analysed for this analyte

Samples analysed as received.
Solid samples expressed on a dry weight basis.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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SAMPLE RECEIPT ADVICE

PE060993

CLIENT DETAILS

Contact	James Gavshon
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square Level 6, Grain Pool Bld, 172 St Georges Tce PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	james.gavshon@erm.com
Project	**0086269 BNPL Burrup**
Order Number	(Not specified)
Samples	9

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
Samples Received	Thu 22/9/2011
Report Due	Fri 30/9/2011
SGS Reference	**PE060993**

SUBMISSION DETAILS

This is to confirm that 9 samples were received on Thursday 22/9/2011. Results are expected to be ready by Friday 30/9/2011. Please quote SGS reference PE060993 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	9 Water	Type of documentation received	COC
Date documentation received	22/9/2011	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	14°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	**No**	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	2

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

Sample MW5 and DUP01 do not have bottles supplied for organics analysis requested on COC.
Trip01 and 02 are both labelled 01 and have incorrect bottles for analysis on COC.

As per conversation between James Gavshon and Mairead Tynan, Trip Blanks analysed for C6-C9 and BTEX. Organics analysis for samples MW5 and DUP01 disregarded. DB

To the extent not inconsistent with the other provisions of this document and unless specifically agreed otherwise in writing by SGS, all SGS services are rendered in accordance with the applicable SGS General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm as at the date of this document. Attention is drawn to the limitations of liability and to the clauses of indemnification.

SAMPLE RECEIPT ADVICE

PE060993

CLIENT DETAILS

Client	ERM Australia Pty Ltd	Project	0086269 BNPL Burrup

SUMMARY OF ANALYSIS

No.	Sample ID	Acidity and Free CO2	Alkalinity	Chloride by Discrete Analyser in Water	Filterable Reactive Phosphorus (FRP)	Fluoride by Ion Selective Electrode in Water	Low Level Ammonia Nitrogen by FIA	Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA	Sulphate in water	Sulphide by Titration in Water	TKN Kjeldahl Digestion by Discrete Analyser	Total and Volatile Suspended Solids (TSS /	Total Phosphorus by Kjeldahl Digestion DA in
001	MW1	1	3	1	1	1	1	1	1	1	2	1	1
002	MW2	1	3	1	1	1	1	1	1	1	2	1	1
003	MW3	1	3	1	1	1	1	1	1	1	2	1	1
004	MW4	1	3	1	1	1	1	1	1	1	2	1	1
005	MW5	1	3	1	1	1	1	1	1	1	2	1	1
006	DUP01	1	3	1	1	1	1	1	1	1	2	1	1
007	RIN01	-	3	1	-	-	-	-	1	-	-	-	-

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

SAMPLE RECEIPT ADVICE

CLIENT DETAILS

Client	ERM Australia Pty Ltd	Project	0086269 BNPL Burrup

SUMMARY OF ANALYSIS

No.	Sample ID	Calculation of Anion-Cation Balance	Metals in Water (Total) by ICPOES	Metals in Water (Dissolved) by ICPOES	Trace Metals (Dissolved) in Water by ICPMS	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	MW1	1	2	6	9	-	-
002	MW2	1	2	6	9	-	-
003	MW3	1	2	6	9	-	-
004	MW4	1	2	6	9	-	-
005	MW5	1	2	6	9	-	-
006	DUP01	1	2	6	9	-	-
007	RIN01	1	-	4	7	-	-
008	TRIP01	-	-	-	-	9	5
009	TRIP02	-	-	-	-	9	5

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

ANALYTICAL REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Brent Carter	Manager	Said Hirad
Client	ERM Australia Pty Ltd	Laboratory	SGS Newburn Environmental
Address	PO Box 7338 Cloisters Square Level 6, Grain Pool Bld, 172 St Georges Tce PERTH WA 6850	Address	10 Reid Rd Newburn WA 6105
Telephone	08 9321 5200	Telephone	(08) 9373 3500
Facsimile	08 9321 5262	Facsimile	(08) 9373 3556
Email	brent.carter@erm.com	Email	au.environmental.perth@sgs.com
Project	**0086269 BNPL Hydro Burrup**	SGS Reference	PE065491 R0
Order Number	**07444**	Report Number	0000036582
Samples	8	Date Reported	13 Mar 2012
		Date Received	04 Mar 2012

COMMENTS

The document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Samples "MW3", "MW4", "MW5" and "DUP01" were diluted due to high conductivity for metals. Hence the LORs were raised.

Total Fe and Al spike recovery for sample "MW1" was outside acceptance criteria due to high background.

SIGNATORIES

Ben Nicholson
Metals Team Leader

Dale Lang
Senior Organics Chemist

Hue Thanh Ly
Spectroscopy Chemist

Jeremy Truong
Inorganics Co-ordinator

Michael McKay
Inorganic Team Leader - Waters

Ohmar David
Spectroscopy Chemist

		Sample Number	PE065491.001	PE065491.002	PE065491.003	PE065491.004	PE065491.005
		Sample Matrix	Water	Water	Water	Water	Water
		Sample Date	27 Feb 2012	27 Feb 2012	27 Feb 2012	28 Feb 2012	28 Feb 2012
		Sample Name	MW1	MW2	MW3	MW4	MW5
Parameter	Units	LOR					

Total and Volatile Suspended Solids (TSS / VSS) Method: AN114

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Total Suspended Solids Dried at 105°C	mg/L	5	220	84	230	1900	1400

Alkalinity Method: AN135

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Total Alkalinity as CaCO3	mg/L	5	300	300	460	390	150
Bicarbonate Alkalinity as HCO3	mg/L	5	370	370	560	480	180
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1

Acidity and Free CO2 Method: AN140

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Acidity to pH 8.3	mg CaCO3/L	5	230	180	120	66	180

Colour by Discrete Analyser Method: AN285

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Colour (True)	Hazen	1	<1	<1	1	<1	<1

Chloride by Discrete Analyser in Water Method: AN274

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Chloride	mg/L	1	670	1400	4000	3200	80000

Sulphate in water Method: AN275

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Sulphate	mg/L	1	140	220	940	410	4400

Sulphide by Titration in Water Method: AN149

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Sulphide	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Nitrate, NO_3 as NO_3	mg/L	0.05	8.7	2.7	1.4	0.74	5.5
Nitrite, NO_2 as NO_2	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	2.0	0.62	0.32	0.17	1.2
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate Nitrogen, NO_3 as N	mg/L	0.005	2.0	0.62	0.32	0.17	1.2

Low Level Ammonia Nitrogen by FIA Method: AN261

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005	0.030	<0.005	<0.005	<0.005
Ammonia, NH_3	mg/L	0.005	<0.005	0.036	<0.005	<0.005	<0.005

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Total Kjeldahl Nitrogen	mg/L	0.05	0.17	0.26	0.29	0.59	2.2
Total Nitrogen (calc)	mg/L	0.05	2.1	0.88	0.61	0.76	3.4

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.08	0.03	0.05	0.48	0.21

Filterable Reactive Phosphorus (FRP) Method: AN278

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Filterable Reactive Phosphorus	mg/L	0.002	<0.002	<0.002	<0.002	0.007	0.006

Fluoride by Ion Selective Electrode in Water Method: AN141

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Fluoride by ISE	mg/L	0.1	0.5	0.7	1.5	0.6	0.4

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Parameter	Units	LOR	MW1	MW2	MW3	MW4	MW5
Aluminium, Al	µg/L	1	2	5	5	<5↑	<100↑
Arsenic, As	µg/L	1	<1	<1	<5↑	<5↑	<100↑
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.5↑	<0.5↑	<10↑
Chromium, Cr	µg/L	1	<1	<1	<5↑	<5↑	<100↑
Copper, Cu	µg/L	1	-	-	-	-	-
Iron, Fe	µg/L	5	<5	240	<25↑	<25↑	<500↑
Lead, Pb	µg/L	1	-	-	-	-	-

		Sample Number	PE065491.001	PE065491.002	PE065491.003	PE065491.004	PE065491.005
		Sample Matrix	Water	Water	Water	Water	Water
		Sample Date	27 Feb 2012	27 Feb 2012	27 Feb 2012	28 Feb 2012	28 Feb 2012
		Sample Name	MW1	MW2	MW3	MW4	MW5
Parameter	**Units**	**LOR**					

Trace Metals (Dissolved) in Water by ICPMS Method: AN318 (continued)

Manganese, Mn	µg/L	1	88	220	26	33	<100↑
Nickel, Ni	µg/L	1	<1	<1	<5↑	<5↑	<100↑
Selenium, Se	µg/L	2	<2	<2	<10↑	<10↑	<200↑
Zinc, Zn	µg/L	1	38	47	32	47	<100↑

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Calcium, Ca	mg/L	0.2	180	240	95	49	1100
Magnesium, Mg	mg/L	0.1	53	140	210	96	4700
Potassium, K	mg/L	0.1	7.7	24	120	110	2100
Silica, Soluble	mg/L	0.05	29	24	33	19	9.8
Sodium, Na	mg/L	0.5	340	1000	3200	2700	57000

Trace Metals (Total) in Water by ICPMS Method: AN318

Total Aluminium	µg/L	5	3600	3600	6500	82000	18000
Total Iron	µg/L	5	4200	4600	6800	130000	25000

Mercury (dissolved) in Water Method: AN311/AN312

Mercury	mg/L	0.0001	-	-	-	-	-

VOCs in Water Method: AN433/AN434

Monocyclic Aromatic Hydrocarbons

Benzene	µg/L	0.5	-	-	-	-	-
Toluene	µg/L	0.5	-	-	-	-	-
Ethylbenzene	µg/L	0.5	-	-	-	-	-
m/p-xylene	µg/L	1	-	-	-	-	-
o-xylene	µg/L	0.5	-	-	-	-	-

Oxygenated Compounds

MtBE (Methyl-tert-butyl ether)	µg/L	0.5	-	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-	-

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

TRH C6-C10 F1	µg/L	50	-	-	-	-	-
TRH C6-C9	µg/L	40	-	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-	-

Sample Number			PE065491.001	PE065491.002	PE065491.003	PE065491.004	PE065491.005
Sample Matrix			Water	Water	Water	Water	Water
Sample Date			27 Feb 2012	27 Feb 2012	27 Feb 2012	28 Feb 2012	28 Feb 2012
Sample Name			MW1	MW2	MW3	MW4	MW5
Parameter	**Units**	**LOR**					

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403

Parameter	Units	LOR	PE065491.001	PE065491.002	PE065491.003	PE065491.004	PE065491.005
TRH C10-C14	µg/L	50	-	-	-	-	-
TRH C15-C28	µg/L	200	-	-	-	-	-
TRH C29-C36	µg/L	200	-	-	-	-	-
TRH >C10-C16 F2	µg/L	60	-	-	-	-	-
TRH >C16-C34 F3	µg/L	500	-	-	-	-	-
TRH >C34-C40 F4	µg/L	500	-	-	-	-	-

Surrogates

Parameter	Units	LOR	PE065491.001	PE065491.002	PE065491.003	PE065491.004	PE065491.005
TRH (Surrogate)	%	-	-	-	-	-	-

Sample Number			PE065491.006	PE065491.007	PE065491.008
Sample Matrix			Water	Water	Water
Sample Date			28 Feb 2012	28 Feb 2012	28 Feb 2012
Sample Name			DUP01	RIN01	TRIP01
Parameter	**Units**	**LOR**			

Total and Volatile Suspended Solids (TSS / VSS) Method: AN114

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Total Suspended Solids Dried at 105°C	mg/L	5	**2200**	-	-

Alkalinity Method: AN135

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Total Alkalinity as CaCO3	mg/L	5	**170**	<5	-
Bicarbonate Alkalinity as HCO3	mg/L	5	**200**	<5	-
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	-

Acidity and Free CO2 Method: AN140

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Acidity to pH 8.3	mg CaCO3/L	5	**180**	-	-

Colour by Discrete Analyser Method: AN285

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Colour (True)	Hazen	1	<1	-	-

Chloride by Discrete Analyser in Water Method: AN274

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Chloride	mg/L	1	**81000**	<1	-

Sulphate in water Method: AN275

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Sulphate	mg/L	1	**4600**	<1	-

Sulphide by Titration in Water Method: AN149

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Sulphide	mg/L	0.5	<0.5	-	-

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Nitrate, NO_3 as NO_3	mg/L	0.05	**5.5**	-	-
Nitrite, NO_2 as NO_2	mg/L	0.05	<0.05	-	-
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**1.2**	-	-
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	-	-
Nitrate Nitrogen, NO_3 as N	mg/L	0.005	**1.2**	-	-

Low Level Ammonia Nitrogen by FIA Method: AN261

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005	-	-
Ammonia, NH_3	mg/L	0.005	<0.005	-	-

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Total Kjeldahl Nitrogen	mg/L	0.05	**3.3**	-	-
Total Nitrogen (calc)	mg/L	0.05	**4.5**	-	-

		Sample Number	PE065491.006	PE065491.007	PE065491.008
		Sample Matrix	Water	Water	Water
		Sample Date	28 Feb 2012	28 Feb 2012	28 Feb 2012
		Sample Name	DUP01	RIN01	TRIP01
Parameter	Units	LOR			

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	**0.25**	-	-

Filterable Reactive Phosphorus (FRP) Method: AN278

Filterable Reactive Phosphorus	mg/L	0.002	**0.008**	-	-

Fluoride by Ion Selective Electrode in Water Method: AN141

Fluoride by ISE	mg/L	0.1	**0.4**	-	-

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Aluminium, Al	µg/L	1	<100↑	-	-
Arsenic, As	µg/L	1	<100↑	<1	-
Cadmium, Cd	µg/L	0.1	<10↑	<0.1	-
Chromium, Cr	µg/L	1	<100↑	<1	-
Copper, Cu	µg/L	1	-	<1	-
Iron, Fe	µg/L	5	<500↑	-	-
Lead, Pb	µg/L	1	-	<1	-
Manganese, Mn	µg/L	1	<100↑	-	-
Nickel, Ni	µg/L	1	<100↑	<1	-
Selenium, Se	µg/L	2	<200↑	-	-
Zinc, Zn	µg/L	1	<100↑	**7**	-

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Calcium, Ca	mg/L	0.2	**1000**	<0.2	-
Magnesium, Mg	mg/L	0.1	**4300**	**0.1**	-
Potassium, K	mg/L	0.1	**2000**	<0.1	-
Silica, Soluble	mg/L	0.05	**9.8**	-	-
Sodium, Na	mg/L	0.5	**52000**	**2.0**	-

Trace Metals (Total) in Water by ICPMS Method: AN318

Total Aluminium	µg/L	5	**18000**	-	-
Total Iron	µg/L	5	**23000**	-	-

Mercury (dissolved) in Water Method: AN311/AN312

Mercury	mg/L	0.0001	-	<0.0001	-

VOCs in Water Method: AN433/AN434

Monocyclic Aromatic Hydrocarbons

Benzene	µg/L	0.5	-	-	<0.5
Toluene	µg/L	0.5	-	-	<0.5
Ethylbenzene	µg/L	0.5	-	-	<0.5
m/p-xylene	µg/L	1	-	-	<1
o-xylene	µg/L	0.5	-	-	<0.5

Oxygenated Compounds

MtBE (Methyl-tert-butyl ether)	µg/L	0.5	-	-	<0.5

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	**104**
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	**103**
d8-toluene (Surrogate)	%	-	-	-	**101**
Bromofluorobenzene (Surrogate)	%	-	-	-	**101**

Parameter	Units	LOR	PE065491.006 Water 28 Feb 2012 DUP01	PE065491.007 Water 28 Feb 2012 RIN01	PE065491.008 Water 28 Feb 2012 TRIP01

Sample Number / Sample Matrix / Sample Date / Sample Name

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
TRH C6-C10 F1	µg/L	50	-	-	<50
TRH C6-C9	µg/L	40	-	-	<40

Surrogates

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
Dibromofluoromethane (Surrogate)	%	-	-	-	104
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	103
d8-toluene (Surrogate)	%	-	-	-	101
Bromofluorobenzene (Surrogate)	%	-	-	-	101

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
TRH C10-C14	µg/L	50	-	-	-
TRH C15-C28	µg/L	200	-	-	-
TRH C29-C36	µg/L	200	-	-	-
TRH >C10-C16 F2	µg/L	60	-	-	-
TRH >C16-C34 F3	µg/L	500	-	-	-
TRH >C34-C40 F4	µg/L	500	-	-	-

Surrogates

Parameter	Units	LOR	PE065491.006	PE065491.007	PE065491.008
TRH (Surrogate)	%	-	-	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Acidity and Free CO2 Method: ME-(AU)-[ENV]AN140

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Acidity to pH 8.3	LB036948	mg CaCO3/L	5	<5	0%

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB036947	mg/L	5	<5	0%	104%
Bicarbonate Alkalinity as HCO3	LB036947	mg/L	5	<5		
Carbonate Alkalinity as CO3	LB036947	mg/L	1	<1		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Chloride	LB036977	mg/L	1	<1	3 - 13%	102 - 103%	94%

Colour by Discrete Analyser Method: ME-(AU)-[ENV]AN285

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Colour (True)	LB036979	Hazen	1	<1	0%	93%

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Filterable Reactive Phosphorus	LB036978	mg/L	0.002	<0.002	0%	103%	102%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Fluoride by ISE	LB037029	mg/L	0.1	<0.1	1 - 3%	97 - 105%	93 - 99%

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Ammonia Nitrogen, NH_3 as N	LB037181	mg/L	0.005	<0.005	0 - 7%	100 - 104%
Ammonia, NH_3	LB037181	mg/L	0.005	<0.005	0 - 7%	100 - 104%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB036965	mg/L	0.0001	<0.0001	0%	102%	99%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB036980	mg/L	0.2	<0.2	0 - 2%	97%	83%
	LB037016	mg/L	0.2	<0.2	0%	94%	99%
Magnesium, Mg	LB036980	mg/L	0.1	<0.1	2 - 4%	95%	82%
	LB037016	mg/L	0.1	<0.1	2%	91%	99%
Potassium, K	LB036980	mg/L	0.1	<0.1	1 - 7%	90%	124%
	LB037016	mg/L	0.1	<0.1	0%	91%	98%
Silica, Soluble	LB036980	mg/L	0.05	<0.05			
Sodium, Na	LB036980	mg/L	0.5	<0.5	3%	107%	95%
	LB037016	mg/L	0.5	<0.5	30%	107%	116%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA **Method: ME-(AU)-[ENV]AN258**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate, NO_3 as NO_3	LB037181	mg/L	0.05	<0.05		
Nitrite, NO_2 as NO_2	LB037181	mg/L	0.05	<0.05		
Nitrate/Nitrite Nitrogen, NOx as N	LB037181	mg/L	0.005	<0.005	0 - 6%	99 - 101%
Nitrite Nitrogen, NO_2 as N	LB037181	mg/L	0.005	<0.005	0%	100 - 102%
Nitrate Nitrogen, NO_3 as N	LB037181	mg/L	0.005	<0.005		

Sulphate in water **Method: ME-(AU)-[ENV]AN275**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sulphate	LB036977	mg/L	1	<1	6 - 10%	110 - 111%	84%

Sulphide by Titration in Water **Method: ME-(AU)-[ENV]AN149**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Sulphide	LB037014	mg/L	0.5	<0.5	82%

TKN Kjeldahl Digestion by Discrete Analyser **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Total Kjeldahl Nitrogen	LB037019	mg/L	0.05	<0.05	103%
Total Nitrogen (calc)	LB037019	mg/L	0.05	<0.05	NA

Total and Volatile Suspended Solids (TSS / VSS) **Method: ME-(AU)-[ENV]AN114**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 105°C	LB037169	mg/L	5	<5	0 - 15%	98 - 108%

Total Phosphorus by Kjeldahl Digestion DA in Water **Method: ME-(AU)-[ENV]AN279/AN293**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB037019	mg/L	0.01	<0.01	94%

Trace Metals (Dissolved) in Water by ICPMS **Method: ME-(AU)-[ENV]AN318**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB036989	µg/L	1	<1	30%	118%	111%
Arsenic, As	LB036989	µg/L	1	<1	20%	102%	99%
Cadmium, Cd	LB036989	µg/L	0.1	<0.1	0%	102%	
Chromium, Cr	LB036989	µg/L	1	<1	7%	107%	104%
Copper, Cu	LB036989	µg/L	1	<1	7%	113%	92%
Iron, Fe	LB036989	µg/L	5	<5	7%	120%	99%
Lead, Pb	LB036989	µg/L	1	<1	17%	96%	88%
Manganese, Mn	LB036989	µg/L	1	<1	4%	107%	101%
Nickel, Ni	LB036989	µg/L	1	<1	9%	105%	95%
Selenium, Se	LB036989	µg/L	2	<2	0%	102%	
Zinc, Zn	LB036989	µg/L	1	<1	7%	115%	75%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Trace Metals (Total) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Aluminium	LB036991	µg/L	5	<5	0%	105%	
Total Iron	LB036991	µg/L	5	<5	5%	119%	0%

VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434

Monocyclic Aromatic Hydrocarbons

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Benzene	LB037004	µg/L	0.5	<0.5	86%
Toluene	LB037004	µg/L	0.5	<0.5	91%
Ethylbenzene	LB037004	µg/L	0.5	<0.5	92%
m/p-xylene	LB037004	µg/L	1	<1	
o-xylene	LB037004	µg/L	0.5	<0.5	

Oxygenated Compounds

Parameter	QC Reference	Units	LOR	MB
MtBE (Methyl-tert-butyl ether)	LB037004	µg/L	0.5	<0.5

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Dibromofluoromethane (Surrogate)	LB037004	%	-	100%	110%
d4-1,2-dichloroethane (Surrogate)	LB037004	%	-	98%	108%
d8-toluene (Surrogate)	LB037004	%	-	97%	98%
Bromofluorobenzene (Surrogate)	LB037004	%	-	99%	99%

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C6-C10 F1	LB037004	µg/L	50	<50	
TRH C6-C9	LB037004	µg/L	40	<40	75%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Dibromofluoromethane (Surrogate)	LB037004	%	-	100%	110%
d4-1,2-dichloroethane (Surrogate)	LB037004	%	-	98%	108%
d8-toluene (Surrogate)	LB037004	%	-	97%	98%
Bromofluorobenzene (Surrogate)	LB037004	%	-	99%	99%

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN083	Separatory funnels are used for aqueous samples and extracted by transferring an appropriate volume (mass) of liquid into a separatory funnel and adding 3 serial aliquots of dichloromethane. Samples receive a single extraction at pH 7 to recover base / neutral analytes and two extractions at pH < 2 to recover acidic analytes. QC samples are prepared by spiking organic free water with target analytes and extracting as per samples.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN140	Acidity by Tritration: The water sample is titrated with sodium hydroxide to designated pH end point. In a sample containing only carbon dioxide, bicarbonates and carbonates, titration to pH 8.3 at 25°C corresponds to stoichiometric neutralisation of carbonic acid to bicarbonate. Method reference APHA 2310 B.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN149	Sulphide by Iodometric Titration: Sulphide is precipitated as zinc sulphide to overcome interferences with sulphite and thiosulphate. After filtration, sulphide is determined titrimetrically. Reference APHA 4500-S2-
AN258	Nitrate and Nitrite by FIA: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN261	Ammonia by Continuous Flow Analyser: Ammonium in a basic medium forms ammonia gas, which is separated from the sample matrix by diffusion through a polypropylene membrane. The ammonia is reacted with phenol and hypochlorite to form indophenol blue at an intensity proportional to the ammonia concentration. The blue colour is intensified with sodium nitroprusside and the absorbance measured at 630 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-NH3 H.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN275	Suphate by Aquakem DA: Sulphate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.
AN278	Reactive Phosphorus by DA: Orthophosphate reacts with ammonium molybdate (Mo VI) and potassium antimonyl tartrate (Sb III) in acid medium to form an antimony-phosphomolybdate complex. This complex is subsequently reduced with ascorbic acid to form a blue colour and the absorbance is read at 880 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-P F

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN285	The term 'colour' is used here to mean true colour, that is, the colour of water from which turbidity has been removed. The term 'apparent colour' includes not only colour due to substances in solution, but also that due to suspended matter. Apparent colour is determined on the original sample without filtration.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with diffential polarity of the elluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependant on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

IS	Insufficient sample for analysis.	QFH	QC result is above the upper tolerance
LNR	Sample listed, but not received.	QFL	QC result is below the lower tolerance
*	This analysis is not covered by the scope of accreditation.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated
LOR	Limit of Reporting		
↑↓	Raised or Lowered Limit of Reporting		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-11.pdf

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STATEMENT OF QA/QC PERFORMANCE

PE065491 R0

CLIENT DETAILS

Contact	Brent Carter
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square Level 6, Grain Pool Bld, 172 St Georges Tce PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	brent.carter@erm.com
Project	**0086269 BNPL Hydro Burrup**
Order Number	**07444**
Samples	8

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE065491 R0
Report Number	0000036581
Date Reported	13 Mar 2012

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS Environmental Services' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Acidity and Free CO2	6 items
	Alkalinity	7 items
	Colour by Discrete Analyser	6 items
	Sulphide by Titration in Water	3 items
	Total and Volatile Suspended Solids (TSS / VSS)	3 items
Analysis Date	Acidity and Free CO2	6 items
	Alkalinity	7 items
	Colour by Discrete Analyser	6 items
	Sulphide by Titration in Water	3 items
Matrix Spike	Trace Metals (Total) in Water by ICPMS	1 item

SAMPLE SUMMARY

Sample counts by matrix	8 Water	Type of documentation received	COC
Date documentation received	4/3/2012	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	4.6°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	2

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Acidity and Free CO2

Method: ME-(AU)-[ENV]AN140

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036948	27 Feb 2012	04 Mar 2012	28 Feb 2012	06 Mar 2012†	28 Feb 2012	06 Mar 2012†
MW2	PE065491.002	LB036948	27 Feb 2012	04 Mar 2012	28 Feb 2012	06 Mar 2012†	28 Feb 2012	06 Mar 2012†
MW3	PE065491.003	LB036948	27 Feb 2012	04 Mar 2012	28 Feb 2012	06 Mar 2012†	28 Feb 2012	06 Mar 2012†
MW4	PE065491.004	LB036948	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
MW5	PE065491.005	LB036948	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
DUP01	PE065491.006	LB036948	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†

Alkalinity

Method: ME-(AU)-[ENV]AN135

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036947	27 Feb 2012	04 Mar 2012	28 Feb 2012	06 Mar 2012†	28 Feb 2012	06 Mar 2012†
MW2	PE065491.002	LB036947	27 Feb 2012	04 Mar 2012	28 Feb 2012	06 Mar 2012†	28 Feb 2012	06 Mar 2012†
MW3	PE065491.003	LB036947	27 Feb 2012	04 Mar 2012	28 Feb 2012	06 Mar 2012†	28 Feb 2012	06 Mar 2012†
MW4	PE065491.004	LB036947	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
MW5	PE065491.005	LB036947	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
DUP01	PE065491.006	LB036947	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
RIN01	PE065491.007	LB036947	28 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†

Chloride by Discrete Analyser in Water

Method: ME-(AU)-[ENV]AN274

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036977	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW2	PE065491.002	LB036977	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW3	PE065491.003	LB036977	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW4	PE065491.004	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
MW5	PE065491.005	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
DUP01	PE065491.006	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
RIN01	PE065491.007	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012

Colour by Discrete Analyser

Method: ME-(AU)-[ENV]AN285

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036979	27 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
MW2	PE065491.002	LB036979	27 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
MW3	PE065491.003	LB036979	27 Feb 2012	04 Mar 2012	29 Feb 2012	06 Mar 2012†	29 Feb 2012	06 Mar 2012†
MW4	PE065491.004	LB036979	28 Feb 2012	04 Mar 2012	01 Mar 2012	06 Mar 2012†	01 Mar 2012	06 Mar 2012†
MW5	PE065491.005	LB036979	28 Feb 2012	04 Mar 2012	01 Mar 2012	06 Mar 2012†	01 Mar 2012	06 Mar 2012†
DUP01	PE065491.006	LB036979	28 Feb 2012	04 Mar 2012	01 Mar 2012	06 Mar 2012†	01 Mar 2012	06 Mar 2012†

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036978	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW2	PE065491.002	LB036978	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW3	PE065491.003	LB036978	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW4	PE065491.004	LB036978	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
MW5	PE065491.005	LB036978	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
DUP01	PE065491.006	LB036978	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012

Fluoride by Ion Selective Electrode in Water

Method: ME-(AU)-[ENV]AN141

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037029	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW2	PE065491.002	LB037029	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW3	PE065491.003	LB037029	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW4	PE065491.004	LB037029	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
MW5	PE065491.005	LB037029	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
DUP01	PE065491.006	LB037029	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012

Low Level Ammonia Nitrogen by FIA

Method: ME-(AU)-[ENV]AN261

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037181	27 Feb 2012	04 Mar 2012	26 Mar 2012	09 Mar 2012	26 Mar 2012	12 Mar 2012
MW2	PE065491.002	LB037181	27 Feb 2012	04 Mar 2012	26 Mar 2012	09 Mar 2012	26 Mar 2012	12 Mar 2012
MW3	PE065491.003	LB037181	27 Feb 2012	04 Mar 2012	26 Mar 2012	09 Mar 2012	26 Mar 2012	12 Mar 2012
MW4	PE065491.004	LB037181	28 Feb 2012	04 Mar 2012	27 Mar 2012	09 Mar 2012	27 Mar 2012	12 Mar 2012
MW5	PE065491.005	LB037181	28 Feb 2012	04 Mar 2012	27 Mar 2012	09 Mar 2012	27 Mar 2012	12 Mar 2012
DUP01	PE065491.006	LB037181	28 Feb 2012	04 Mar 2012	27 Mar 2012	09 Mar 2012	27 Mar 2012	12 Mar 2012

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
RIN01	PE065491.007	LB036965	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320/AN321

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036980	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	09 Mar 2012
MW2	PE065491.002	LB036980	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	09 Mar 2012
MW3	PE065491.003	LB036980	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	09 Mar 2012
MW4	PE065491.004	LB036980	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	09 Mar 2012
MW5	PE065491.005	LB036980	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	09 Mar 2012
DUP01	PE065491.006	LB036980	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	09 Mar 2012
RIN01	PE065491.007	LB037016	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	09 Mar 2012

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA

Method: ME-(AU)-[ENV]AN258

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037181	27 Feb 2012	04 Mar 2012	26 Mar 2012	09 Mar 2012	26 Mar 2012	12 Mar 2012
MW2	PE065491.002	LB037181	27 Feb 2012	04 Mar 2012	26 Mar 2012	09 Mar 2012	26 Mar 2012	12 Mar 2012
MW3	PE065491.003	LB037181	27 Feb 2012	04 Mar 2012	26 Mar 2012	09 Mar 2012	26 Mar 2012	12 Mar 2012
MW4	PE065491.004	LB037181	28 Feb 2012	04 Mar 2012	27 Mar 2012	09 Mar 2012	27 Mar 2012	12 Mar 2012
MW5	PE065491.005	LB037181	28 Feb 2012	04 Mar 2012	27 Mar 2012	09 Mar 2012	27 Mar 2012	12 Mar 2012
DUP01	PE065491.006	LB037181	28 Feb 2012	04 Mar 2012	27 Mar 2012	09 Mar 2012	27 Mar 2012	12 Mar 2012

Sulphate in water

Method: ME-(AU)-[ENV]AN275

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036977	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW2	PE065491.002	LB036977	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW3	PE065491.003	LB036977	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	07 Mar 2012
MW4	PE065491.004	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
MW5	PE065491.005	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
DUP01	PE065491.006	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012
RIN01	PE065491.007	LB036977	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	07 Mar 2012

Sulphide by Titration in Water

Method: ME-(AU)-[ENV]AN149

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037014	27 Feb 2012	04 Mar 2012	05 Mar 2012	06 Mar 2012†	05 Mar 2012	06 Mar 2012†
MW2	PE065491.002	LB037014	27 Feb 2012	04 Mar 2012	05 Mar 2012	06 Mar 2012†	05 Mar 2012	06 Mar 2012†
MW3	PE065491.003	LB037014	27 Feb 2012	04 Mar 2012	05 Mar 2012	06 Mar 2012†	05 Mar 2012	06 Mar 2012†
MW4	PE065491.004	LB037014	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	06 Mar 2012	06 Mar 2012
MW5	PE065491.005	LB037014	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	06 Mar 2012	06 Mar 2012
DUP01	PE065491.006	LB037014	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	06 Mar 2012	06 Mar 2012

TKN Kjeldahl Digestion by Discrete Analyser

Method: ME-(AU)-[ENV]AN281

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037019	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	09 Mar 2012
MW2	PE065491.002	LB037019	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	09 Mar 2012
MW3	PE065491.003	LB037019	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	09 Mar 2012
MW4	PE065491.004	LB037019	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	09 Mar 2012
MW5	PE065491.005	LB037019	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	09 Mar 2012
DUP01	PE065491.006	LB037019	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	09 Mar 2012

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037169	27 Feb 2012	04 Mar 2012	05 Mar 2012	06 Mar 2012†	13 Mar 2012	07 Mar 2012
MW2	PE065491.002	LB037169	27 Feb 2012	04 Mar 2012	05 Mar 2012	06 Mar 2012†	13 Mar 2012	07 Mar 2012
MW3	PE065491.003	LB037169	27 Feb 2012	04 Mar 2012	05 Mar 2012	06 Mar 2012†	13 Mar 2012	07 Mar 2012
MW4	PE065491.004	LB037169	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	13 Mar 2012	07 Mar 2012
MW5	PE065491.005	LB037169	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	13 Mar 2012	07 Mar 2012
DUP01	PE065491.006	LB037169	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	13 Mar 2012	07 Mar 2012

Total Phosphorus by Kjeldahl Digestion DA in Water

Method: ME-(AU)-[ENV]AN279/AN293

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB037019	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	09 Mar 2012
MW2	PE065491.002	LB037019	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	09 Mar 2012

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Total Phosphorus by Kjeldahl Digestion DA in Water (continued)

Method: ME-(AU)-[ENV]AN279/AN293

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW3	PE065491.003	LB037019	27 Feb 2012	04 Mar 2012	26 Mar 2012	07 Mar 2012	26 Mar 2012	09 Mar 2012
MW4	PE065491.004	LB037019	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	09 Mar 2012
MW5	PE065491.005	LB037019	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	09 Mar 2012
DUP01	PE065491.006	LB037019	28 Feb 2012	04 Mar 2012	27 Mar 2012	07 Mar 2012	27 Mar 2012	09 Mar 2012

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036989	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	12 Mar 2012
MW2	PE065491.002	LB036989	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	12 Mar 2012
MW3	PE065491.003	LB036989	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	12 Mar 2012
MW4	PE065491.004	LB036989	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	12 Mar 2012
MW5	PE065491.005	LB036989	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	12 Mar 2012
DUP01	PE065491.006	LB036989	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	12 Mar 2012
RIN01	PE065491.007	LB036989	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	09 Mar 2012

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE065491.001	LB036991	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	13 Mar 2012
MW2	PE065491.002	LB036991	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	13 Mar 2012
MW3	PE065491.003	LB036991	27 Feb 2012	04 Mar 2012	25 Aug 2012	07 Mar 2012	25 Aug 2012	13 Mar 2012
MW4	PE065491.004	LB036991	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	13 Mar 2012
MW5	PE065491.005	LB036991	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	13 Mar 2012
DUP01	PE065491.006	LB036991	28 Feb 2012	04 Mar 2012	26 Aug 2012	07 Mar 2012	26 Aug 2012	13 Mar 2012

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TRIP01	PE065491.008	LB037004	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	15 Apr 2012	08 Mar 2012

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TRIP01	PE065491.008	LB037004	28 Feb 2012	04 Mar 2012	06 Mar 2012	06 Mar 2012	15 Apr 2012	08 Mar 2012

Samples received outside recommended technical holding times for Acidity, Alkalinity, Colour and Sulphide and TSS.

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	101
d4-1,2-dichloroethane (Surrogate)	TRIP01	PE065491.008	%	40 - 130%	103
d8-toluene (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	101
Dibromofluoromethane (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	104

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	101
d4-1,2-dichloroethane (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	103
d8-toluene (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	101
Dibromofluoromethane (Surrogate)	TRIP01	PE065491.008	%	60 - 130%	104

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Acidity and Free CO2

Method: ME-(AU)-[ENV]AN140

Sample Number	Parameter	Units	LOR	Result
LB036948.001	Acidity to pH 8.3	mg CaCO3/L	5	<5

Alkalinity

Method: ME-(AU)-[ENV]AN135

Sample Number	Parameter	Units	LOR	Result
LB036947.001	Total Alkalinity as CaCO3	mg/L	5	<5

Chloride by Discrete Analyser in Water

Method: ME-(AU)-[ENV]AN274

Sample Number	Parameter	Units	LOR	Result
LB036977.001	Chloride	mg/L	1	<1
LB036977.025	Chloride	mg/L	1	<1

Colour by Discrete Analyser

Method: ME-(AU)-[ENV]AN285

Sample Number	Parameter	Units	LOR	Result
LB036979.001	Colour (True)	Hazen	1	<1

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Sample Number	Parameter	Units	LOR	Result
LB036978.001	Filterable Reactive Phosphorus	mg/L	0.002	<0.002

Fluoride by Ion Selective Electrode in Water

Method: ME-(AU)-[ENV]AN141

Sample Number	Parameter	Units	LOR	Result
LB037029.001	Fluoride by ISE	mg/L	0.1	<0.1
LB037029.025	Fluoride by ISE	mg/L	0.1	<0.1

Low Level Ammonia Nitrogen by FIA

Method: ME-(AU)-[ENV]AN261

Sample Number	Parameter	Units	LOR	Result
LB037181.001	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005
	Ammonia, NH_3	mg/L	0.005	<0.005
LB037181.024	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005
	Ammonia, NH_3	mg/L	0.005	<0.005

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Sample Number	Parameter	Units	LOR	Result
LB036965.001	Mercury	mg/L	0.0001	<0.0001

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320/AN321

Sample Number	Parameter	Units	LOR	Result
LB036980.001	Calcium, Ca	mg/L	0.2	<0.2
	Magnesium, Mg	mg/L	0.1	<0.1
	Potassium, K	mg/L	0.1	<0.1
	Sodium, Na	mg/L	0.5	<0.5
LB037016.001	Calcium, Ca	mg/L	0.2	<0.2
	Magnesium, Mg	mg/L	0.1	<0.1
	Potassium, K	mg/L	0.1	<0.1
	Sodium, Na	mg/L	0.5	<0.5

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA

Method: ME-(AU)-[ENV]AN258

Sample Number	Parameter	Units	LOR	Result
LB037181.001	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
	Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005
LB037181.024	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
	Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Sulphate in water

Method: ME-(AU)-[ENV]AN275

Sample Number	Parameter	Units	LOR	Result
LB036977.001	Sulphate	mg/L	1	<1
LB036977.025	Sulphate	mg/L	1	<1

Sulphide by Titration in Water

Method: ME-(AU)-[ENV]AN149

Sample Number	Parameter	Units	LOR	Result
LB037014.001	Sulphide	mg/L	0.5	<0.5

TKN Kjeldahl Digestion by Discrete Analyser

Method: ME-(AU)-[ENV]AN281

Sample Number	Parameter	Units	LOR	Result
LB037019.001	Total Kjeldahl Nitrogen	mg/L	0.05	<0.05

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Sample Number	Parameter	Units	LOR	Result
LB037169.001	Total Suspended Solids Dried at 105°C	mg/L	5	<5
LB037169.024	Total Suspended Solids Dried at 105°C	mg/L	5	<5

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB036989.001	Aluminium, Al	µg/L	1	<1
	Arsenic, As	µg/L	1	<1
	Cadmium, Cd	µg/L	0.1	<0.1
	Chromium, Cr	µg/L	1	<1
	Copper, Cu	µg/L	1	<1
	Iron, Fe	µg/L	5	<5
	Lead, Pb	µg/L	1	<1
	Manganese, Mn	µg/L	1	<1
	Nickel, Ni	µg/L	1	<1
	Selenium, Se	µg/L	2	<2
	Zinc, Zn	µg/L	1	<1

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB036991.001	Total Aluminium	µg/L	5	<5
	Total Iron	µg/L	5	<5

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result
LB037004.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		o-xylene	µg/L	0.5	<0.5
	Oxygenated Compounds	MtBE (Methyl-tert-butyl ether)	µg/L	0.5	<0.5
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	100
		d4-1,2-dichloroethane (Surrogate)	%	-	98
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	99

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result
LB037004.001		TRH C6-C9	µg/L	40	<40
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	100
		d4-1,2-dichloroethane (Surrogate)	%	-	98
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	99

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Acidity and Free CO2

Method: ME-(AU)-[ENV]AN140

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.006	LB036948.008	Acidity to pH 8.3	mg CaCO3/L	5	180	180	18	0

Alkalinity

Method: ME-(AU)-[ENV]AN135

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.007	LB036947.012	Total Alkalinity as CaCO3	mg/L	5	<5	<5	149	0

Chloride by Discrete Analyser in Water

Method: ME-(AU)-[ENV]AN274

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065484.002	LB036977.014	Chloride	mg/L	1	23.332	23.924	19	3
PE065492.001	LB036977.028	Chloride	mg/L	1	10404.998	11879.693	15	13
PE065505.001	LB036977.038	Chloride	mg/L	1	4119.537	4008.802	15	3

Colour by Discrete Analyser

Method: ME-(AU)-[ENV]AN285

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.006	LB036979.009	Colour (True)	Hazen	1	<1	<1	200	0

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.006	LB036978.010	Filterable Reactive Phosphorus	mg/L	0.002	0.008	0.008	76	0

Fluoride by Ion Selective Electrode in Water

Method: ME-(AU)-[ENV]AN141

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.001	LB037029.020	Fluoride by ISE	mg/L	0.1	0.5	0.5	36	3
PE065492.005	LB037029.040	Fluoride by ISE	mg/L	0.1	1.1378881027	1.1141962040	24	2
PE065519.001	LB037029.047	Fluoride by ISE	mg/L	0.1	0.3932208242	0.3891056779	41	1

Low Level Ammonia Nitrogen by FIA

Method: ME-(AU)-[ENV]AN261

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.002	LB037181.037	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.030	0.028	32	7
		Ammonia, NH_3	mg/L	0.005	0.036	0.034	29	7
PE065491.006	LB037181.042	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005	<0.005	200	0
		Ammonia, NH_3	mg/L	0.005	<0.005	<0.005	200	0
PE065611.002	LB037181.013	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0	0	200	0

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065484.002	LB036965.017	Mercury	μg/L	0.0001	0	0	200	0
PE065497.001	LB036965.021	Mercury	μg/L	0.0001	0	0	200	0

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320/AN321

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065483.002	LB036980.014	Calcium, Ca	mg/L	0.2	17	17	16	0
		Magnesium, Mg	mg/L	0.1	6.5	6.7	17	4
		Potassium, K	mg/L	0.1	6.7	7.2	16	7
		Sodium, Na	mg/L	0.5	66	69	16	3
PE065491.006	LB036980.024	Calcium, Ca	mg/L	0.2	1000	1100	15	2
		Magnesium, Mg	mg/L	0.1	4300	4400	15	2
		Potassium, K	mg/L	0.1	2000	2000	15	1
		Sodium, Na	mg/L	0.5	52000	54000	15	3
PE065491.007	LB037016.005	Calcium, Ca	mg/L	0.2	<0.2	<0.2	200	0
		Magnesium, Mg	mg/L	0.1	0.1	<0.1	133	2
		Potassium, K	mg/L	0.1	<0.1	<0.1	200	0
		Sodium, Na	mg/L	0.5	2.0	1.5	44	30

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA

Method: ME-(AU)-[ENV]AN258

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.002	LB037181.037	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.62	0.62	16	0
		Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	200	0
PE065491.006	LB037181.042	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	1.2	1.2	15	1
		Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	200	0
PE065611.002	LB037181.013	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	6.511	6.919	15	6
		Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0	0	200	0
PE065628.001	LB037181.026	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	1.007	1.009	15	0
		Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0	0	200	0

Sulphate in water

Method: ME-(AU)-[ENV]AN275

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065484.002	LB036977.014	Sulphate	mg/L	1	1.753	2.275	65	26
PE065492.001	LB036977.028	Sulphate	mg/L	1	6887.071	7285.353	15	6
PE065505.001	LB036977.038	Sulphate	mg/L	1	5058.728	5567.21	15	10

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.006	LB037169.037	Total Suspended Solids Dried at 105°C	mg/L	5	2200	2200	15	1
PE065536.001	LB037169.013	Total Suspended Solids Dried at 105°C	mg/L	5	14.6666666666	12.666666666	52	15
PE065557.001	LB037169.026	Total Suspended Solids Dried at 105°C	mg/L	5	548.666666666	1556	15	0

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.002	LB036989.014	Aluminium, Al	μg/L	1	5	4	39	30
		Arsenic, As	μg/L	1	<1	<1	164	0
		Cadmium, Cd	μg/L	0.1	<0.1	<0.1	200	0
		Chromium, Cr	μg/L	1	<1	<1	200	0
		Iron, Fe	μg/L	5	240	240	17	1
		Manganese, Mn	μg/L	1	220	220	15	1
		Nickel, Ni	μg/L	1	<1	1	116	5
		Selenium, Se	μg/L	2	<2	<2	200	0
		Zinc, Zn	μg/L	1	47	47	17	1
PE065505.001	LB036989.021	Aluminium, Al	μg/L	1	67.38	68.1	16	1
		Arsenic, As	μg/L	1	1.032	1.258	102	20
		Chromium, Cr	μg/L	1	0.2911	0.3111	200	7
		Copper, Cu	μg/L	1	10.35	11.14	24	7
		Iron, Fe	μg/L	5	14.38	15.48	48	7
		Lead, Pb	μg/L	1	0.03449	0.0411	200	17
		Manganese, Mn	μg/L	1	27.21	28.46	19	4
		Nickel, Ni	μg/L	1	22.79	24.84	19	9
		Zinc, Zn	μg/L	1	157.4	168.3	16	7

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
PE065491.006	LB036991.010	Total Aluminium	μg/L	5	18000	18000	15	0
		Total Iron	μg/L	5	23000	22000	15	5

LABORATORY CONTROL SAMPLES

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Alkalinity

Method: ME-(AU)-[ENV]AN135

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036947.002	Total Alkalinity as CaCO3	mg/L	5	47	45	85 - 115	104

Chloride by Discrete Analyser in Water

Method: ME-(AU)-[ENV]AN274

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036977.002	Chloride	mg/L	1	10	10	85 - 115	103
LB036977.026	Chloride	mg/L	1	10	10	85 - 115	102

Colour by Discrete Analyser

Method: ME-(AU)-[ENV]AN285

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036979.002	Colour (True)	Hazen	1	5	5	90 - 110	93

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036978.002	Filterable Reactive Phosphorus	mg/L	0.002	0.052	0.05	80 - 120	103

Fluoride by Ion Selective Electrode in Water

Method: ME-(AU)-[ENV]AN141

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037029.007	Fluoride by ISE	mg/L	0.1	2.1	2	80 - 120	105
LB037029.037	Fluoride by ISE	mg/L	0.1	1.9	2	80 - 120	97

Low Level Ammonia Nitrogen by FIA

Method: ME-(AU)-[ENV]AN261

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037181.002	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.83	0.8	85 - 115	104
	Ammonia, NH_3	mg/L	0.005	1.0	0.971	85 - 115	104
LB037181.025	Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.80	0.8	85 - 115	100
	Ammonia, NH_3	mg/L	0.005	0.97	0.971	85 - 115	100

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036965.002	Mercury	mg/L	0.0001	0.0026	2.5	80 - 120	102

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320/AN321

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036980.002	Calcium, Ca	mg/L	0.2	190	200	80 - 120	97
	Magnesium, Mg	mg/L	0.1	190	200	80 - 120	95
	Potassium, K	mg/L	0.1	18	20	80 - 120	90
	Sodium, Na	mg/L	0.5	210	200	80 - 120	107
LB037016.002	Calcium, Ca	mg/L	0.2	190	200	80 - 120	94
	Magnesium, Mg	mg/L	0.1	180	200	80 - 120	91
	Potassium, K	mg/L	0.1	18	20	80 - 120	91
	Sodium, Na	mg/L	0.5	210	200	80 - 120	107

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA

Method: ME-(AU)-[ENV]AN258

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037181.002	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.81	0.8	85 - 115	101
	Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.81	0.8	85 - 115	102
LB037181.025	Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.79	0.8	85 - 115	99
	Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.80	0.8	85 - 115	100

Sulphate in water

Method: ME-(AU)-[ENV]AN275

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036977.002	Sulphate	mg/L	1	11	10	80 - 120	111
LB036977.026	Sulphate	mg/L	1	11	10	80 - 120	110

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Sulphide by Titration in Water

Method: ME-(AU)-[ENV]AN149

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037014.002	Sulphide	mg/L	0.5	0.8	1	80 - 120	82

TKN Kjeldahl Digestion by Discrete Analyser

Method: ME-(AU)-[ENV]AN281

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037019.002	Total Kjeldahl Nitrogen	mg/L	0.05	1.0	1	80 - 120	103

Total and Volatile Suspended Solids (TSS / VSS)

Method: ME-(AU)-[ENV]AN114

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037169.002	Total Suspended Solids Dried at 105°C	mg/L	5	490	500	85 - 115	98
LB037169.025	Total Suspended Solids Dried at 105°C	mg/L	5	540	500	85 - 115	108

Total Phosphorus by Kjeldahl Digestion DA in Water

Method: ME-(AU)-[ENV]AN279/AN293

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037019.002	Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.47	0.5	80 - 120	94

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036989.002	Aluminium, Al	µg/L	1	12	10	80 - 120	118
	Arsenic, As	µg/L	1	10	10	80 - 120	102
	Cadmium, Cd	µg/L	0.1	10	10	80 - 120	102
	Chromium, Cr	µg/L	1	11	10	80 - 120	107
	Copper, Cu	µg/L	1	11	10	80 - 120	113
	Iron, Fe	µg/L	5	12	10	80 - 120	120
	Lead, Pb	µg/L	1	10	10	80 - 120	96
	Manganese, Mn	µg/L	1	11	10	80 - 120	107
	Nickel, Ni	µg/L	1	11	10	80 - 120	105
	Selenium, Se	µg/L	2	10	10	80 - 120	102
	Zinc, Zn	µg/L	1	11	10	80 - 120	115

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB036991.002	Total Aluminium	µg/L	5	5	5	80 - 120	105
	Total Iron	µg/L	5	6	5	80 - 120	119

VOCs in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037004.002	Monocyclic Aromatic	Benzene	µg/L	0.5	4.3	5	50 - 150	86
		Toluene	µg/L	0.5	4.5	5	50 - 150	91
		Ethylbenzene	µg/L	0.5	4.6	5	50 - 150	92
	Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.5	5	60 - 130	110
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.4	5	60 - 130	108
		d8-toluene (Surrogate)	µg/L	-	4.9	5	60 - 130	98
		Bromofluorobenzene (Surrogate)	µg/L	-	5.0	5	60 - 130	99

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433/AN434

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB037004.002		TRH C6-C9	µg/L	40	<40	30	70 - 130	75
	Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.5	5	60 - 130	110
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.4	5	60 - 130	108
		d8-toluene (Surrogate)	µg/L	-	4.9	5	60 - 130	98
		Bromofluorobenzene (Surrogate)	µg/L	-	5.0	5	60 - 130	99

MATRIX SPIKES

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Chloride by Discrete Analyser in Water

Method: ME-(AU)-[ENV]AN274

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065475.001	LB036977.004	Chloride	mg/L	1	440	340	100	94

Filterable Reactive Phosphorus (FRP)

Method: ME-(AU)-[ENV]AN278

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065491.001	LB036978.004	Filterable Reactive Phosphorus	mg/L	0.002	0.052	<0.002	0.05	102

Fluoride by Ion Selective Electrode in Water

Method: ME-(AU)-[ENV]AN141

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065475.001	LB037029.010	Fluoride by ISE	mg/L	0.1	1.4	0.9	0.5	99
PE065492.007	LB037029.042	Fluoride by ISE	mg/L	0.1	1.5	1.02425984270	0.5	93

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311/AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065475.001	LB036965.004	Mercury	mg/L	0.0001	0.0020	<0.00005	0.0025	99

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320/AN321

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065475.001	LB036980.004	Calcium, Ca	mg/L	0.2	220	60	200	83
		Magnesium, Mg	mg/L	0.1	210	48	200	82
		Potassium, K	mg/L	0.1	69	45	20	124
		Sodium, Na	mg/L	0.5	500	310	200	95
PE065491.007	LB037016.004	Calcium, Ca	mg/L	0.2	200	<0.2	200	99
		Magnesium, Mg	mg/L	0.1	200	0.1	200	99
		Potassium, K	mg/L	0.1	20	<0.1	20	98
		Sodium, Na	mg/L	0.5	230	2.0	200	116

Sulphate in water

Method: ME-(AU)-[ENV]AN275

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065475.001	LB036977.004	Sulphate	mg/L	1	290	200	100	84

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065475.001	LB036989.004	Aluminium, Al	µg/L	1	12	0.001	10	111
		Arsenic, As	µg/L	1	10	<0.001	10	99
		Chromium, Cr	µg/L	1	11	<0.001	10	104
		Copper, Cu	µg/L	1	15	0.006	10	92
		Iron, Fe	µg/L	5	39	0.029	10	99
		Lead, Pb	µg/L	1	9	<0.001	10	88
		Manganese, Mn	µg/L	1	11	0.001	10	101
		Nickel, Ni	µg/L	1	10	<0.001	10	95
		Zinc, Zn	µg/L	1	29	0.021	10	75

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
PE065491.001	LB036991.004	Total Iron	µg/L	5	4200	4200	5	0 ⑤

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here:
http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-11.pdf

*	Non-accredited analysis.
-	Sample not analysed for this analyte.
^	Analysis performed by external laboratory.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Low surrogate recovery due to the sample emulsifying during extraction.
†	Refer to Analytical Report comments for further information.

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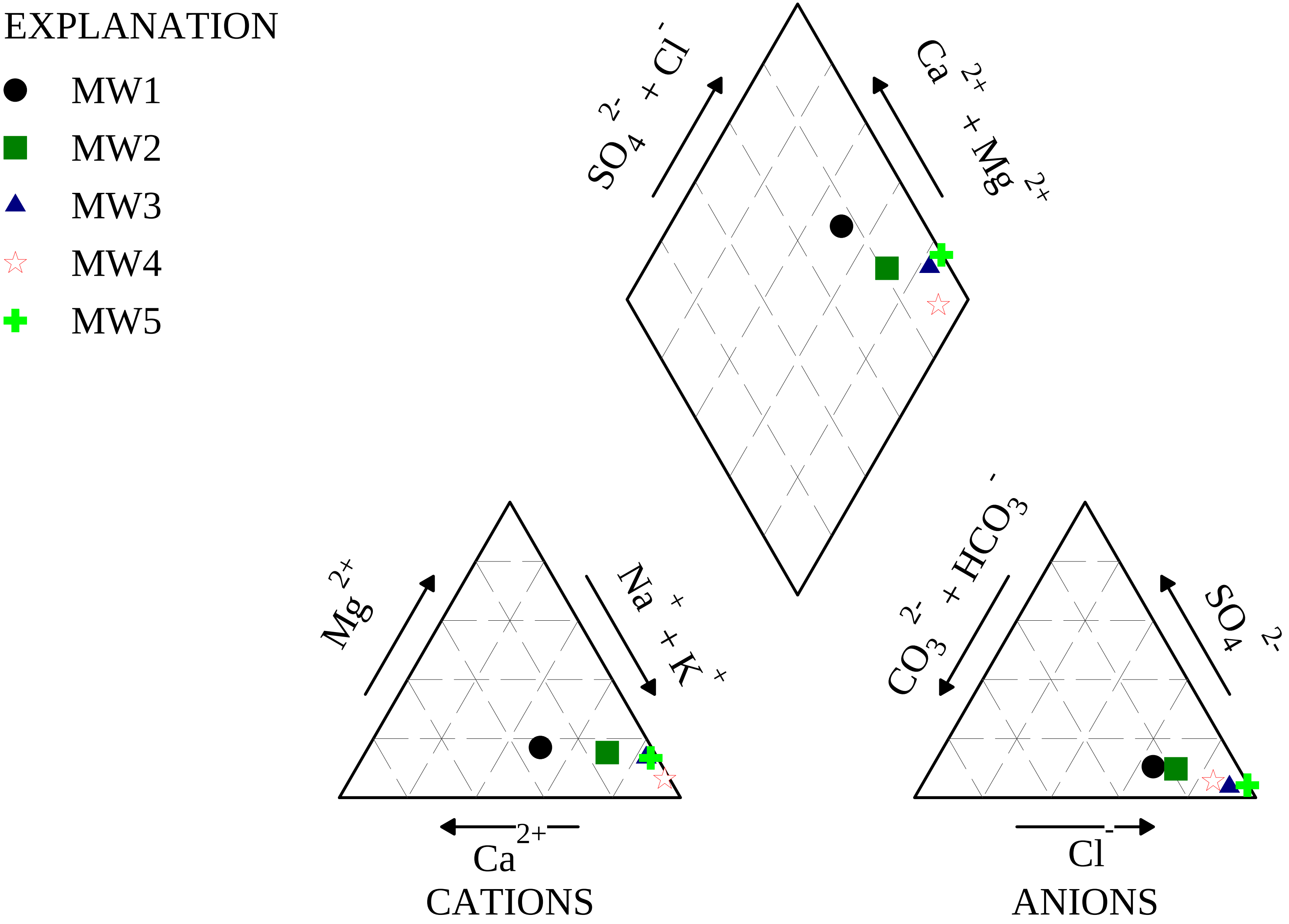
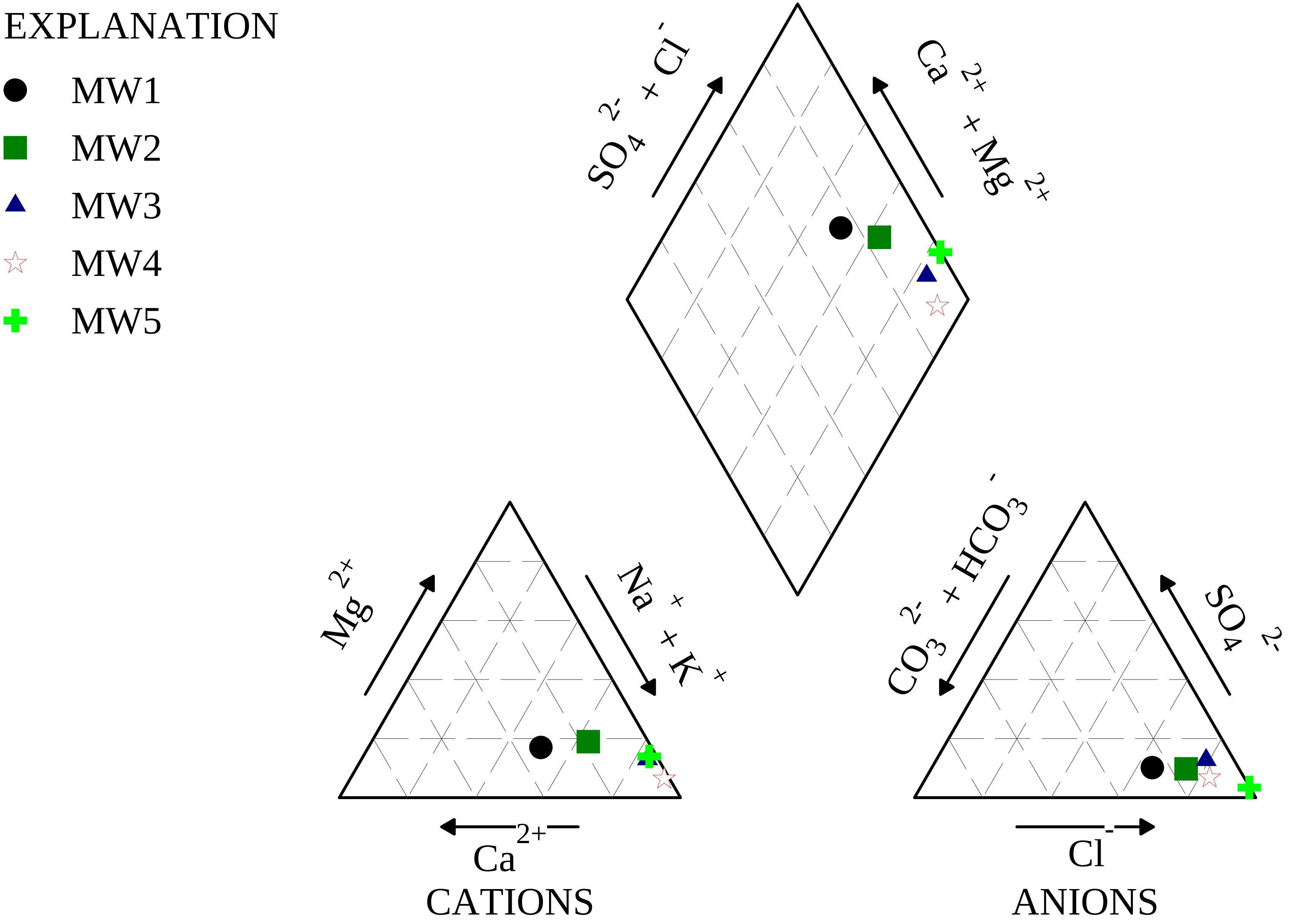
Annex G

Piper Plots

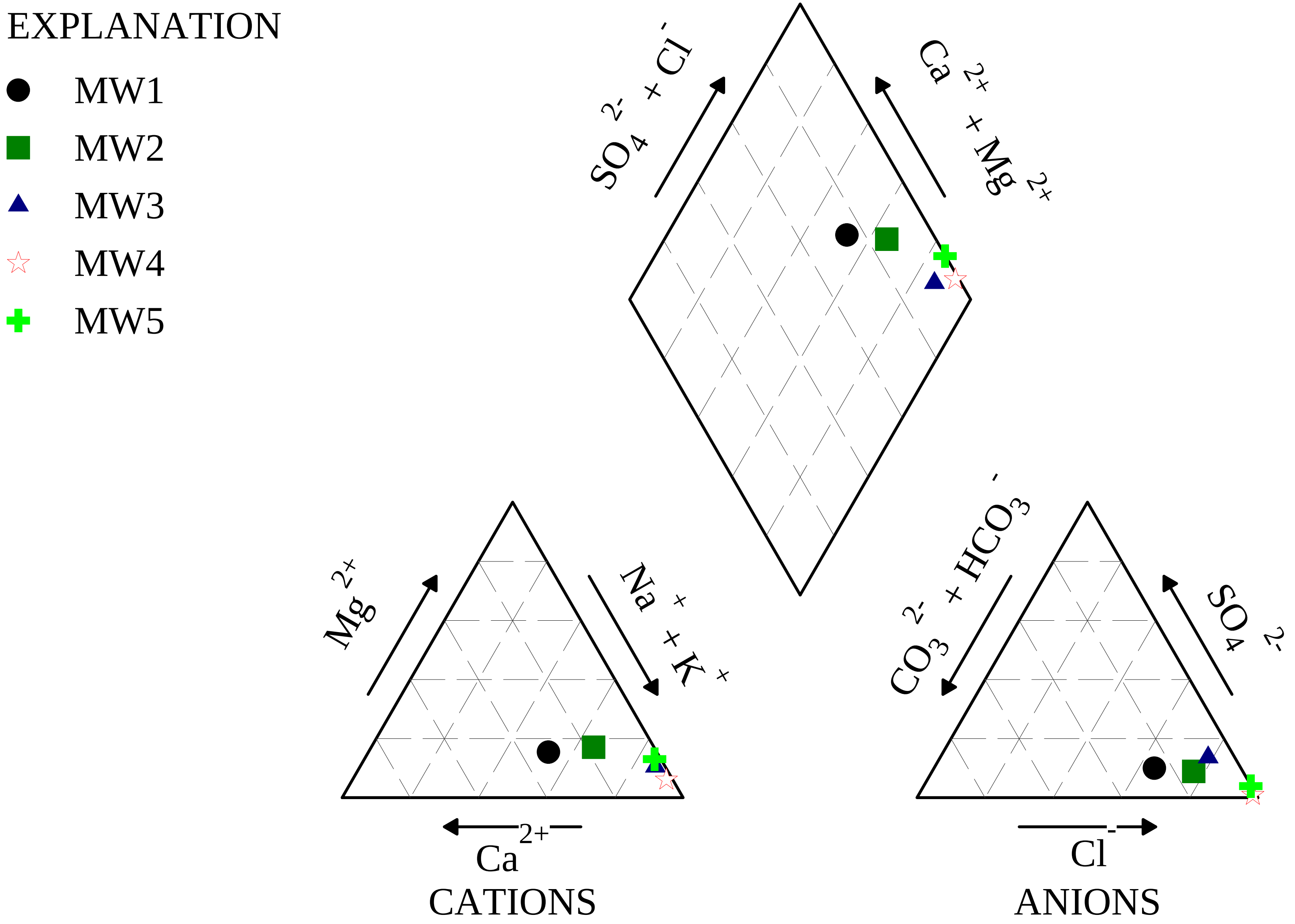
Piper Plot - Burrup Nitrates - April 2011



Piper Plot - Burrup Nitrates - September 2011

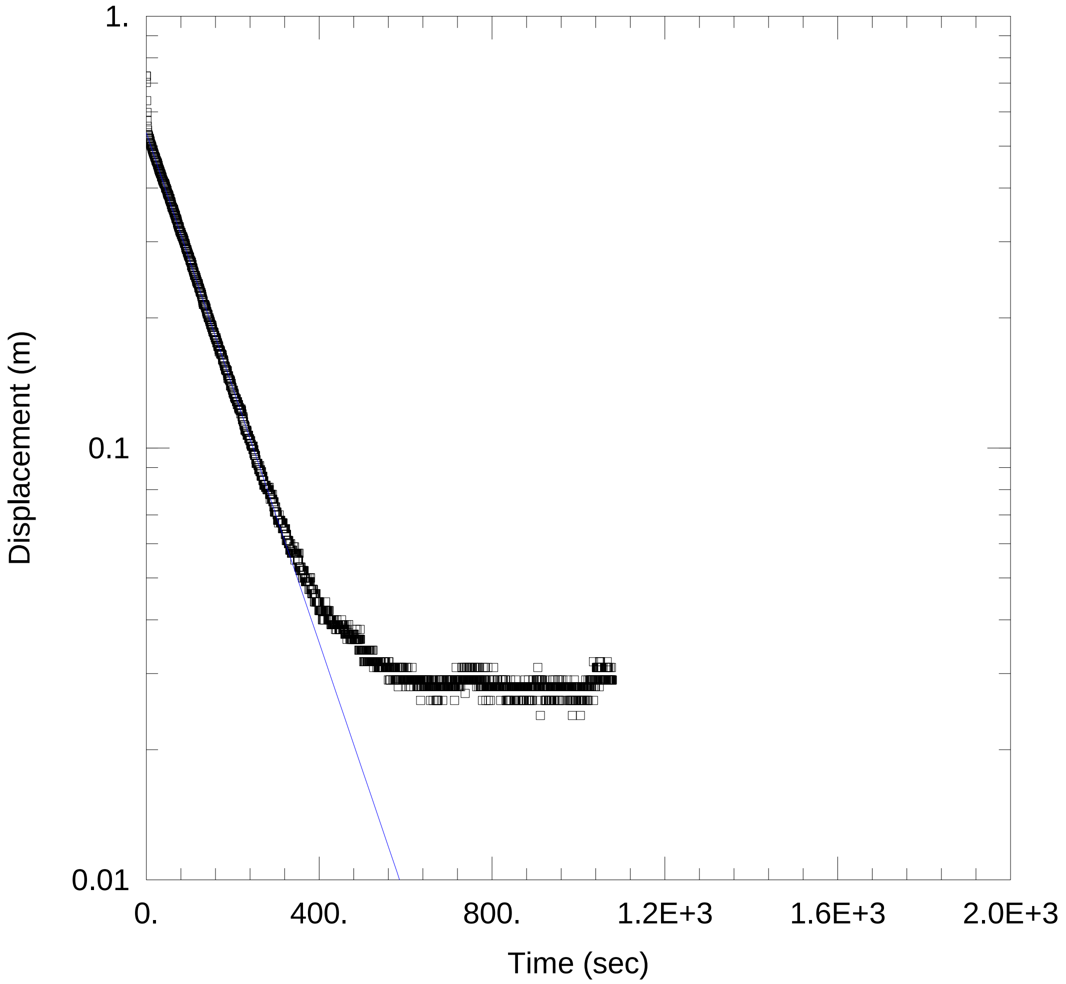


Piper Plot - Burrup Nitrates - February 2012



Annex H

Slug Tests



MW1 TEST 1

Data Set: C:\...\MW1 Test 1a.aqt
Date: 04/11/12 Time: 11:56:43

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

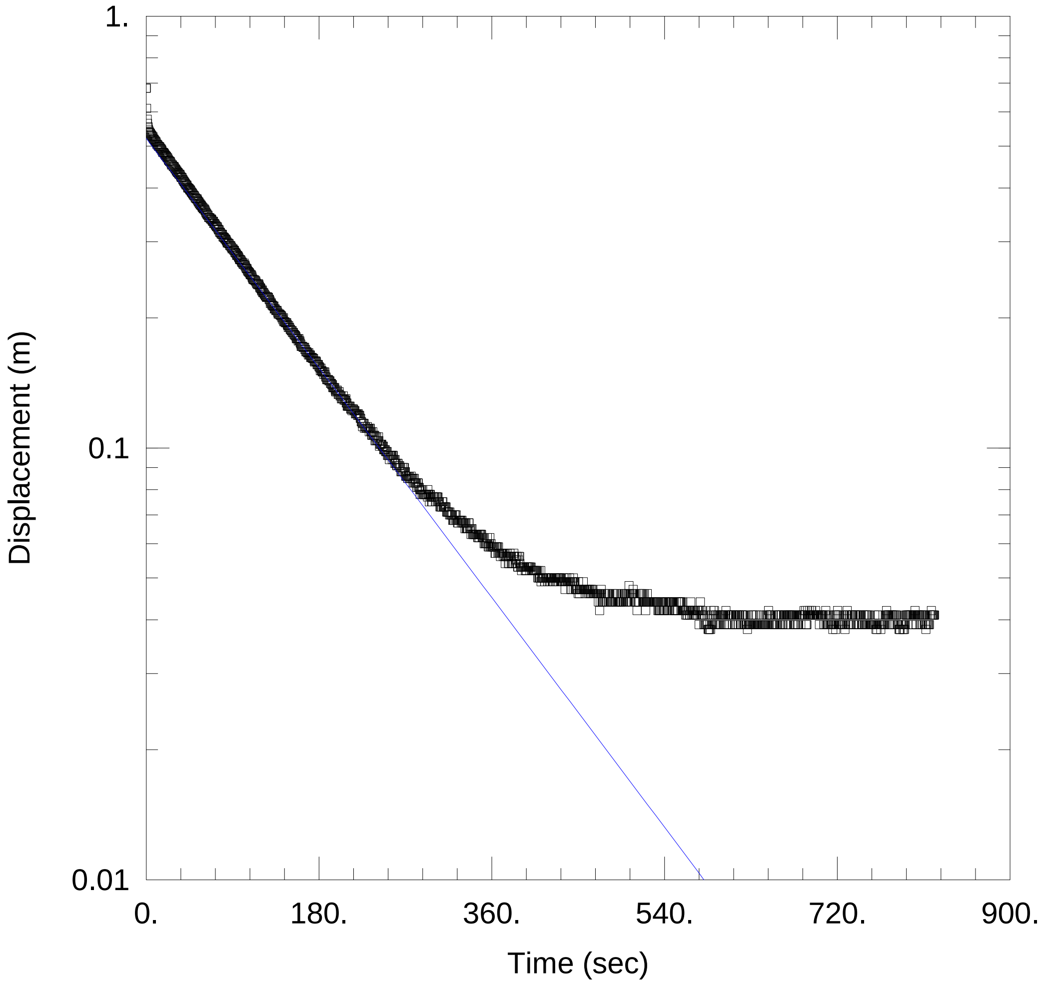
Saturated Thickness: 5.352 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1)

Initial Displacement: 0.726 m
Static Water Column Height: 5.352 m
Total Well Penetration Depth: 5.352 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.1934 m/day
y0 = 0.5364 m



MW1 TEST 2

Data Set: C:\...\MW1 Test 2a.aqt

Date: 04/11/12 Time: 11:48:38

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.35 m
Anisotropy Ratio (Kz/Kr): 1.

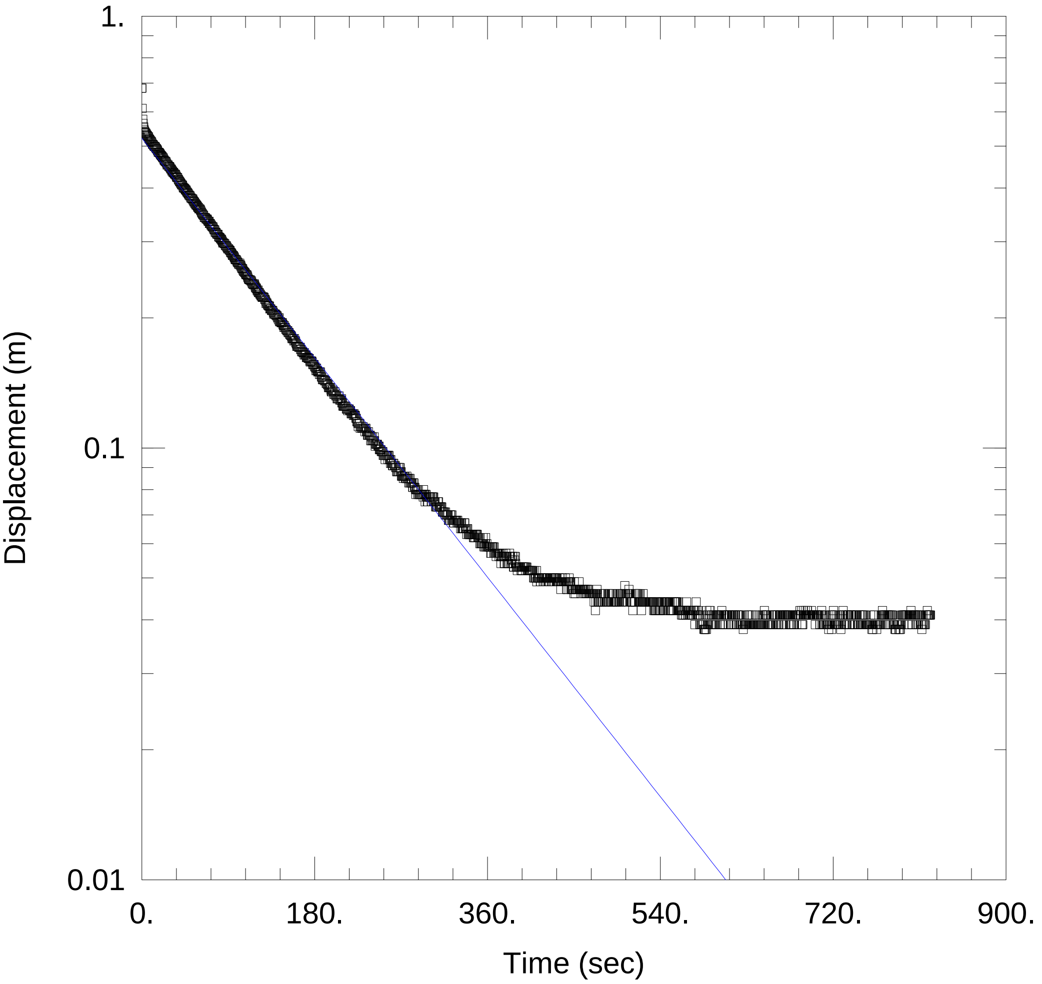
WELL DATA (MW1)

Initial Displacement: 0.681 m
Static Water Column Height: 5.35 m
Total Well Penetration Depth: 5.351 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1936 m/day
y0 = 0.521 m



MW1 TEST 2

Data Set: C:\...\MW1 Test 2a.aqt
Date: 04/11/12
Time: 11:52:23

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 10.35 m
Anisotropy Ratio (Kz/Kr): 1.

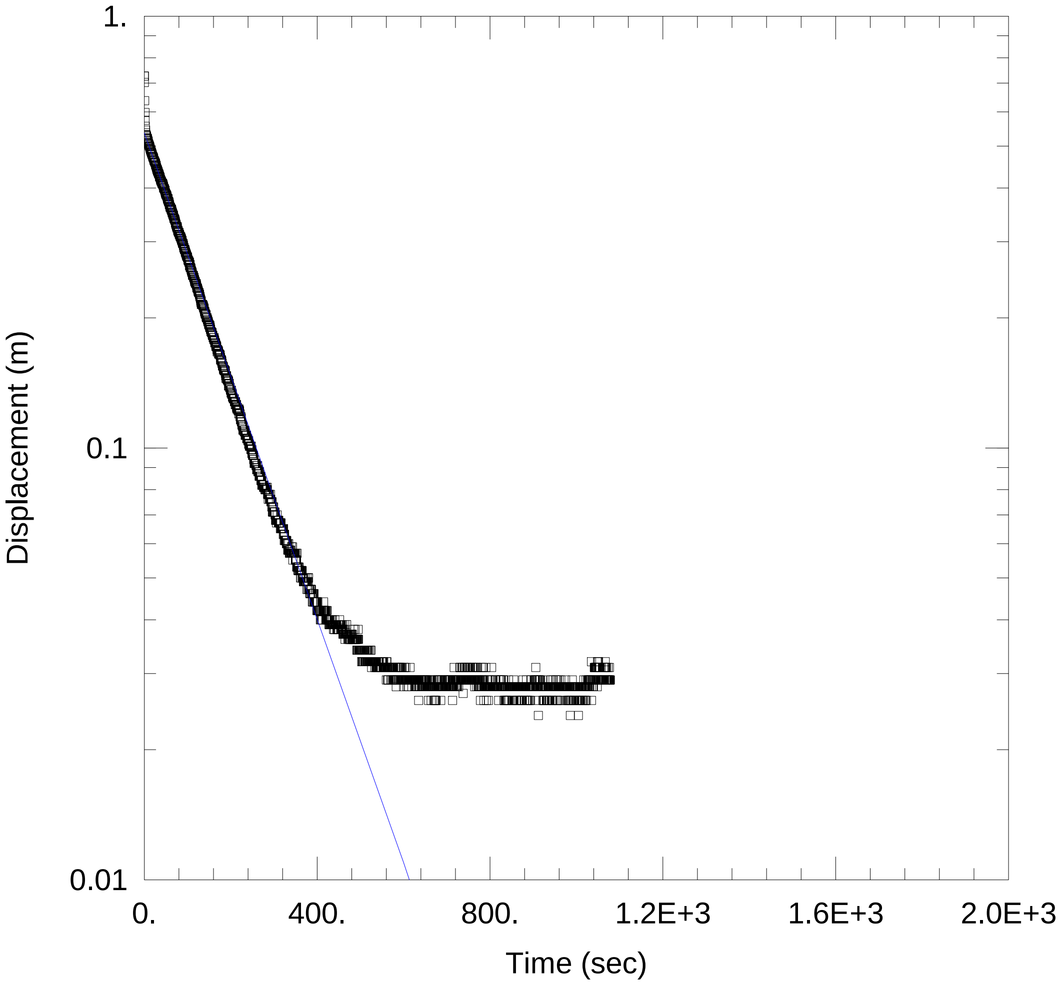
WELL DATA (MW1)

Initial Displacement: 0.681 m
Static Water Column Height: 5.35 m
Total Well Penetration Depth: 5.351 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1545 m/day
y0 = 0.5213 m



MW1 TEST 1

Data Set: C:\...\MW1 Test 1a.aqt
Date: 04/11/12
Time: 12:00:41

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.352 m
Anisotropy Ratio (Kz/Kr): 1.

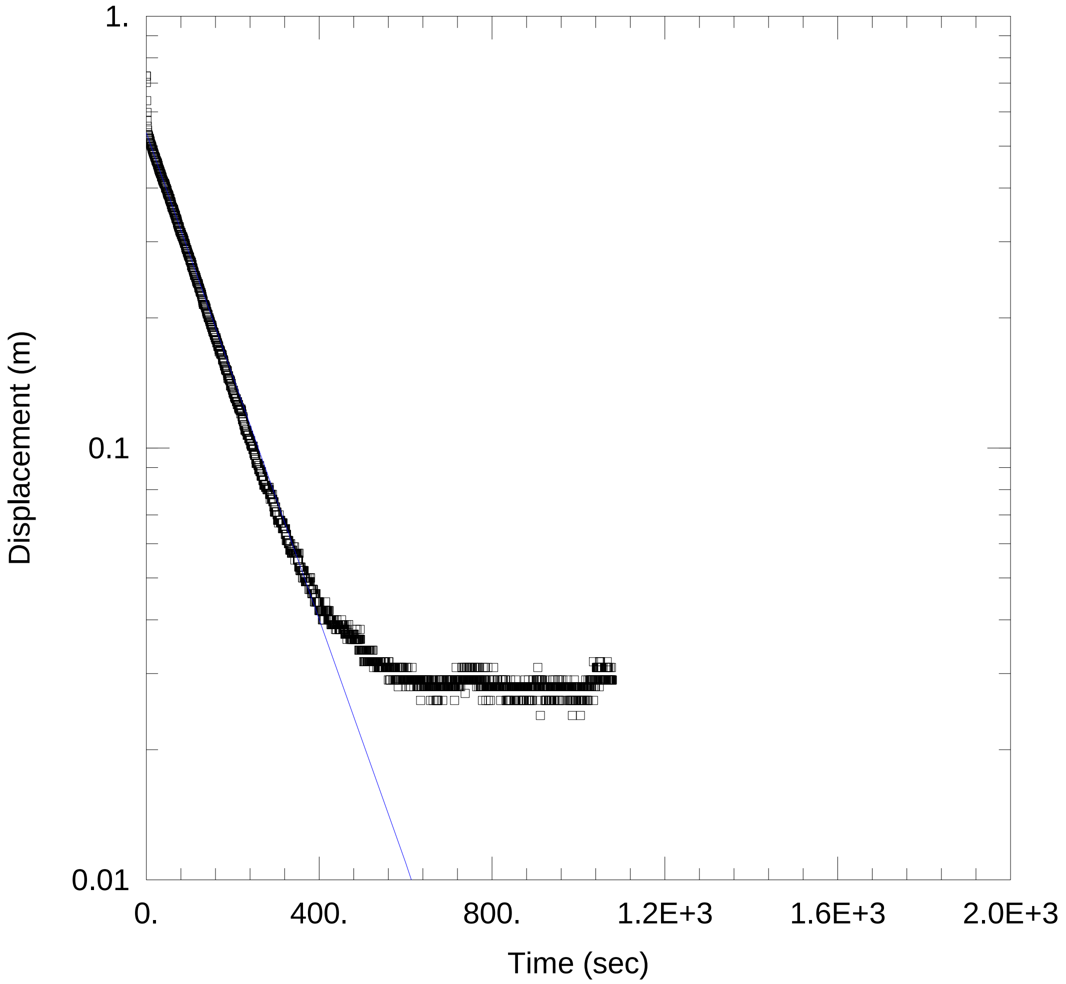
WELL DATA (MW1)

Initial Displacement: 0.726 m
Static Water Column Height: 5.352 m
Total Well Penetration Depth: 5.352 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.2585 m/day
y0 = 0.5362 m



MW1 TEST 1

Data Set: C:\...\MW1 Test 1a.aqt
Date: 04/11/12 Time: 12:00:41

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.352 m
Anisotropy Ratio (Kz/Kr): 1.

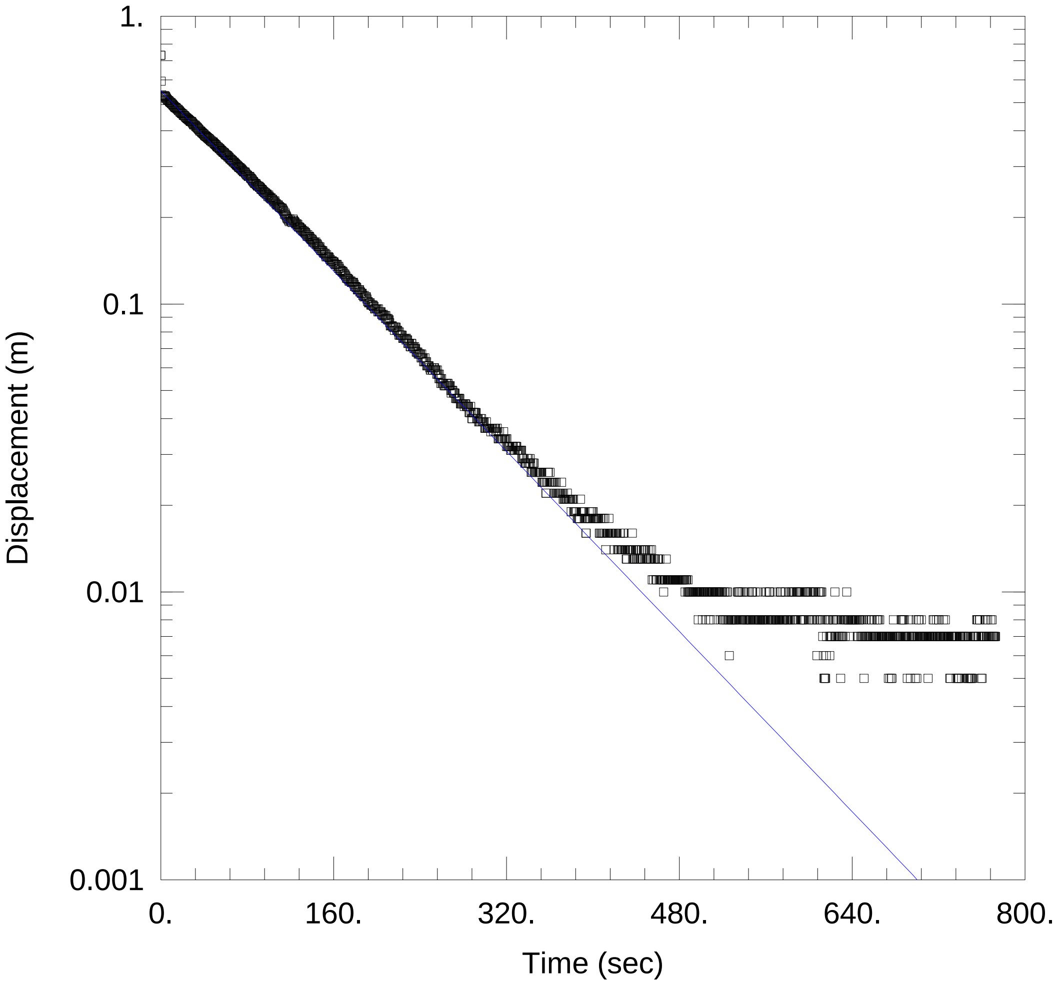
WELL DATA (MW1)

Initial Displacement: 0.726 m
Static Water Column Height: 5.352 m
Total Well Penetration Depth: 5.352 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.2585 m/day
y0 = 0.5362 m



MW1 TEST 3

Data Set: C:\...\MW1 Test 3a.aqt
Date: 04/11/12
Time: 11:13:38

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.35 m
Anisotropy Ratio (Kz/Kr): 1.

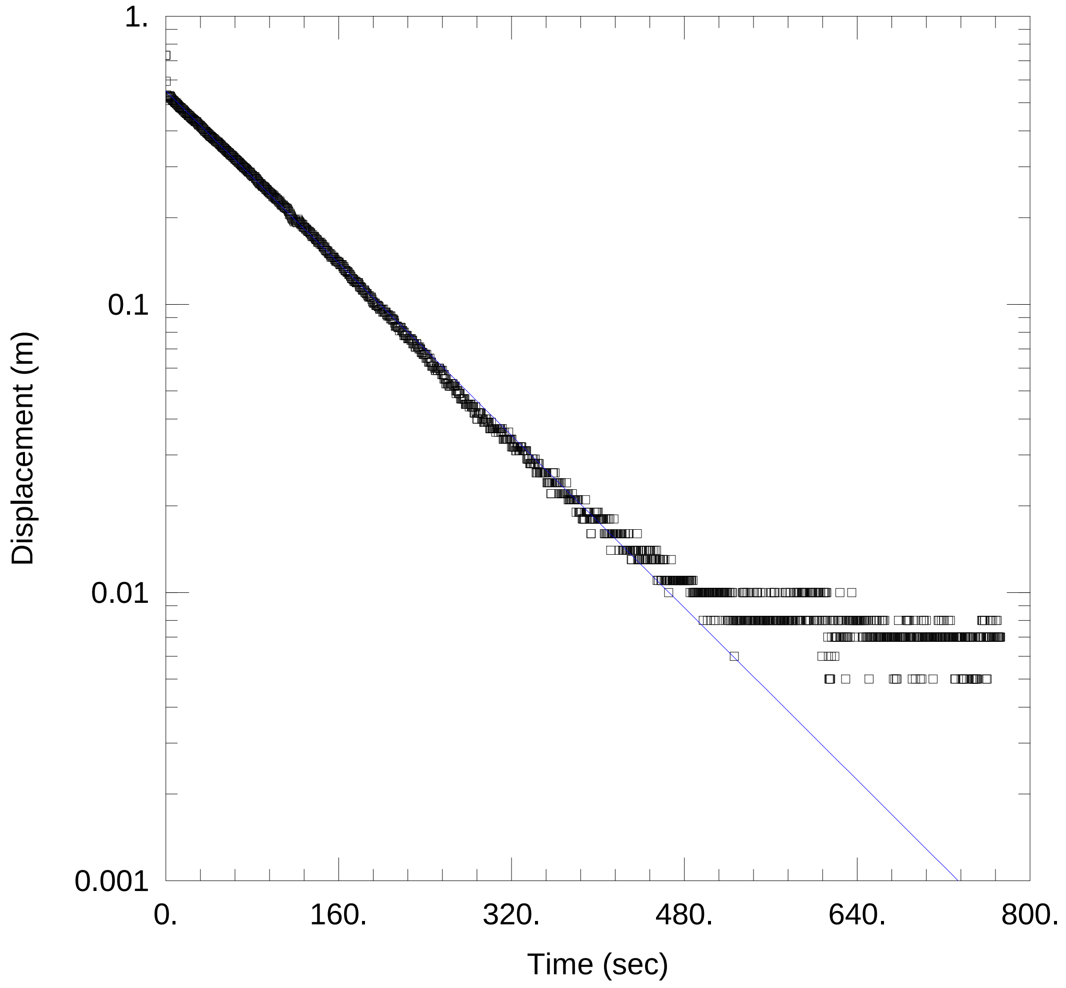
WELL DATA (MW1)

Initial Displacement: 0.731 m
Static Water Column Height: 5.35 m
Total Well Penetration Depth: 4.091 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.2132 m/day
y0 = 0.5501 m



MW1 TEST 3

Data Set: C:\...\MW1 Test 3a.aqt
Date: 04/11/12
Time: 11:11:57

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 20 Sept 2011

AQUIFER DATA

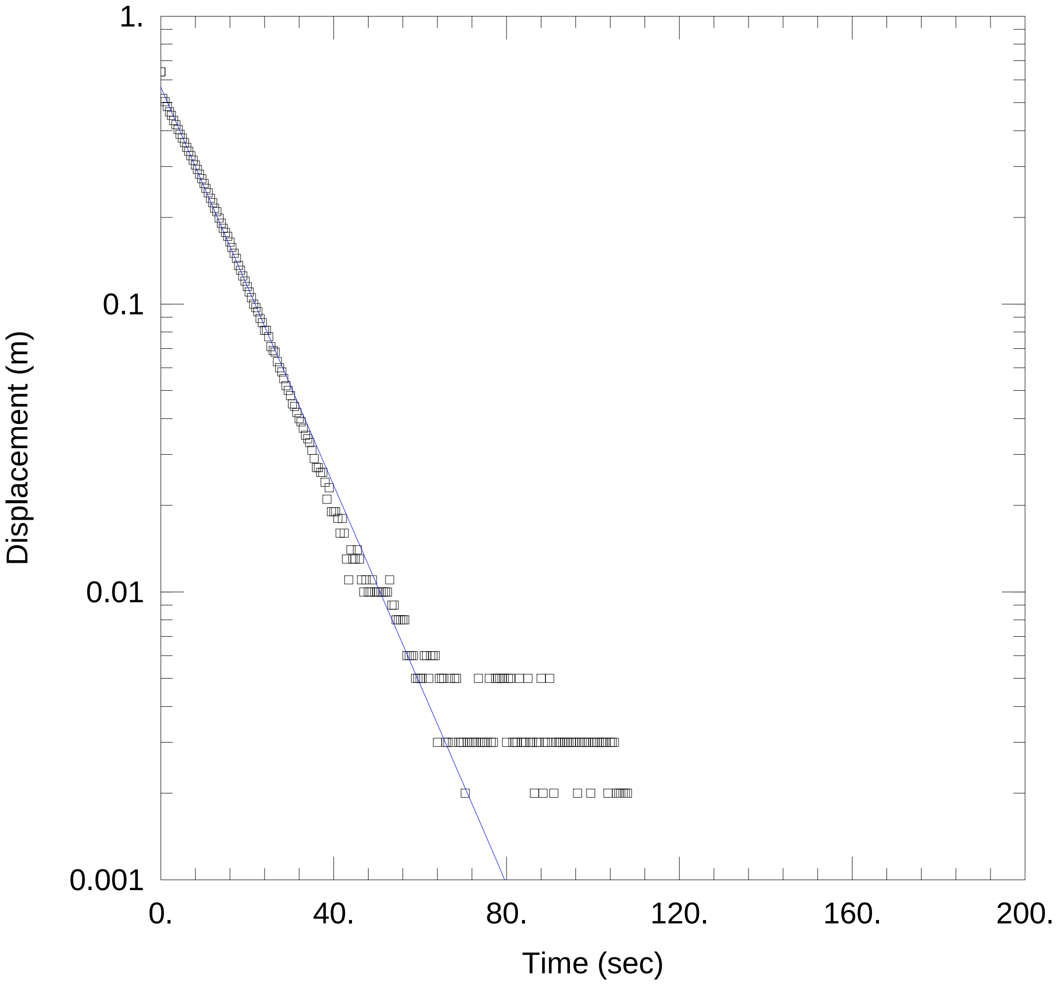
Saturated Thickness: 10.35 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1)

Initial Displacement: 0.731 m
Static Water Column Height: 5.35 m
Total Well Penetration Depth: 4.091 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.1936 m/day
y0 = 0.5501 m



MW2 TEST 1

Data Set: C:\...\MW2 Test 1a.aqt
Date: 04/11/12
Time: 12:12:48

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

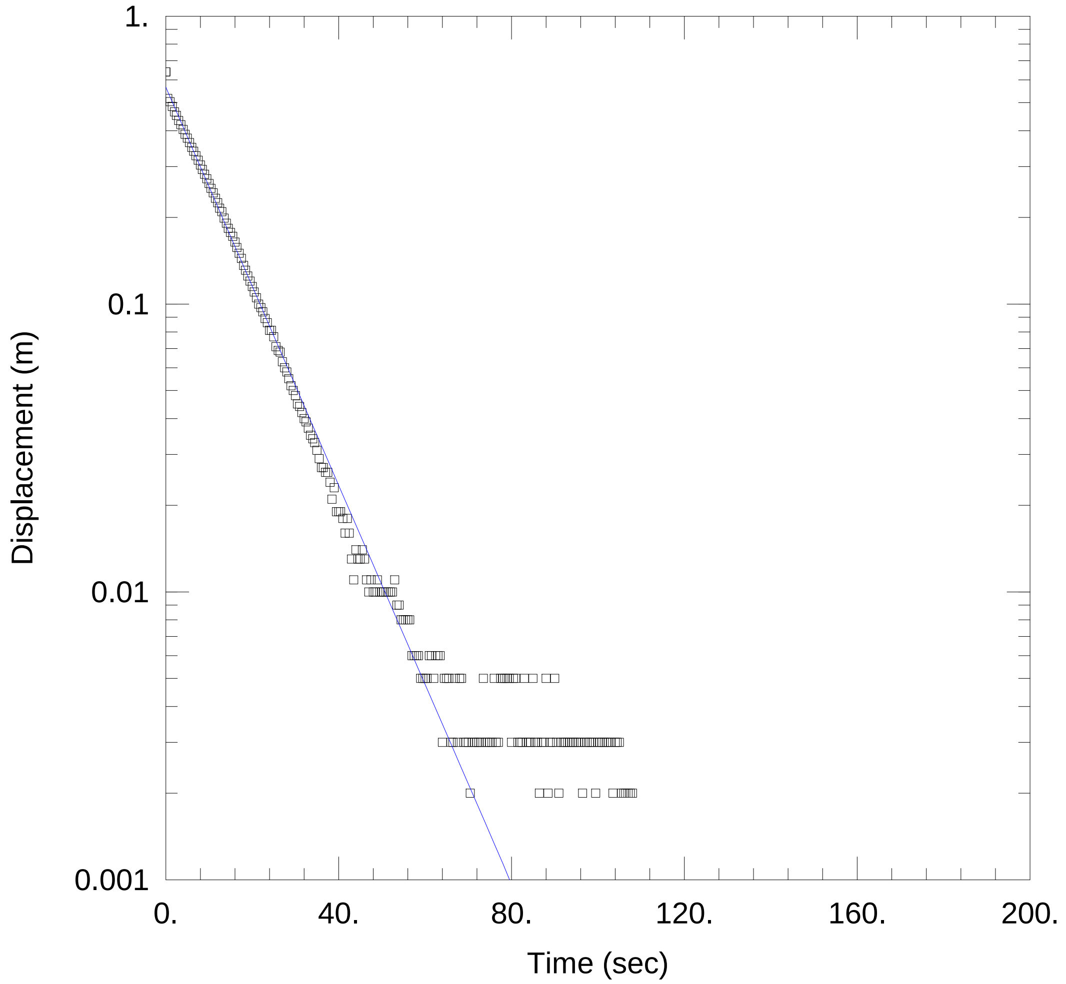
Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 0.64 m
Total Well Penetration Depth: 5.108 m
Casing Radius: 0.026 m
Static Water Column Height: 5.108 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.244 m/day
y0 = 0.566 m



MW2 TEST 1

Data Set: C:\...\MW2 Test 1a.aqt
Date: 04/11/12
Time: 12:14:18

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

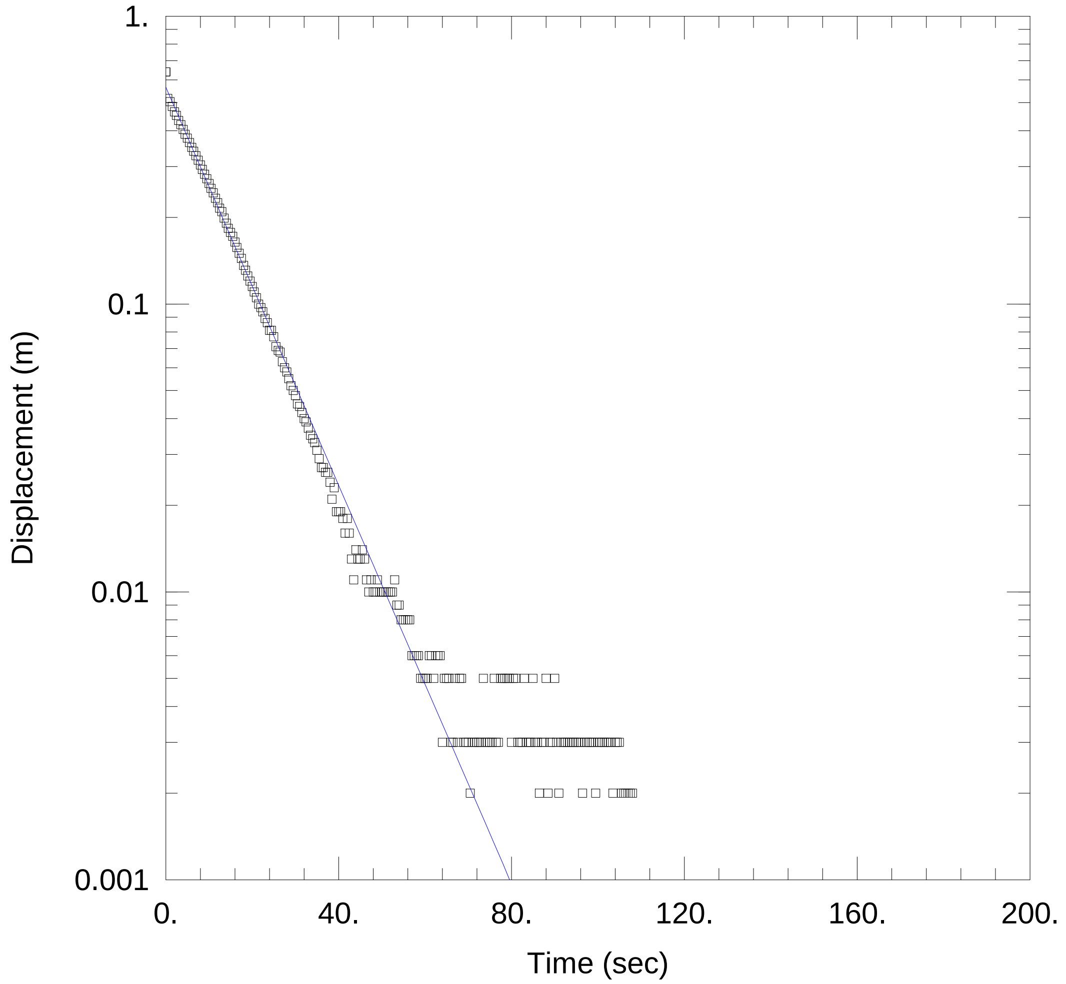
Saturated Thickness: 10.11 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 0.64 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.876 m/day
y0 = 0.566 m



MW2 TEST 1

Data Set: C:\...\MW2 Test 1a.aqt
Date: 04/11/12
Time: 12:16:33

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 1.

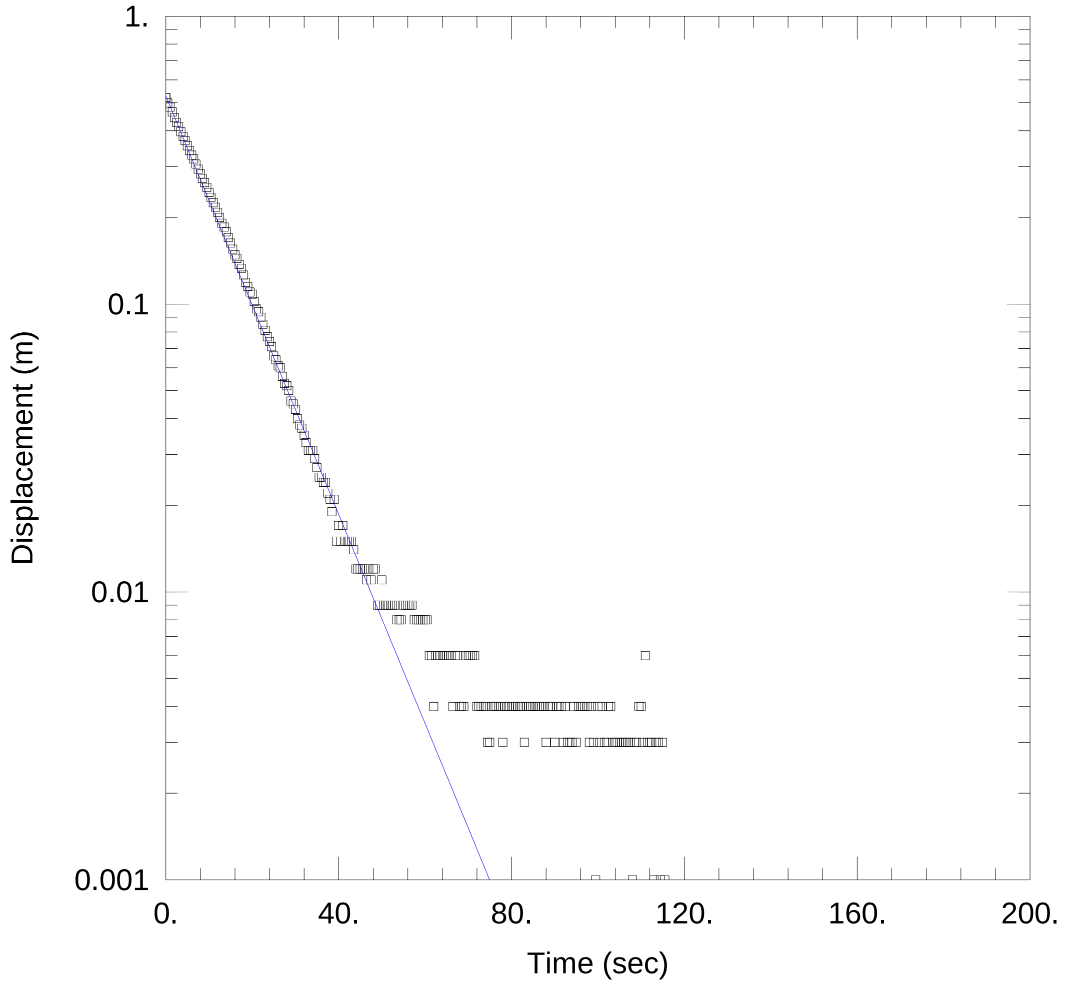
WELL DATA (MW2)

Initial Displacement: 0.64 m
Total Well Penetration Depth: 5.108 m
Casing Radius: 0.026 m
Static Water Column Height: 5.108 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 3.173 m/day
y0 = 0.566 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12
Time: 12:59:47

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 1.

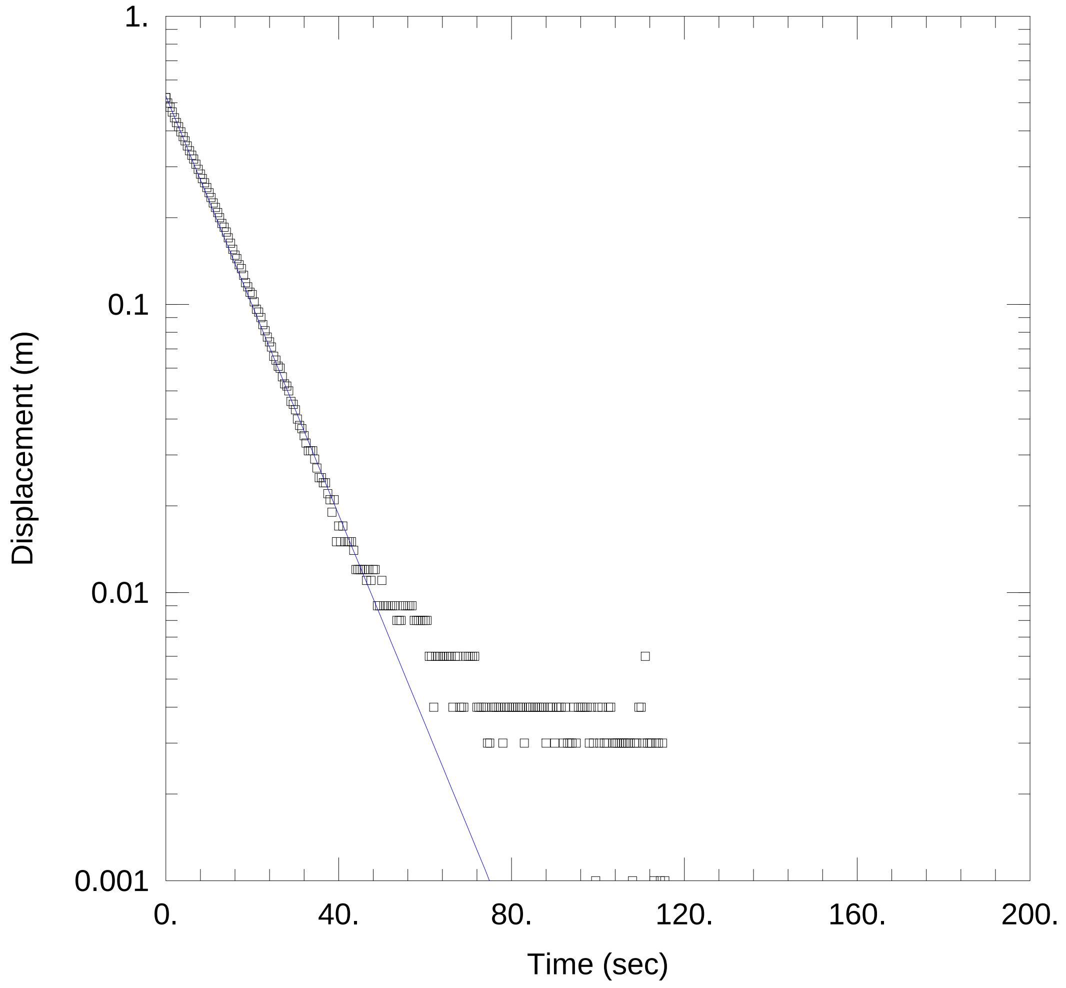
WELL DATA (MW2)

Initial Displacement: 0.522 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.358 m/day
y0 = 0.5275 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12 Time: 13:02:11

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 10.11 m
Anisotropy Ratio (Kz/Kr): 1.

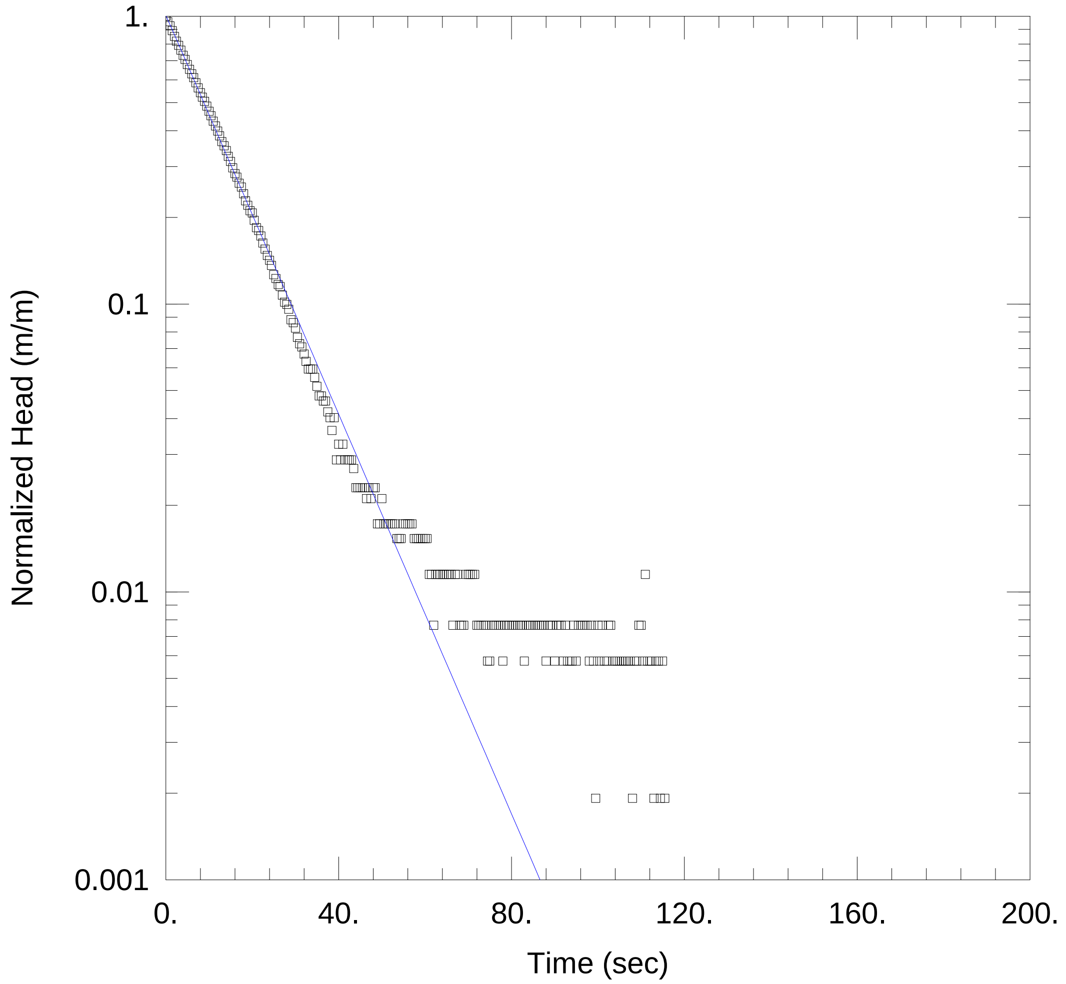
WELL DATA (MW2)

Initial Displacement: 0.522 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.972 m/day
y0 = 0.5275 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12
Time: 13:08:22

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

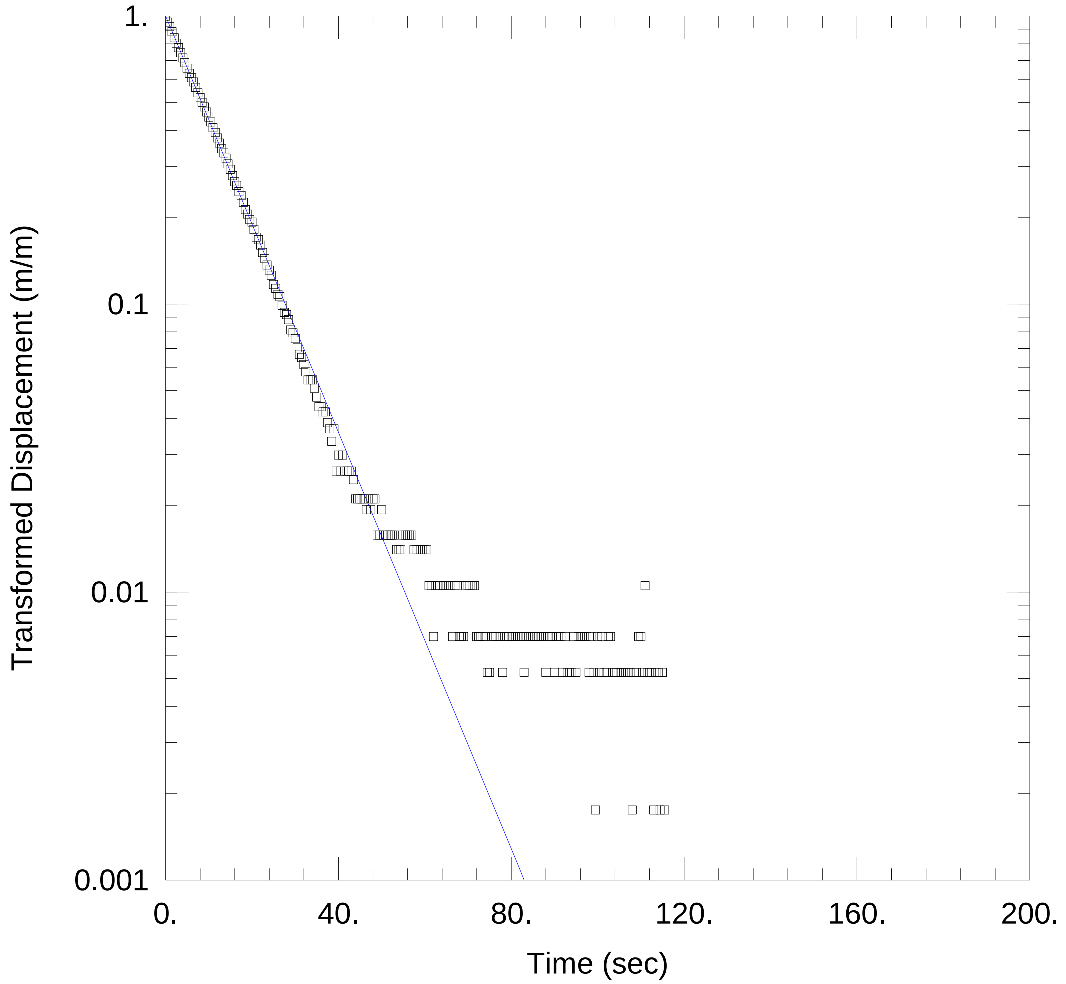
Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW2)

Initial Displacement: 0.522 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.988 m/day
y0 = 0.5275 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12
Time: 13:07:15

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 1.

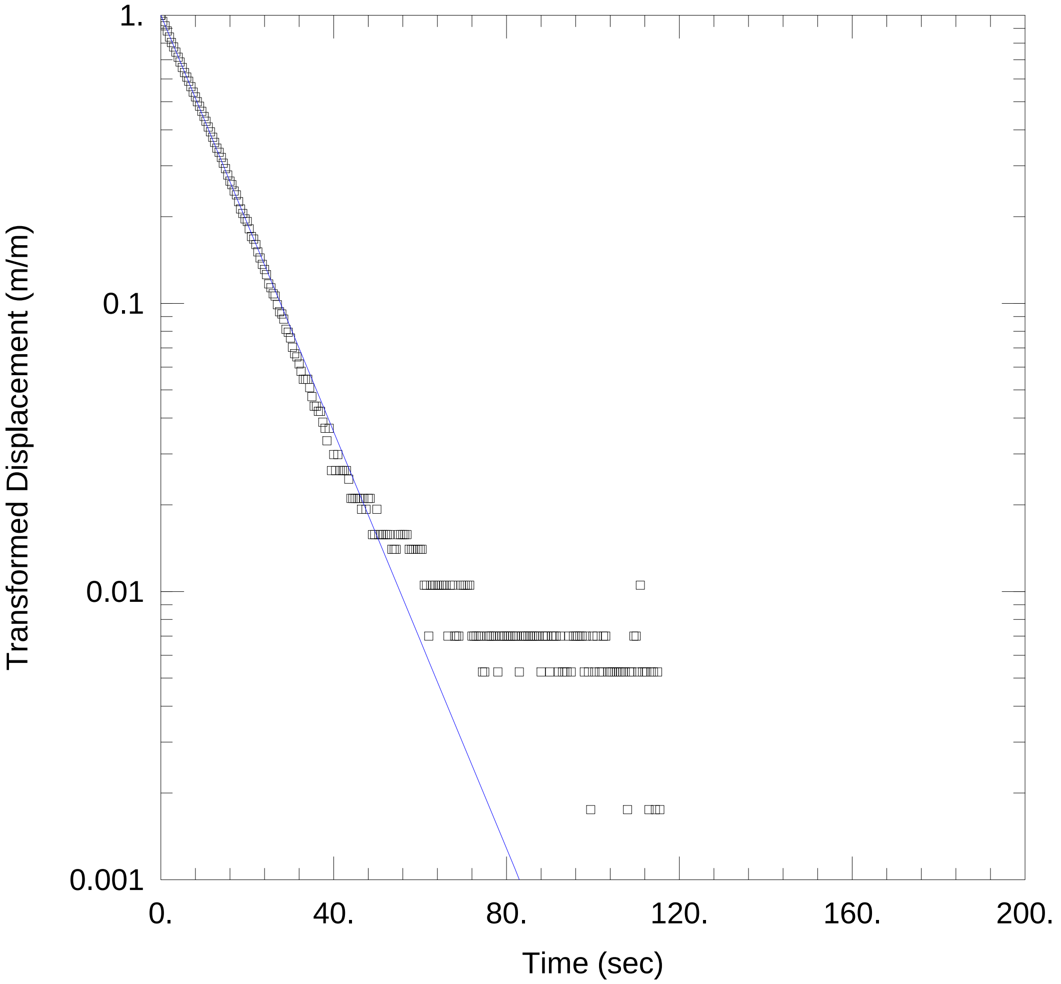
WELL DATA (MW2)

Initial Displacement: 0.522 m
Total Well Penetration Depth: 5.108 m
Casing Radius: 0.026 m
Static Water Column Height: 5.108 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Dagan

K = 2.156 m/day
y0 = 0.5228 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12
Time: 13:06:24

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 10.11 m
Anisotropy Ratio (Kz/Kr): 1.

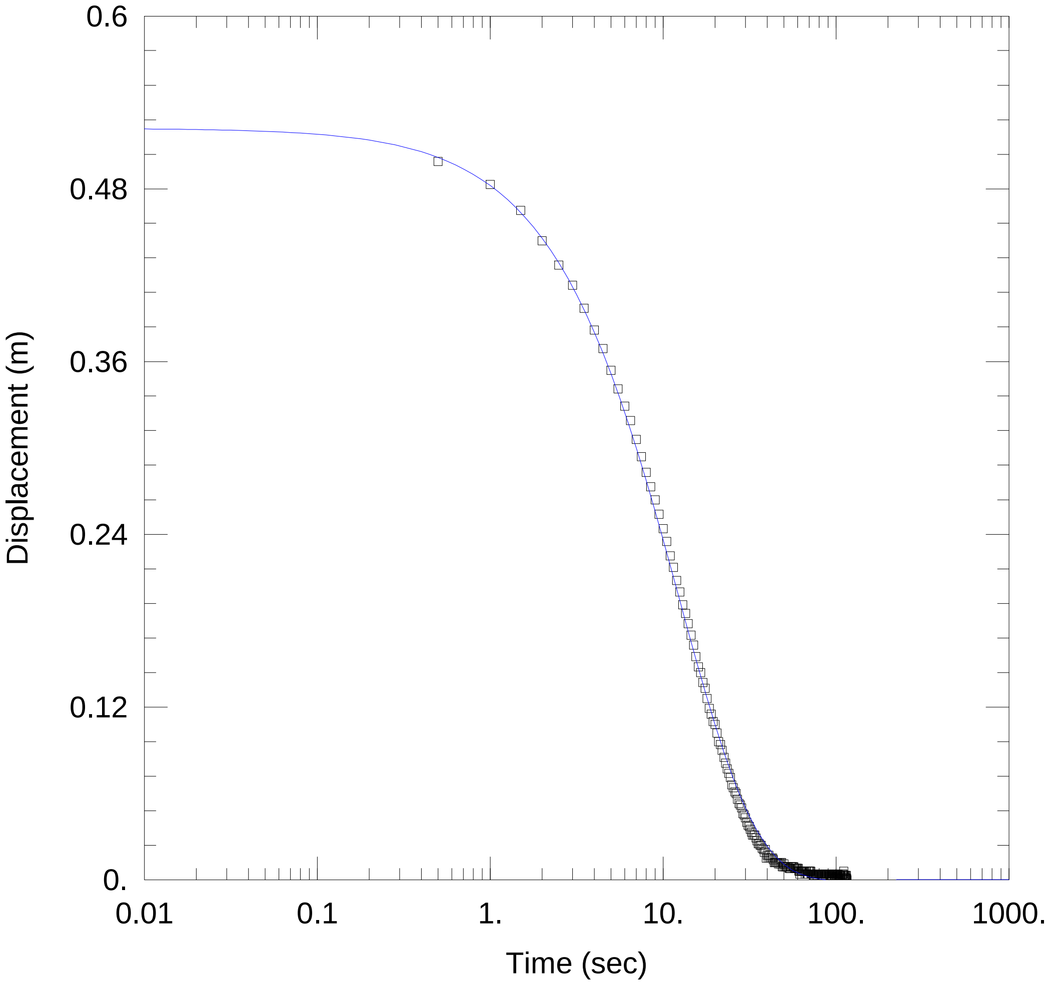
WELL DATA (MW2)

Initial Displacement: 0.522 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Dagan

K = 2.102 m/day
y0 = 0.5228 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12 Time: 13:03:50

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.108 m

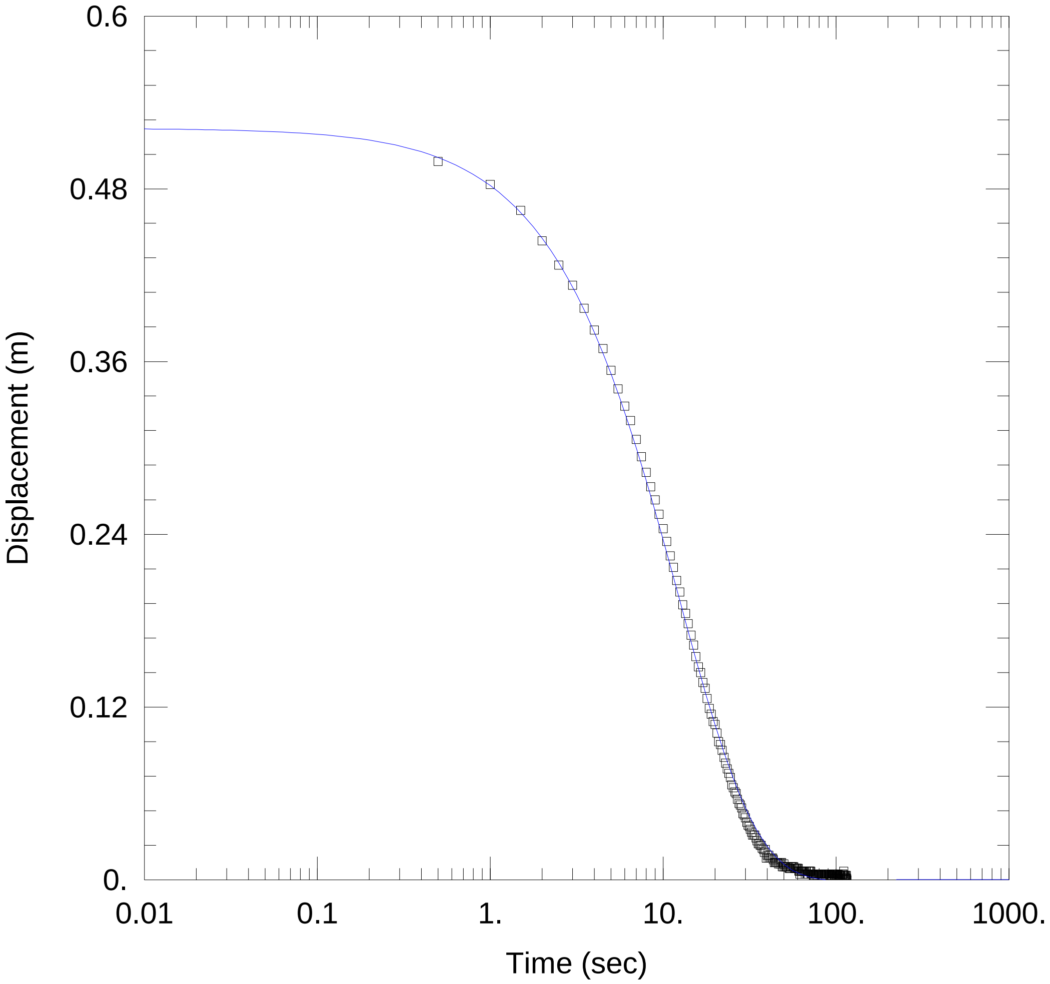
WELL DATA (MW2)

Initial Displacement: 0.522 m
Total Well Penetration Depth: 5.108 m
Casing Radius: 0.026 m
Static Water Column Height: 5.108 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 2.605 m/day
Kz/Kr = 1.
Ss = 3.874E-11 m^{-1}



MW2 TEST 2

Data Set: C:\...\MW2 Test 2a.aqt
Date: 04/11/12
Time: 13:04:36

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

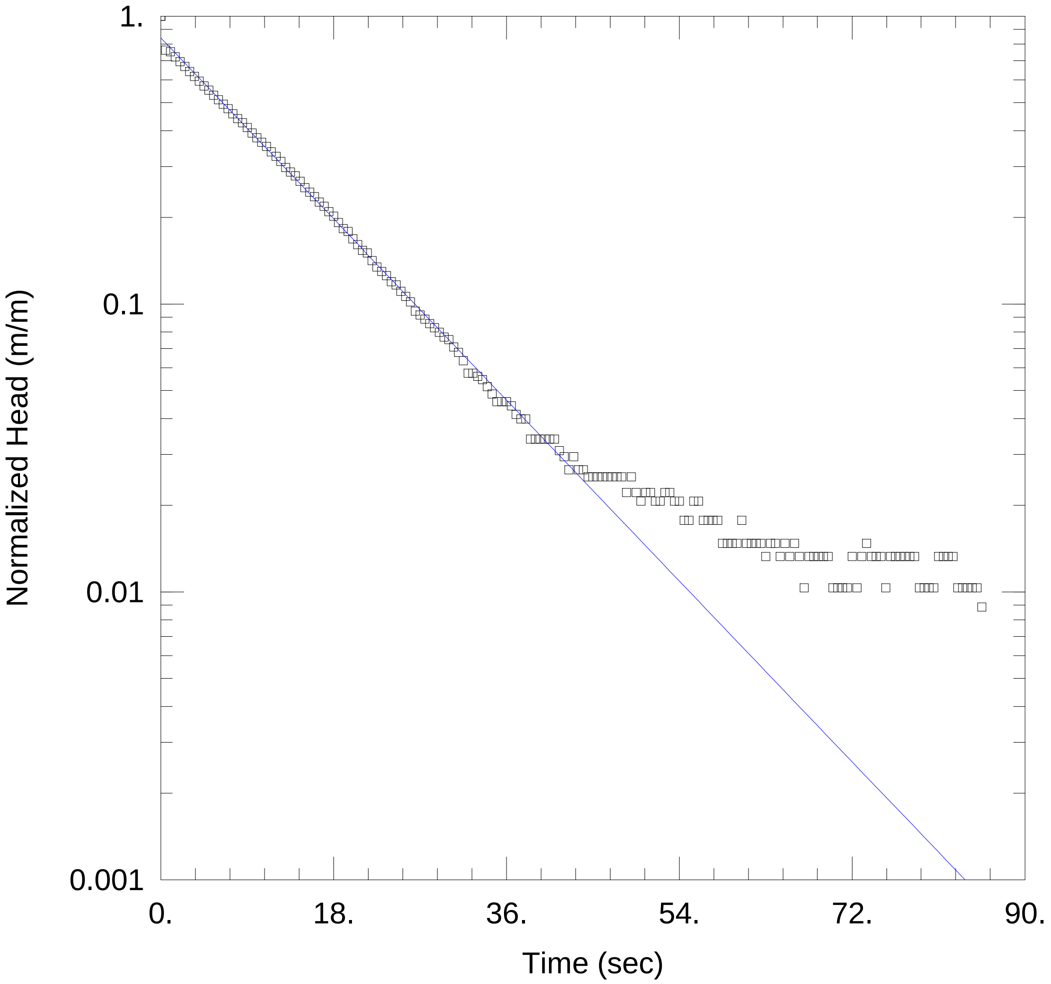
Saturated Thickness: 10.11 m

WELL DATA (MW2)

Initial Displacement: 0.522 m
Total Well Penetration Depth: 5.108 m
Casing Radius: 0.026 m
Static Water Column Height: 5.108 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model
Kr = 2.287 m/day
Kz/Kr = 1.
Ss = 3.874E-11 m^{-1}



MW2 TEST 3

Data Set: C:\...\MW2 Test 3a.aqt
Date: 04/11/12 Time: 13:13:00

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

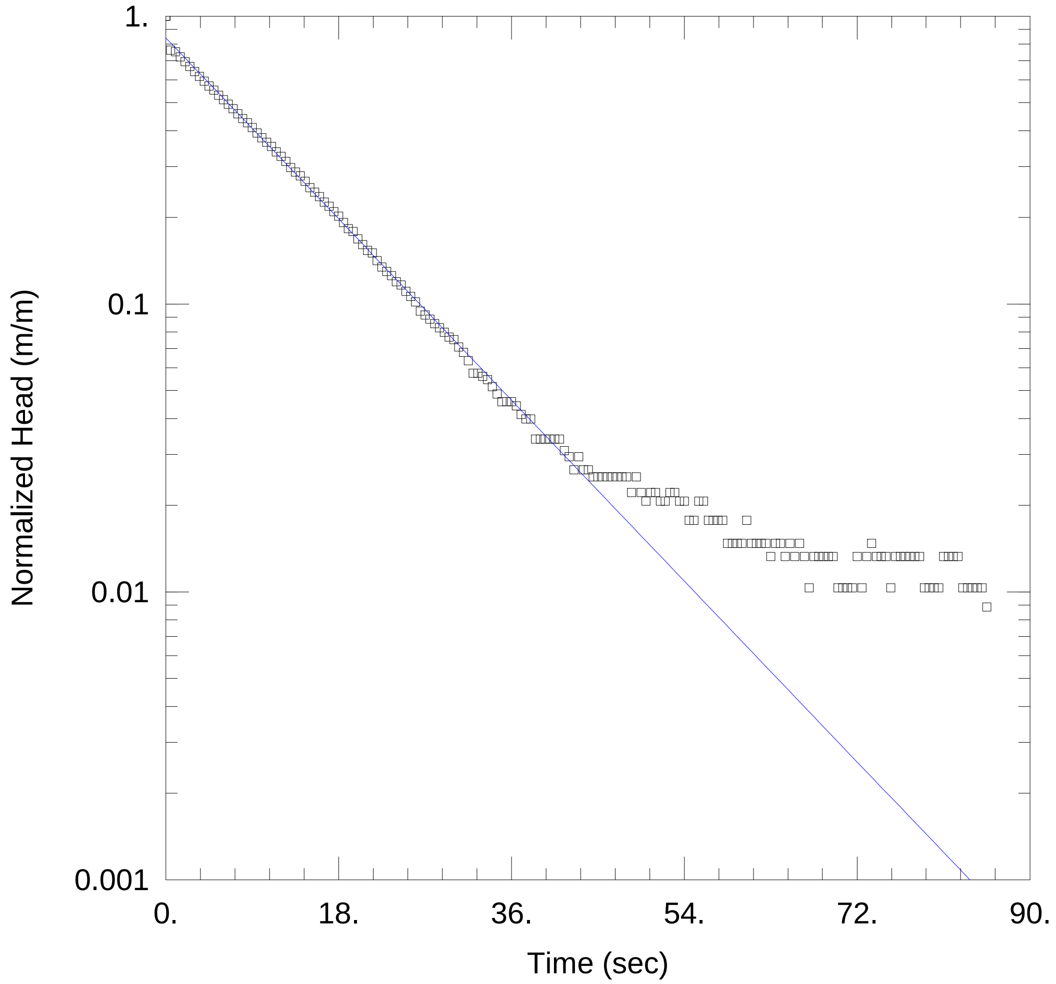
Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 0.678 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.267 m/day
y0 = 0.5694 m



MW2 TEST 3

Data Set: C:\...\MW2 Test 3a.aqt
Date: 04/11/12

Time: 13:15:11

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 10.11 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 0.678 m
Total Well Penetration Depth: 5.108 m
Casing Radius: 0.026 m

Static Water Column Height: 5.108 m
Screen Length: 3. m
Well Radius: 0.1 m

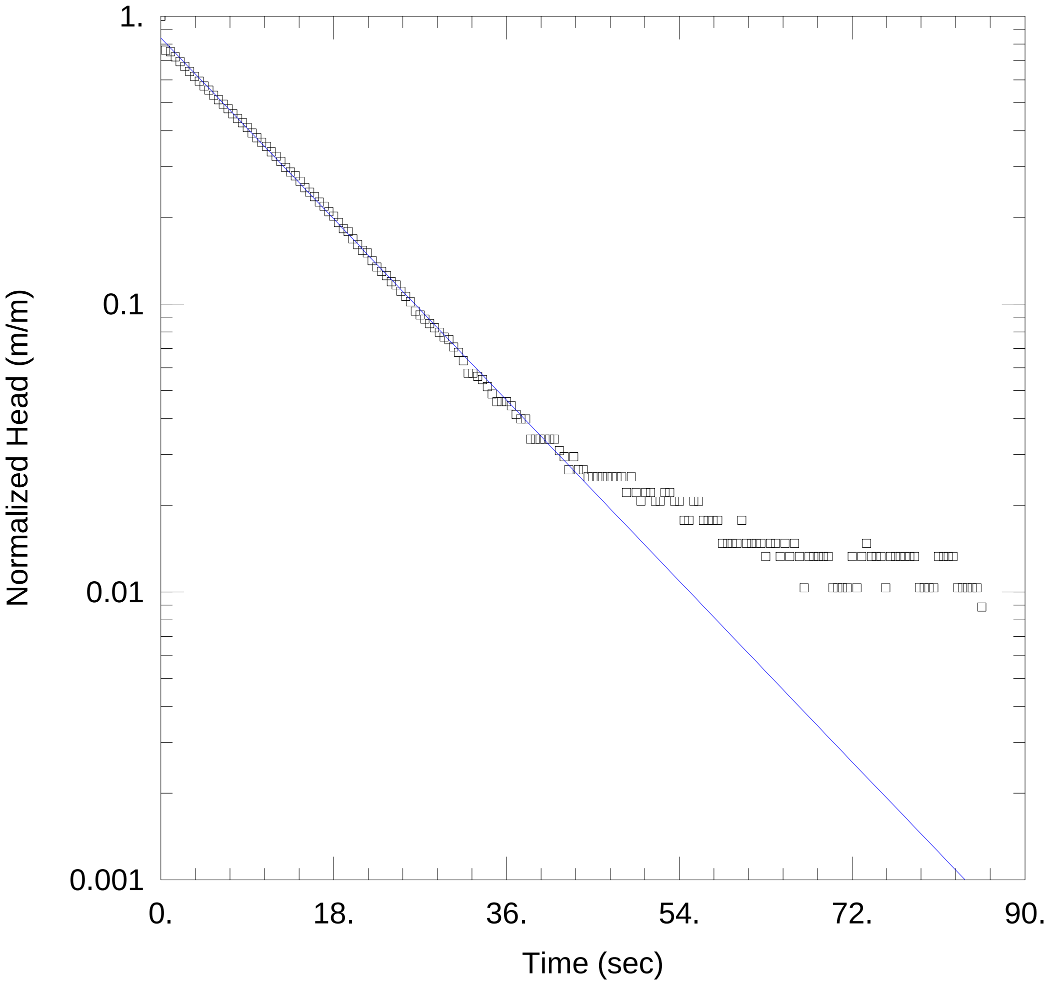
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.896 m/day

y0 = 0.5695 m



MW2 TEST 3

Data Set: C:\...\MW2 Test 3a.aqt
Date: 04/11/12
Time: 13:21:34

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 5.108 m
Anisotropy Ratio (Kz/Kr): 1.

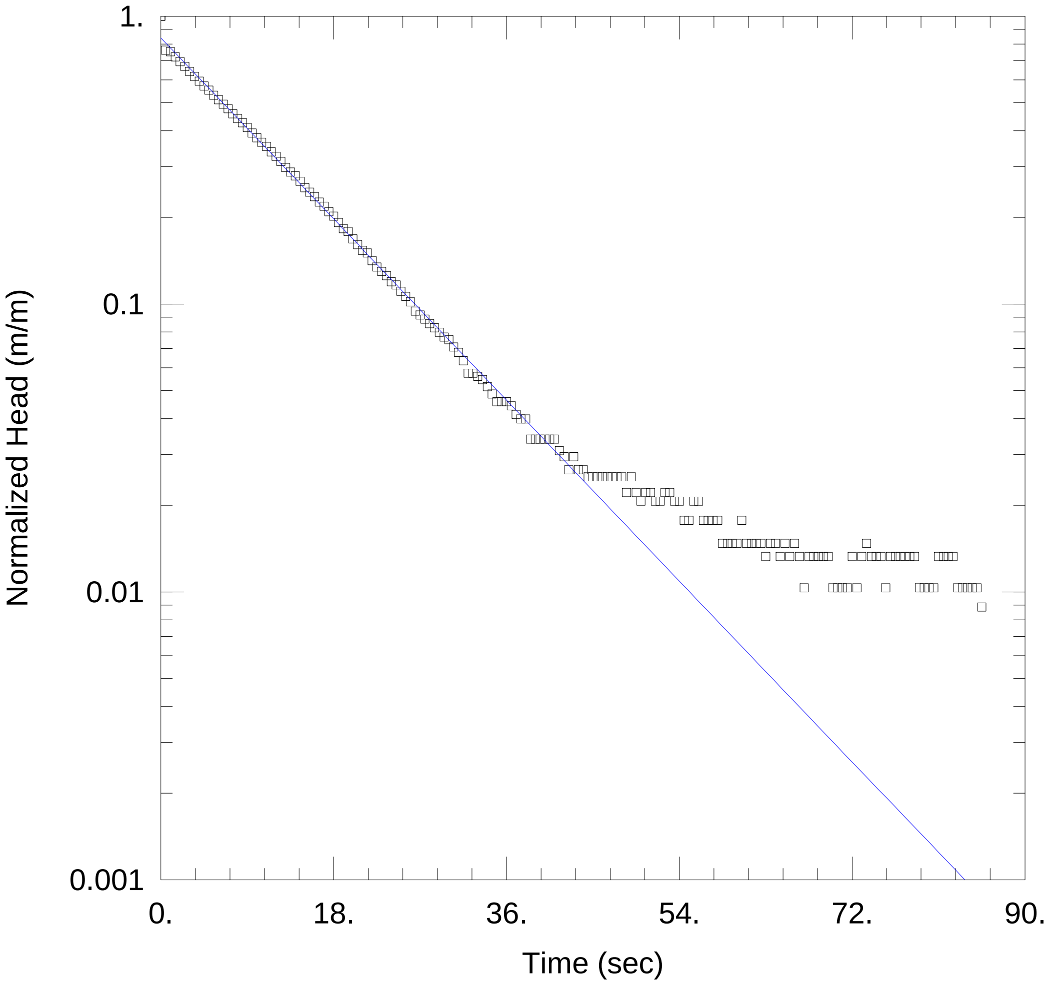
WELL DATA (MW2)

Initial Displacement: 0.678 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 3.205 m/day
y0 = 0.5694 m



MW2 TEST 3

Data Set: C:\...\MW2 Test 3a.aqt
Date: 04/11/12
Time: 13:20:51

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 10.11 m
Anisotropy Ratio (Kz/Kr): 1.

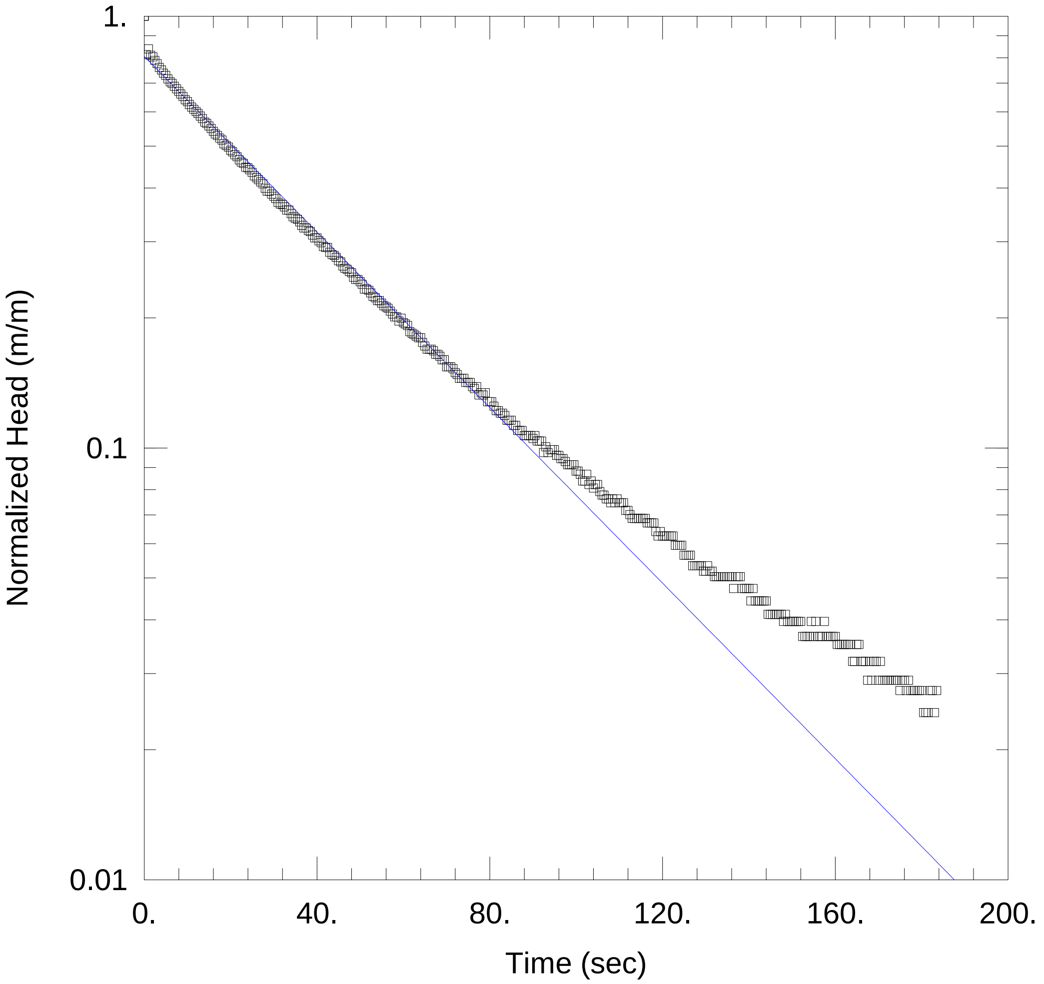
WELL DATA (MW2)

Initial Displacement: 0.678 m
Static Water Column Height: 5.108 m
Total Well Penetration Depth: 5.108 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 2.663 m/day
y0 = 0.5695 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1a.aqt
Date: 04/11/12
Time: 14:21:09

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

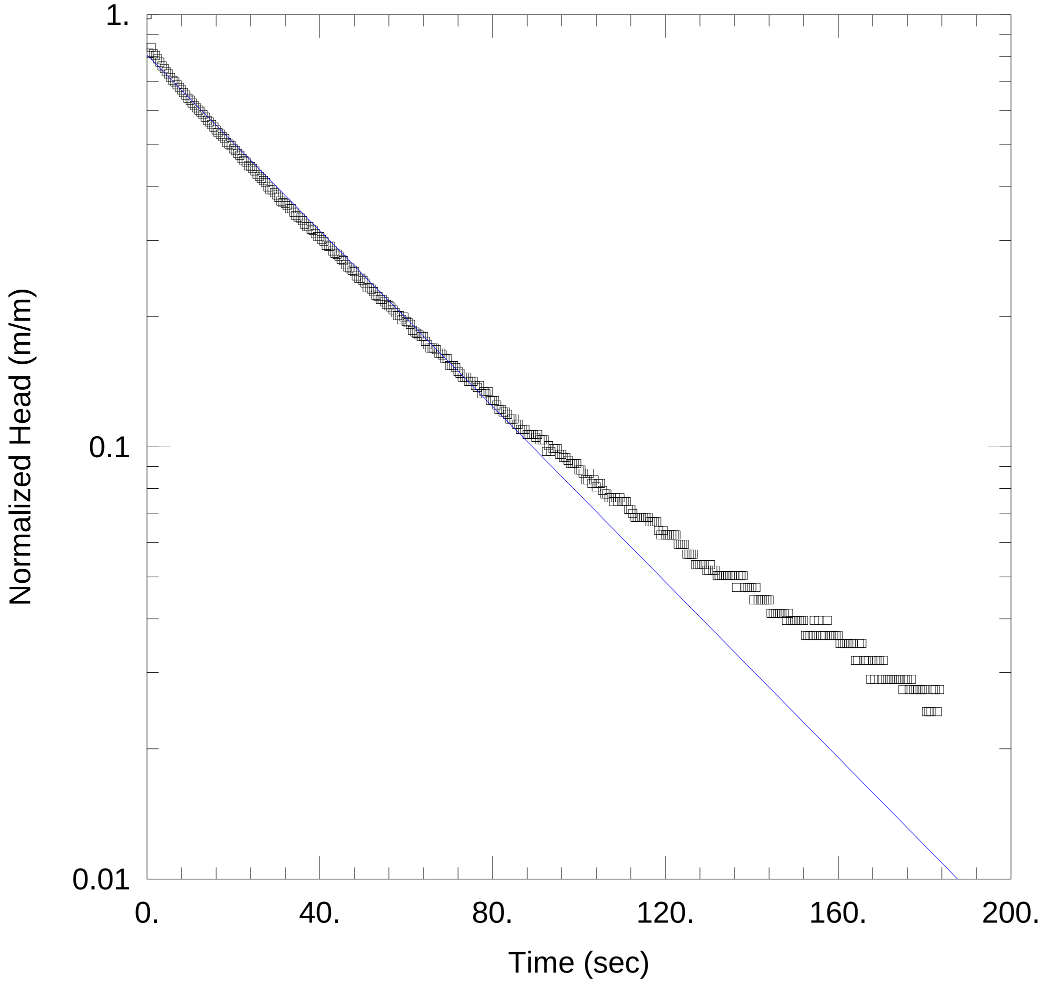
Saturated Thickness: 6.21 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.656 m
Static Water Column Height: 6.21 m
Total Well Penetration Depth: 6.21 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.6861 m/day
y0 = 0.5289 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1a.aqt
Date: 04/11/12
Time: 14:22:31

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

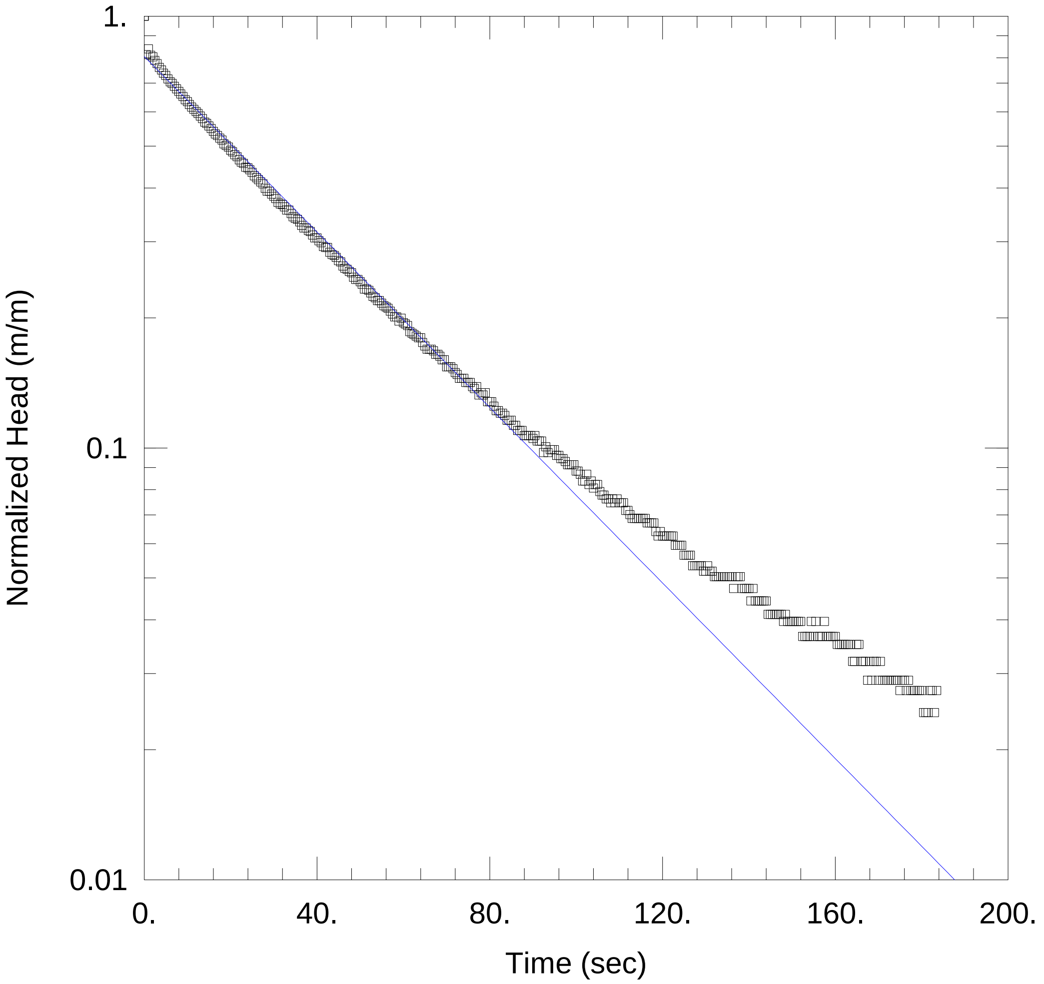
Saturated Thickness: 11.21 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.656 m
Static Water Column Height: 6.21 m
Total Well Penetration Depth: 6.21 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.5697 m/day
y0 = 0.5287 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1a.aqt
Date: 04/11/12
Time: 14:19:06

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 6.21 m
Anisotropy Ratio (Kz/Kr): 1.

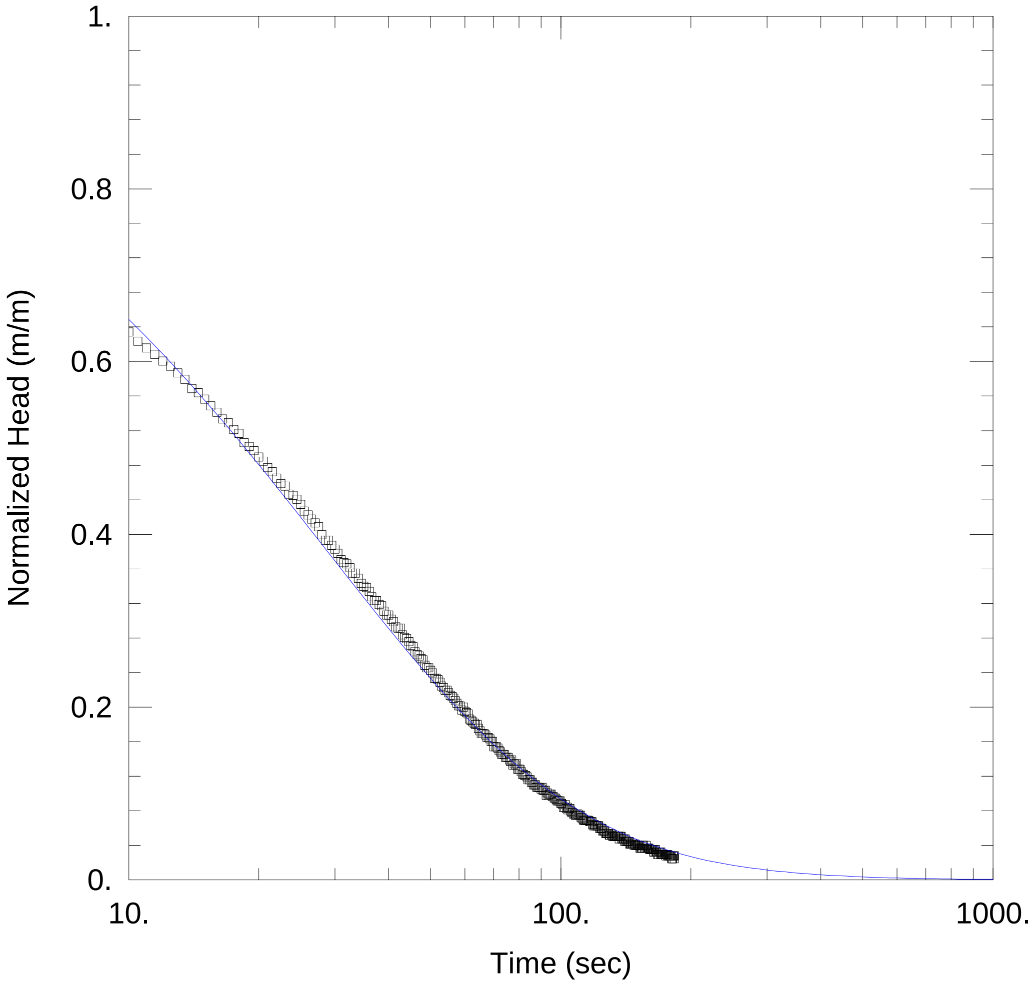
WELL DATA (MW3)

Initial Displacement: 0.656 m
Static Water Column Height: 6.21 m
Total Well Penetration Depth: 6.21 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.9325 m/day
y0 = 0.5288 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1a.aqt
Date: 04/11/12
Time: 14:20:36

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 6.21 m

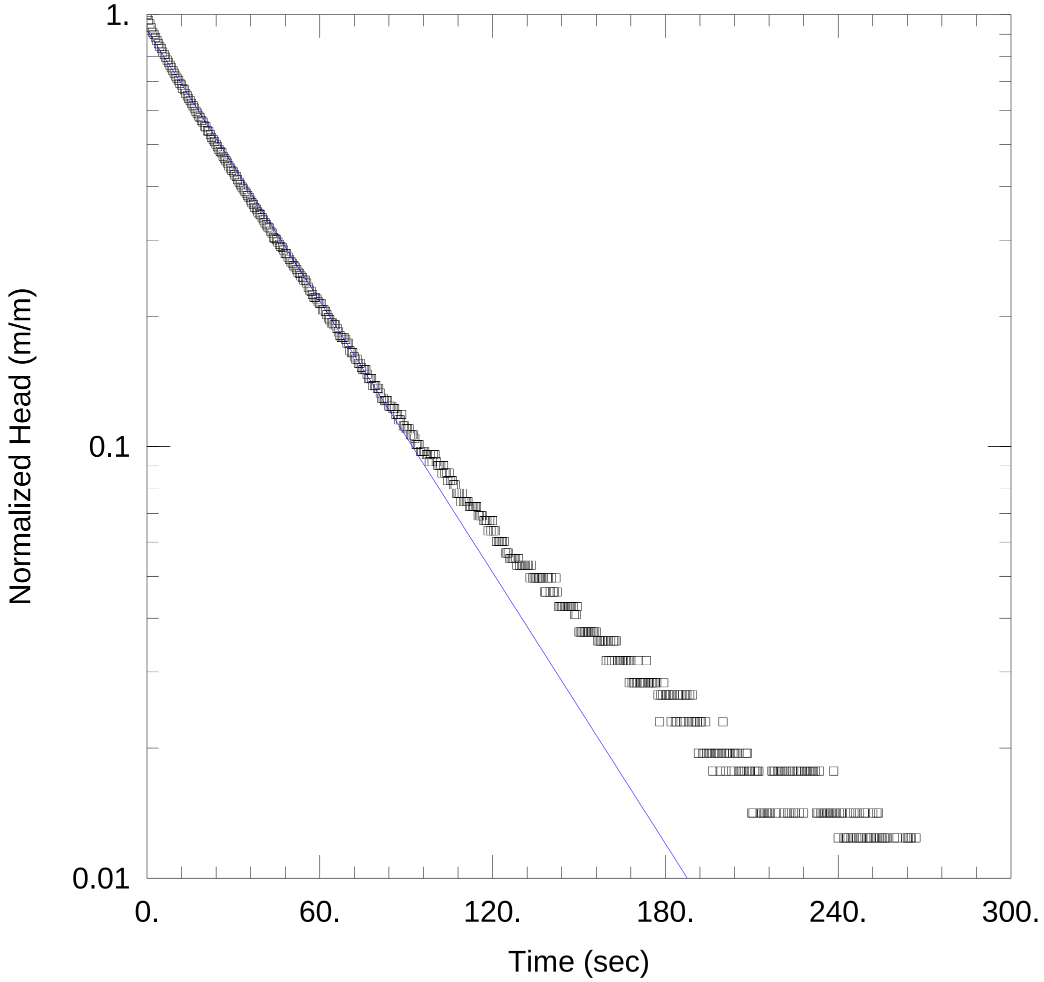
WELL DATA (MW3)

Initial Displacement: 0.656 m
Total Well Penetration Depth: 6.21 m
Casing Radius: 0.026 m
Static Water Column Height: 6.21 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.8472 m/day
Kz/Kr = 1.
Ss = 0.0002169 m^{-1}



MW3 TEST 2

Data Set: C:\...\MW3 Test 2a.aqt
Date: 04/11/12 Time: 14:25:32

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

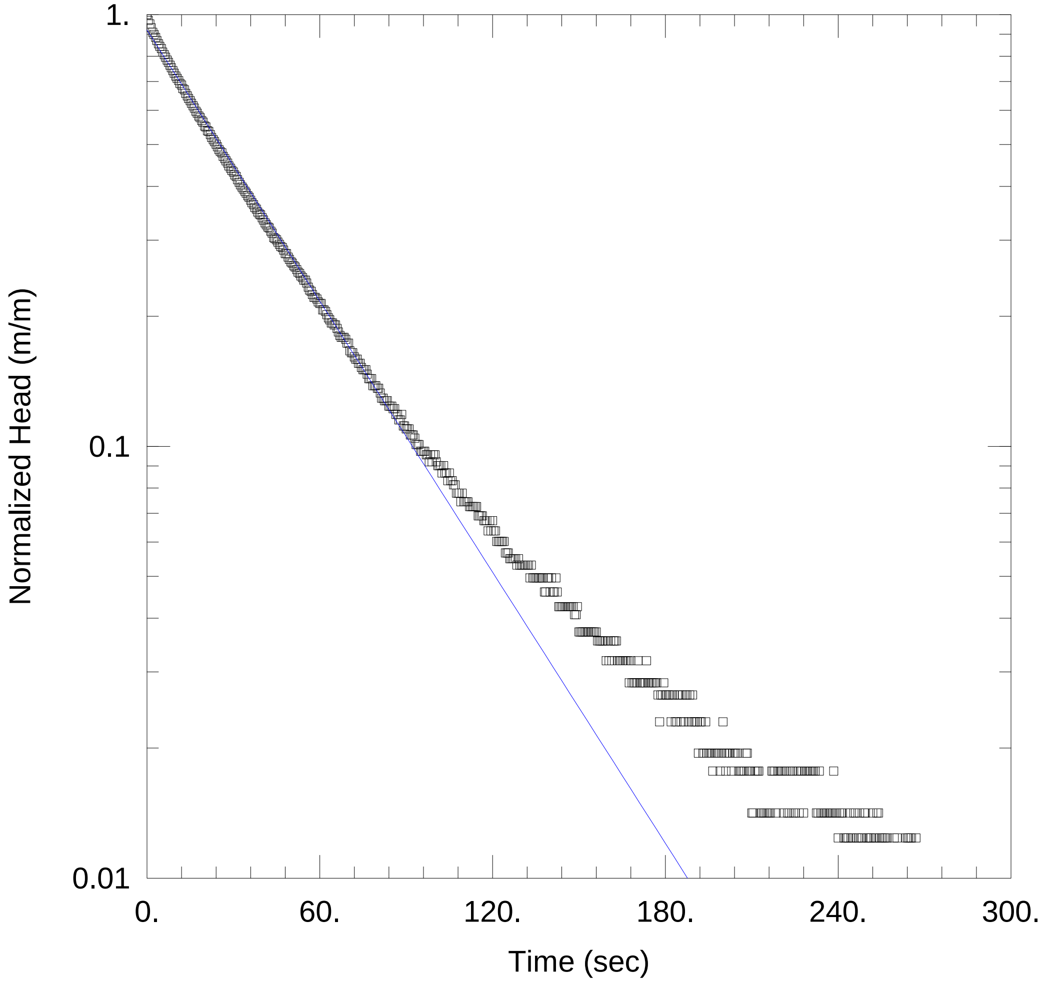
Saturated Thickness: 6.21 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.565 m
Static Water Column Height: 6.21 m
Total Well Penetration Depth: 6.21 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.7067 m/day
y0 = 0.5203 m



MW3 TEST 2

Data Set: C:\...\MW3 Test 2a.aqt
Date: 04/11/12 Time: 14:27:04

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

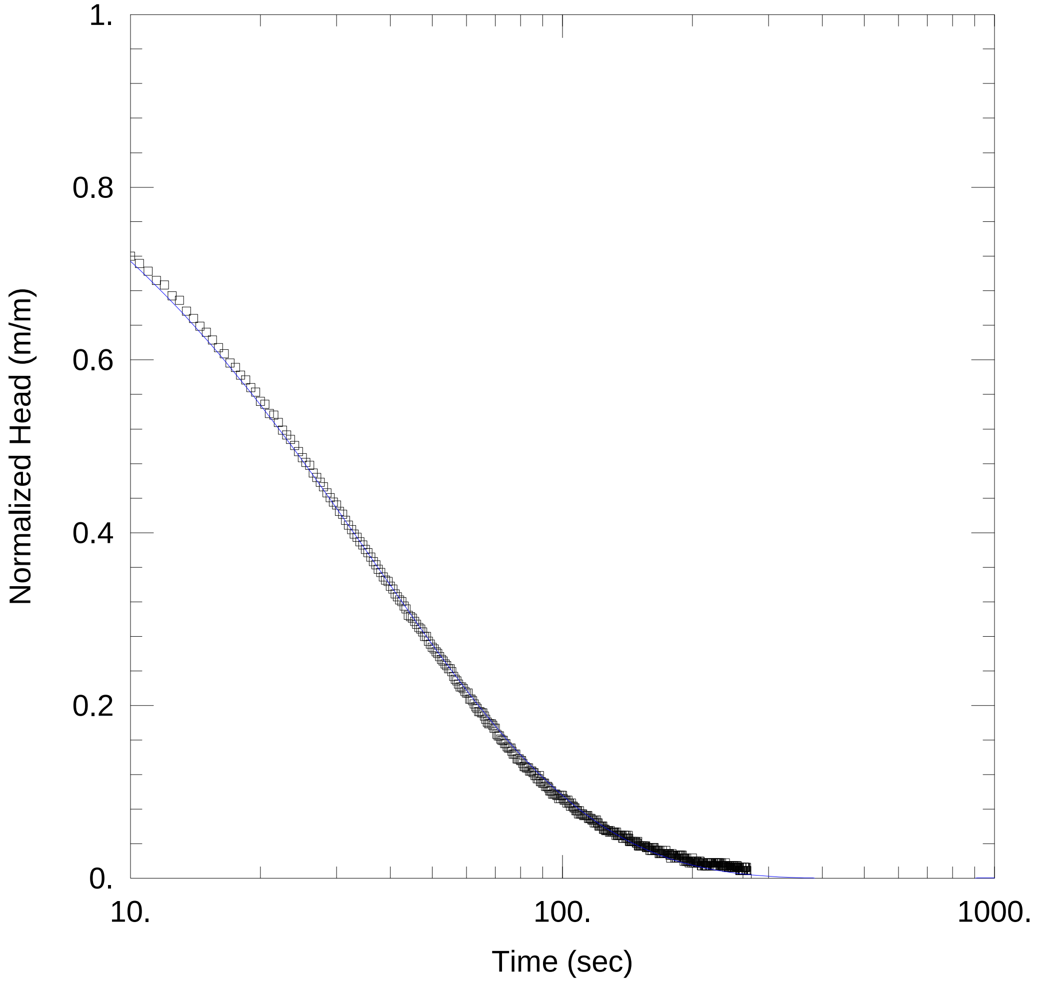
Saturated Thickness: 11.21 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.565 m
Static Water Column Height: 6.21 m
Total Well Penetration Depth: 6.21 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.5868 m/day
y0 = 0.5202 m



MW3 TEST 2

Data Set: C:\...\MW3 Test 2a.aqt
Date: 04/11/12 Time: 14:30:04

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 6.21 m

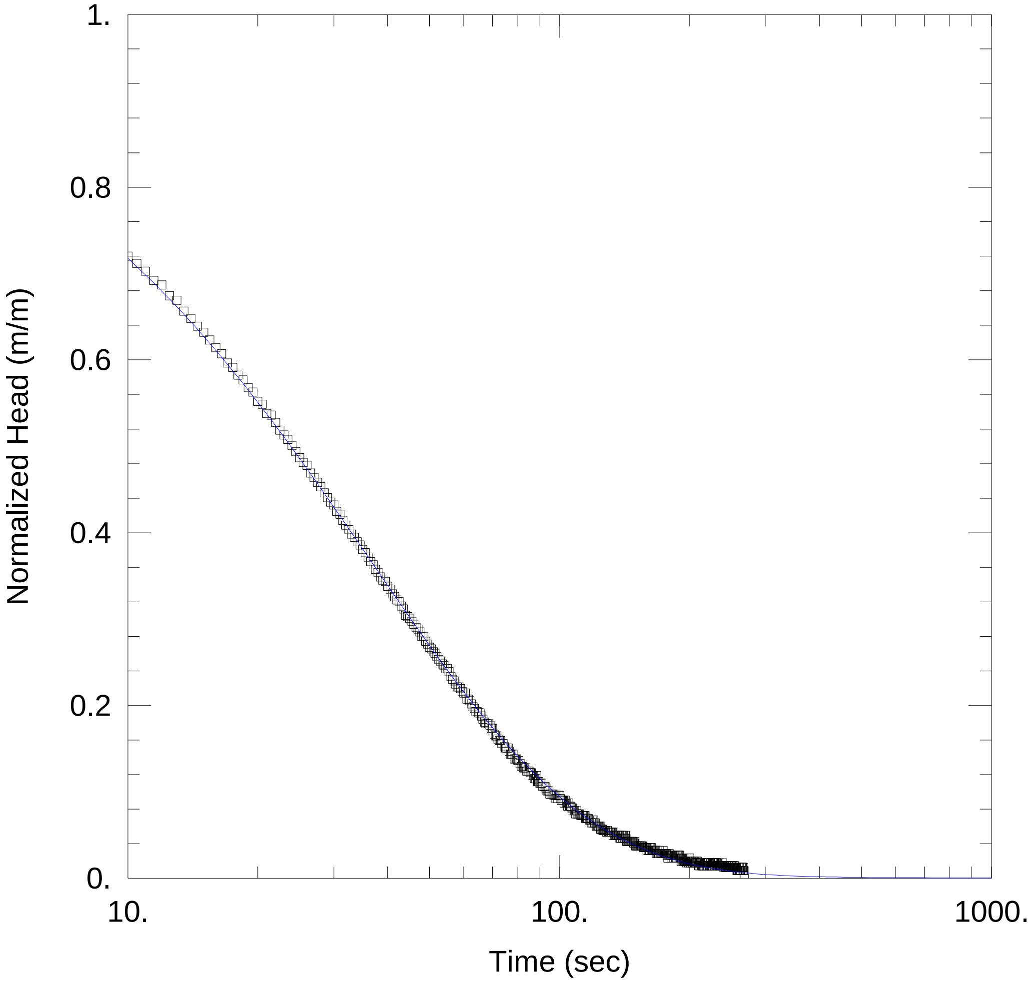
WELL DATA (MW3)

Initial Displacement: 0.565 m
Total Well Penetration Depth: 6.21 m
Casing Radius: 0.026 m
Static Water Column Height: 6.21 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.8517 m/day
Kz/Kr = 1.
Ss = 4.446E-5 m^{-1}



MW3 TEST 2

Data Set: C:\...\MW3 Test 2a.aqt
Date: 04/11/12 Time: 14:29:22

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 11.21 m

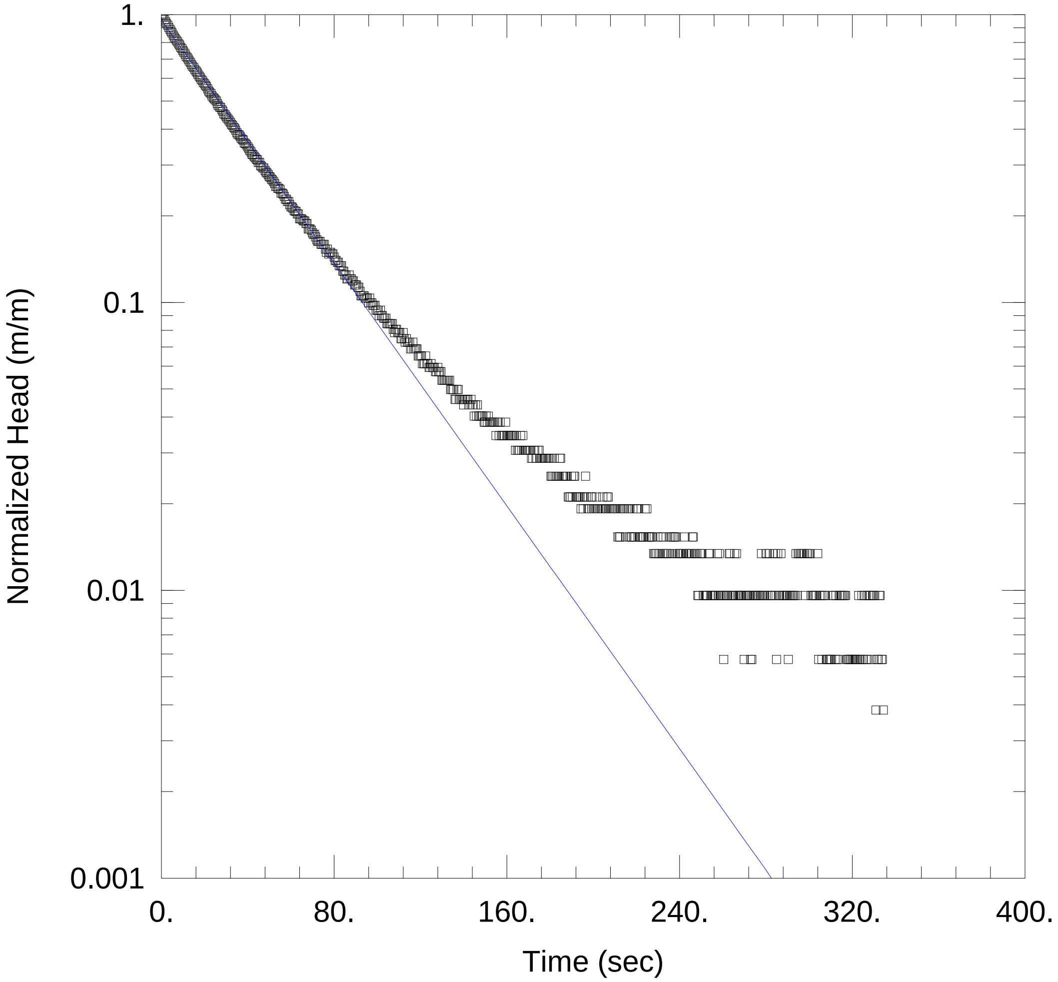
WELL DATA (MW3)

Initial Displacement: 0.565 m
Total Well Penetration Depth: 6.21 m
Casing Radius: 0.026 m
Static Water Column Height: 6.21 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.728 m/day
Kz/Kr = 1.
Ss = 6.496E-5 m^{-1}



MW3 TEST 3

Data Set: C:\...\MW3 Test 3a.aqt

Date: 04/11/12 Time: 14:35:23

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 6.217 m
Anisotropy Ratio (Kz/Kr): 1.

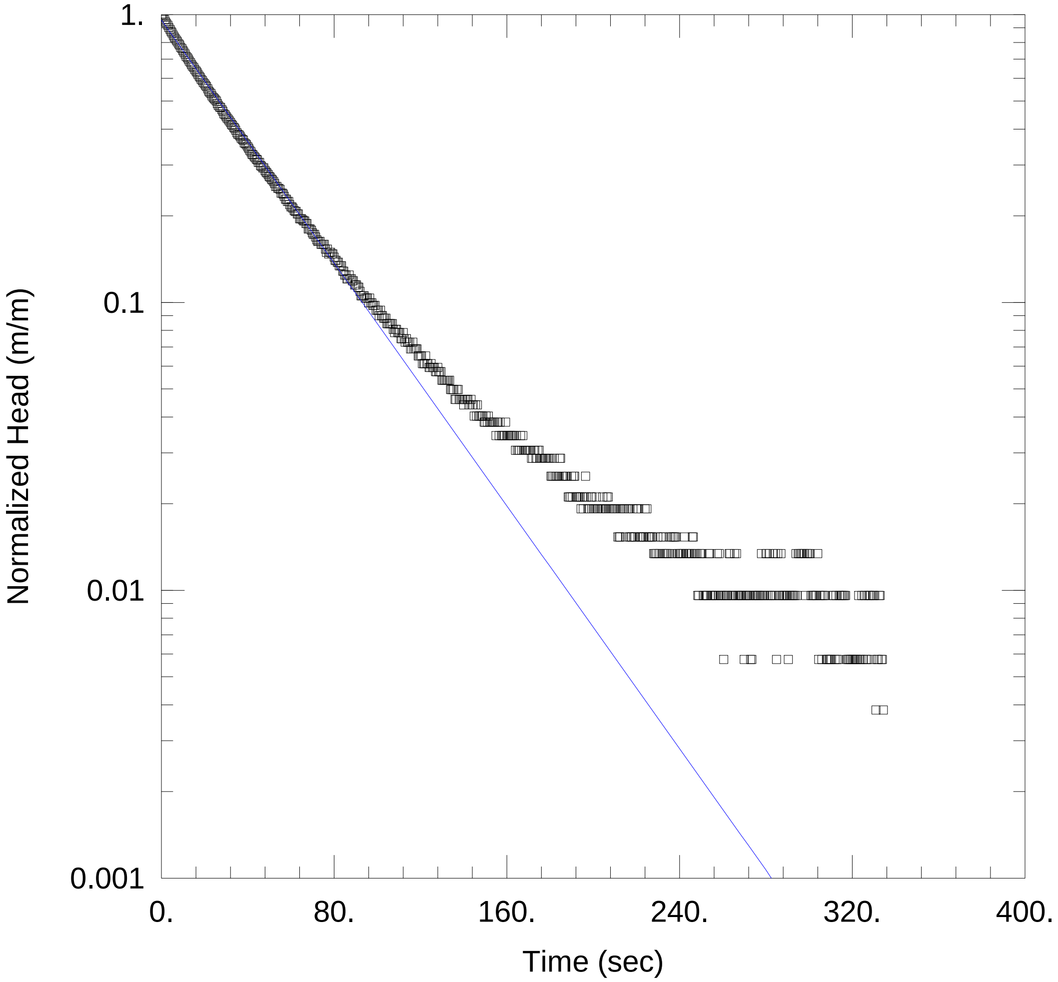
WELL DATA (MW3)

Initial Displacement: 0.522 m
Static Water Column Height: 6.217 m
Total Well Penetration Depth: 6.217 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.7119 m/day
y0 = 0.4985 m



MW3 TEST 3

Data Set: C:\...\MW3 Test 3a.aqt
Date: 04/11/12
Time: 14:36:29

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

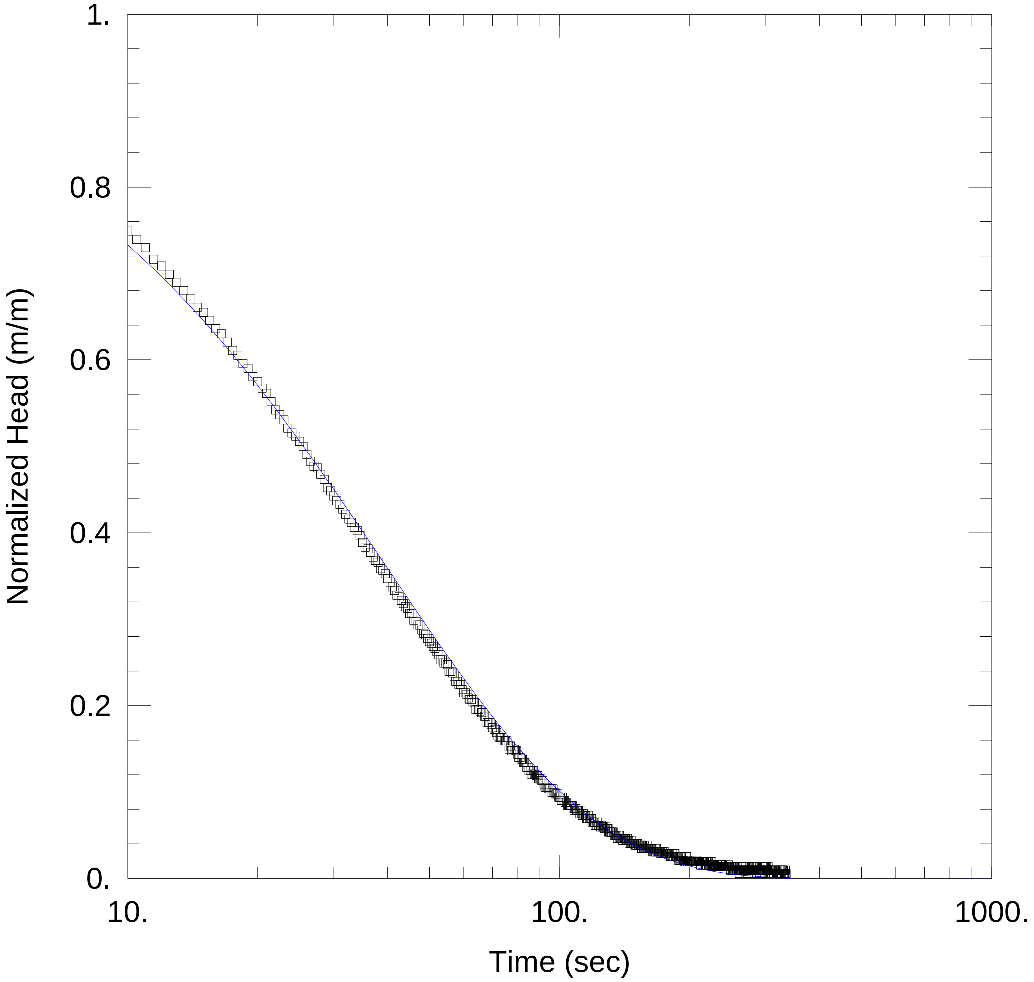
Saturated Thickness: 11.22 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.522 m
Static Water Column Height: 6.217 m
Total Well Penetration Depth: 6.217 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.5913 m/day
y0 = 0.4985 m



MW3 TEST 3

Data Set: C:\...\MW3 Test 3a.aqt
Date: 04/11/12 Time: 14:39:33

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 6.217 m

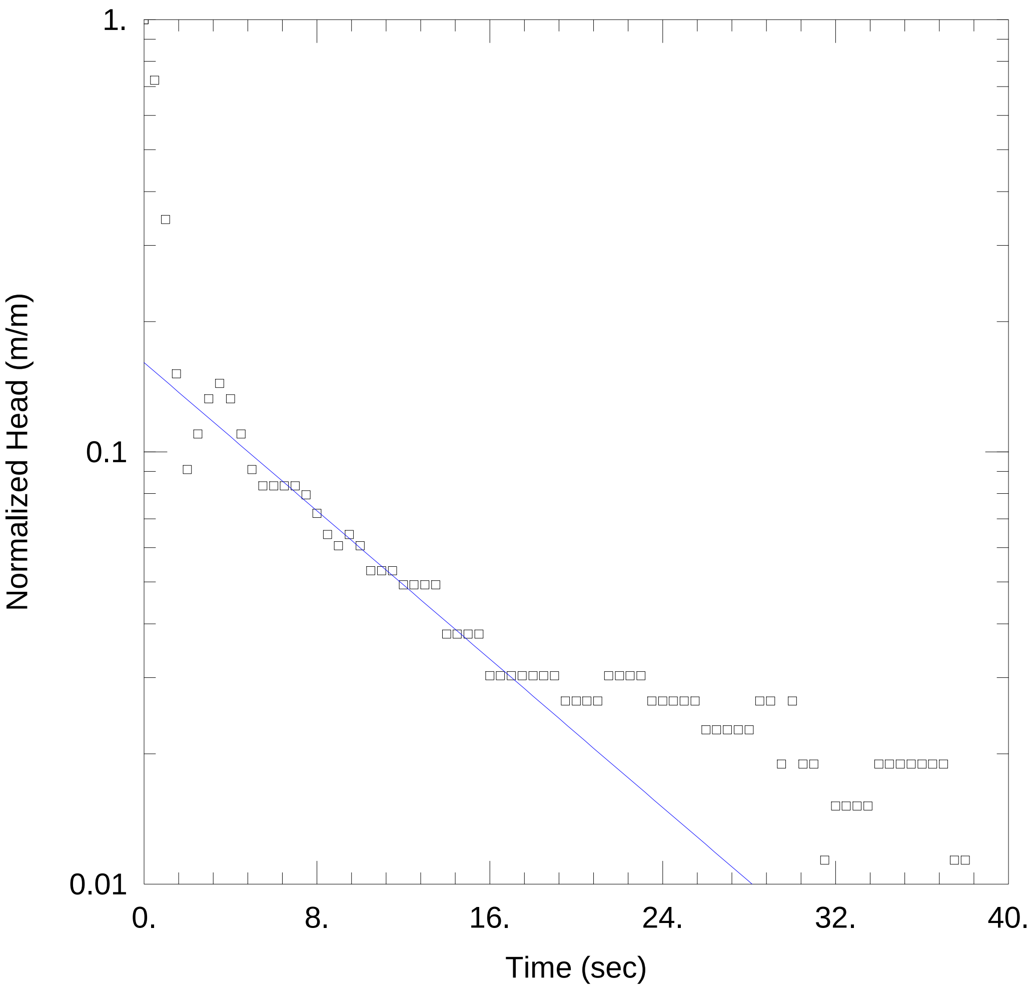
WELL DATA (MW3)

Initial Displacement: 0.522 m
Static Water Column Height: 6.217 m
Total Well Penetration Depth: 6.217 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.8229 m/day
Ss = 2.996E-5 m^{-1}
Kz/Kr = 1.



MW4 TEST 1

Data Set: C:\...\MW4 Test 1a.aqt
Date: 04/11/12 Time: 16:04:11

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

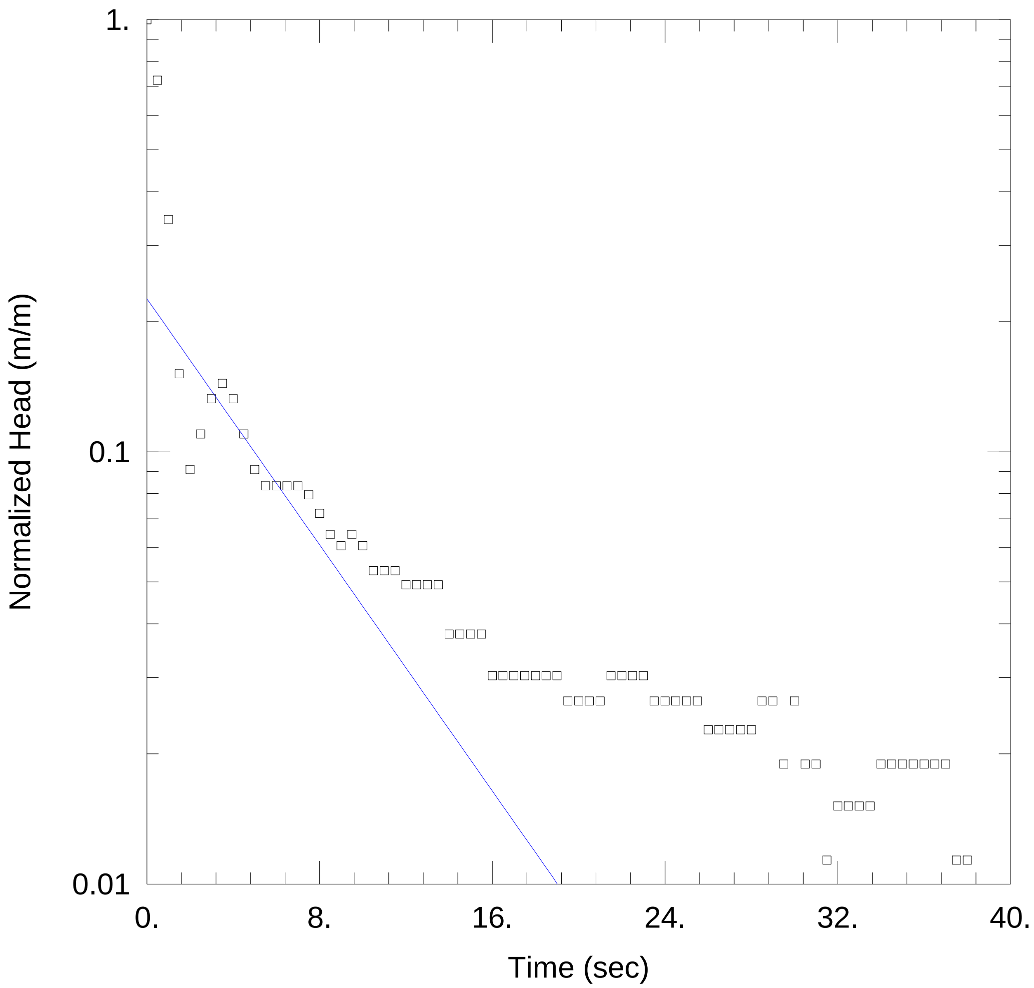
Saturated Thickness: 3.951 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4)

Initial Displacement: 0.264 m
Total Well Penetration Depth: 3.951 m
Casing Radius: 0.026 m
Static Water Column Height: 3.951 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.634 m/day
y0 = 0.04246 m



MW4 TEST 1

Data Set: C:\...\MW4 Test 1a.aqt
Date: 04/11/12 Time: 16:06:39

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 8.951 m
Anisotropy Ratio (Kz/Kr): 1.

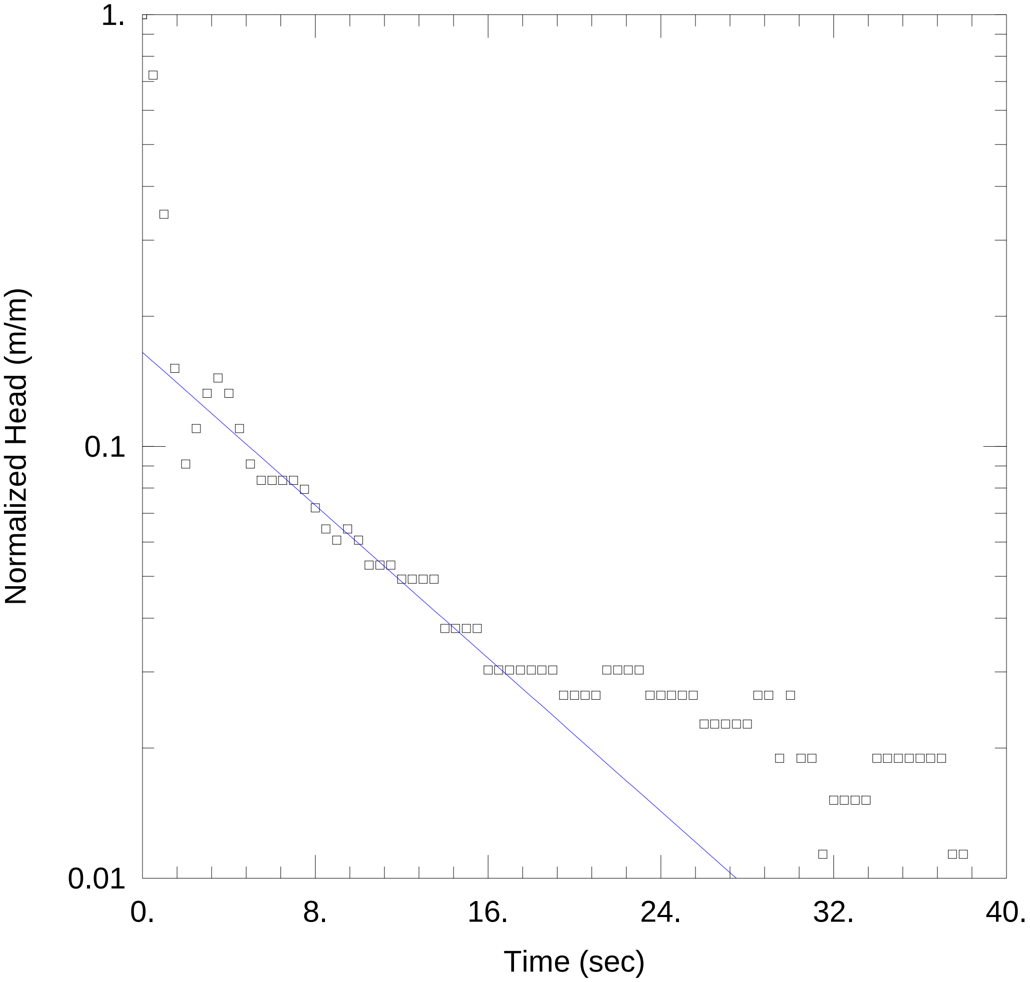
WELL DATA (MW4)

Initial Displacement: 0.264 m
Static Water Column Height: 3.951 m
Total Well Penetration Depth: 3.951 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.69 m/day
y0 = 0.05965 m



MW4 TEST 1

Data Set: C:\...\MW4 Test 1a.aqt
Date: 04/11/12 Time: 16:07:09

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 8.951 m
Anisotropy Ratio (Kz/Kr): 1.

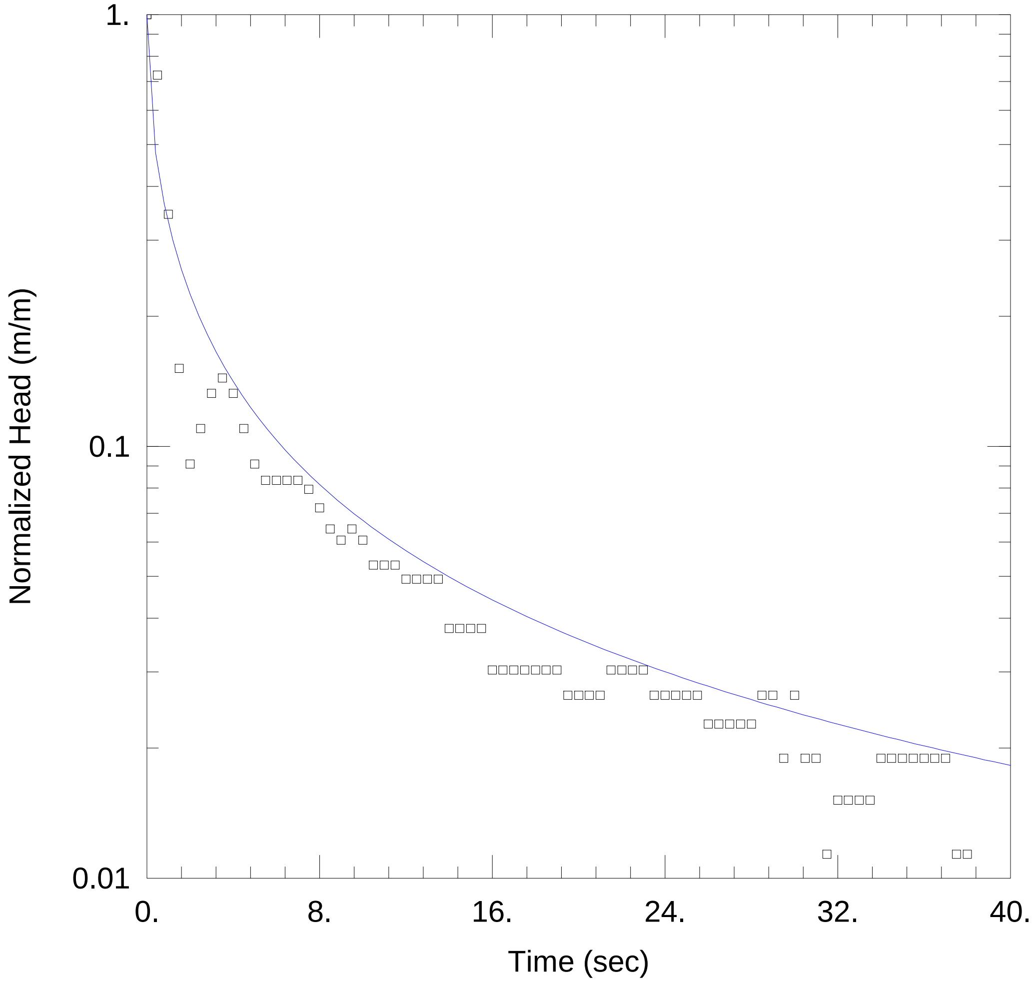
WELL DATA (MW4)

Initial Displacement: 0.264 m
Static Water Column Height: 3.951 m
Total Well Penetration Depth: 3.951 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.295 m/day
y0 = 0.04358 m



MW4 TEST 1

Data Set: C:\...\MW4 Test 1a.aqt
Date: 04/11/12 Time: 16:09:01

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 3.951 m

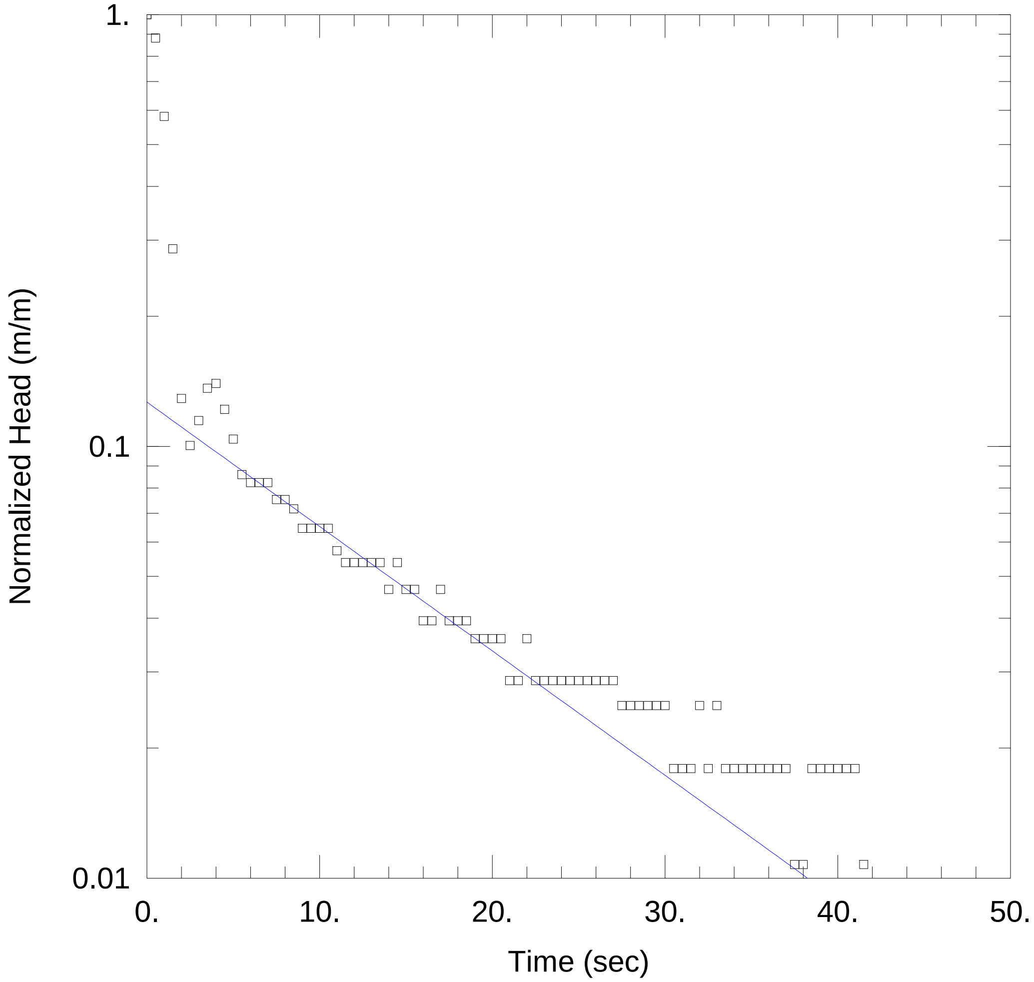
WELL DATA (MW4)

Initial Displacement: 0.264 m
Total Well Penetration Depth: 3.951 m
Casing Radius: 0.026 m
Static Water Column Height: 3.951 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 6. m/day
Kz/Kr = 1.
Ss = 0.02266 m^{-1}



MW4 TEST 2

Data Set: C:\...\MW4 Test 2a.aqt
Date: 04/11/12 Time: 16:14:33

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 3.951 m Anisotropy Ratio (Kz/Kr): 1.

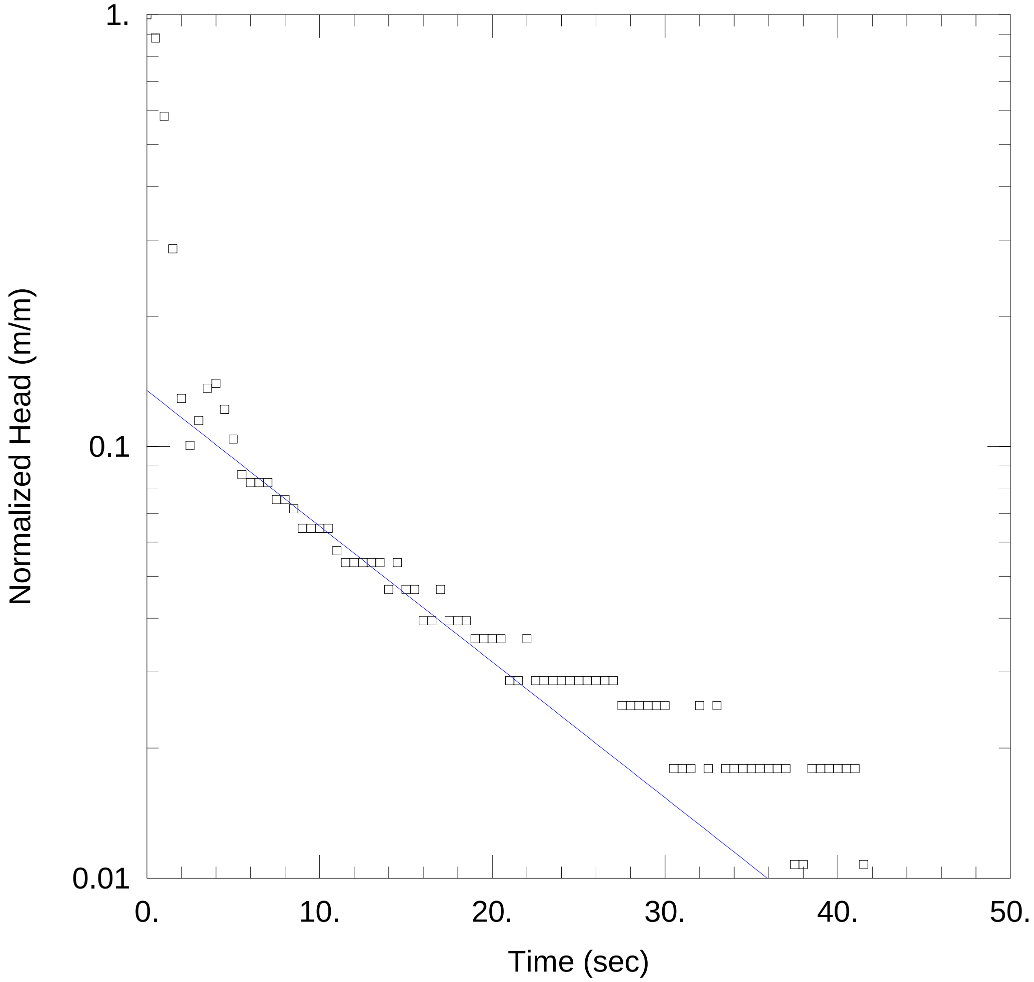
WELL DATA (MW4)

Initial Displacement: 0.279 m Static Water Column Height: 3.951 m
Total Well Penetration Depth: 3.951 m Screen Length: 3. m
Casing Radius: 0.026 m Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.77 m/day y0 = 0.03531 m



MW4 TEST 2

Data Set: C:\...\MW4 Test 2a.aqt
Date: 04/11/12
Time: 16:17:08

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

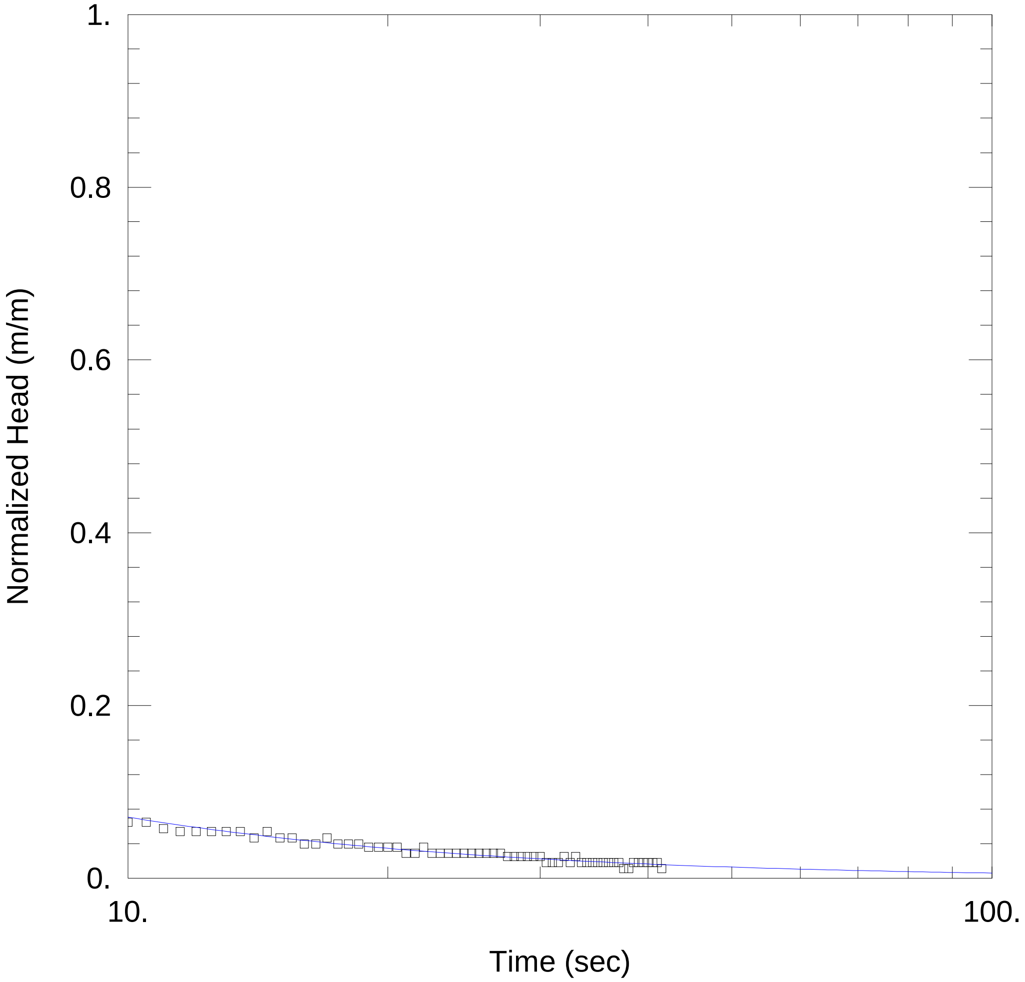
Saturated Thickness: 8.951 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4)

Initial Displacement: 0.279 m
Static Water Column Height: 3.951 m
Total Well Penetration Depth: 3.951 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.63 m/day
y0 = 0.03758 m



MW4 TEST 2

Data Set: C:\...\MW4 Test 2a.aqt
Date: 04/11/12 Time: 16:22:22

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 3.951 m

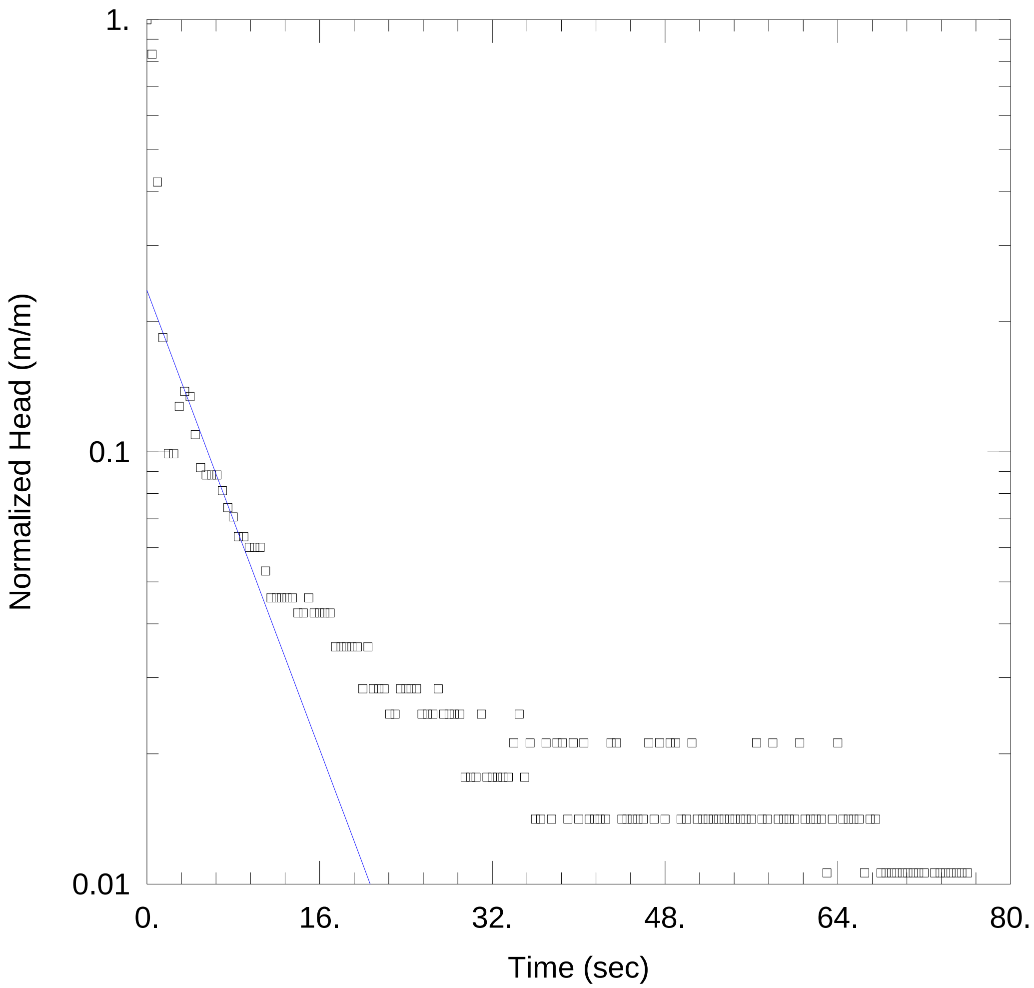
WELL DATA (MW4)

Initial Displacement: 0.279 m
Total Well Penetration Depth: 3.951 m
Casing Radius: 0.026 m
Static Water Column Height: 3.951 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 7.055 m/day
Kz/Kr = 1.
Ss = 0.009138 m^{-1}



MW4 TEST 3

Data Set: C:\...\MW4 Test 3a.aqt
Date: 04/11/12 Time: 16:24:55

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 20 Sept 2011

AQUIFER DATA

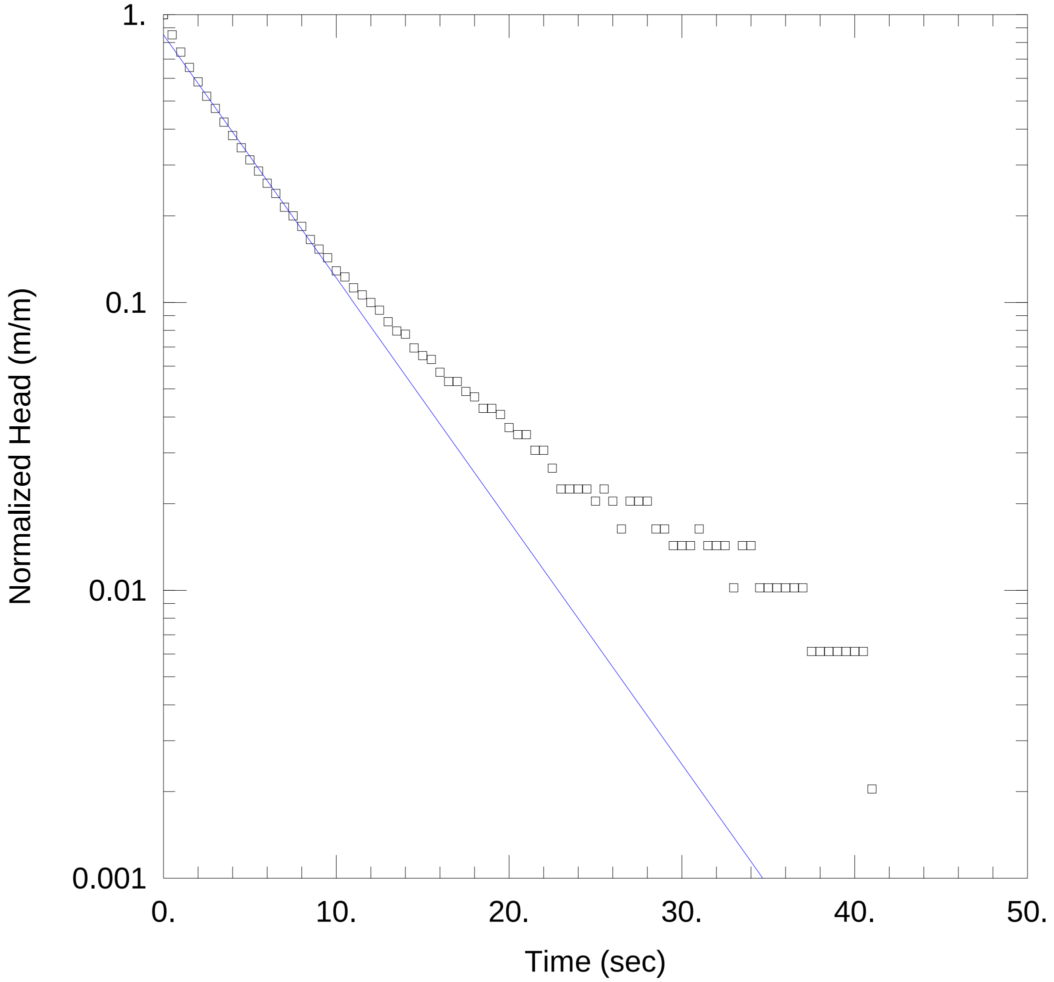
Saturated Thickness: 3.951 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4)

Initial Displacement: 0.283 m
Static Water Column Height: 3.951 m
Total Well Penetration Depth: 3.951 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.08 m/day
y0 = 0.06693 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1a.aqt
Date: 04/11/12 Time: 16:40:10

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 4.301 m
Anisotropy Ratio (Kz/Kr): 1.

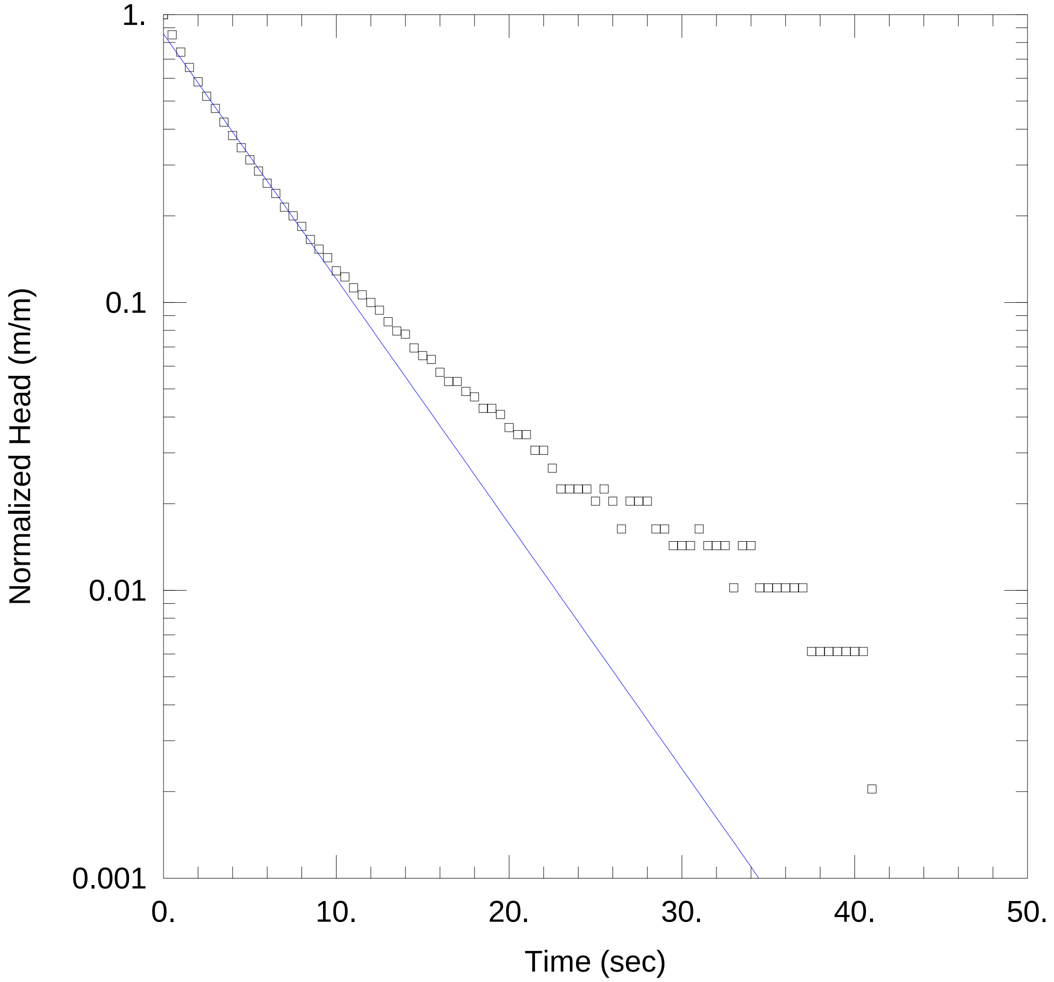
WELL DATA (MW5)

Initial Displacement: 0.49 m
Static Water Column Height: 4.301 m
Total Well Penetration Depth: 4.301 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.288 m/day
y0 = 0.4163 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1a.aqt
Date: 04/11/12 Time: 16:44:02

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 9.301 m
Anisotropy Ratio (Kz/Kr): 1.

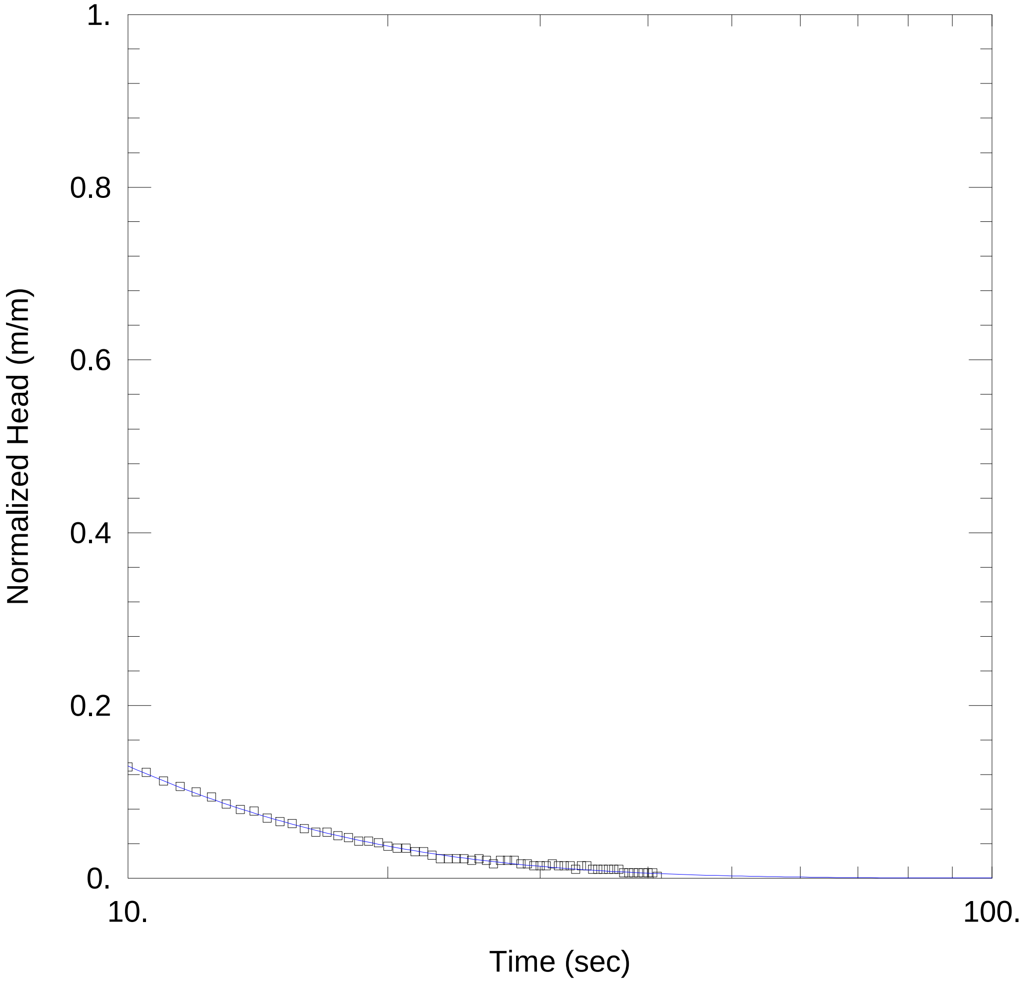
WELL DATA (MW5)

Initial Displacement: 0.49 m
Static Water Column Height: 4.301 m
Total Well Penetration Depth: 4.301 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.48 m/day
y0 = 0.4194 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1a.aqt
Date: 04/11/12 Time: 16:46:32

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 4.301 m

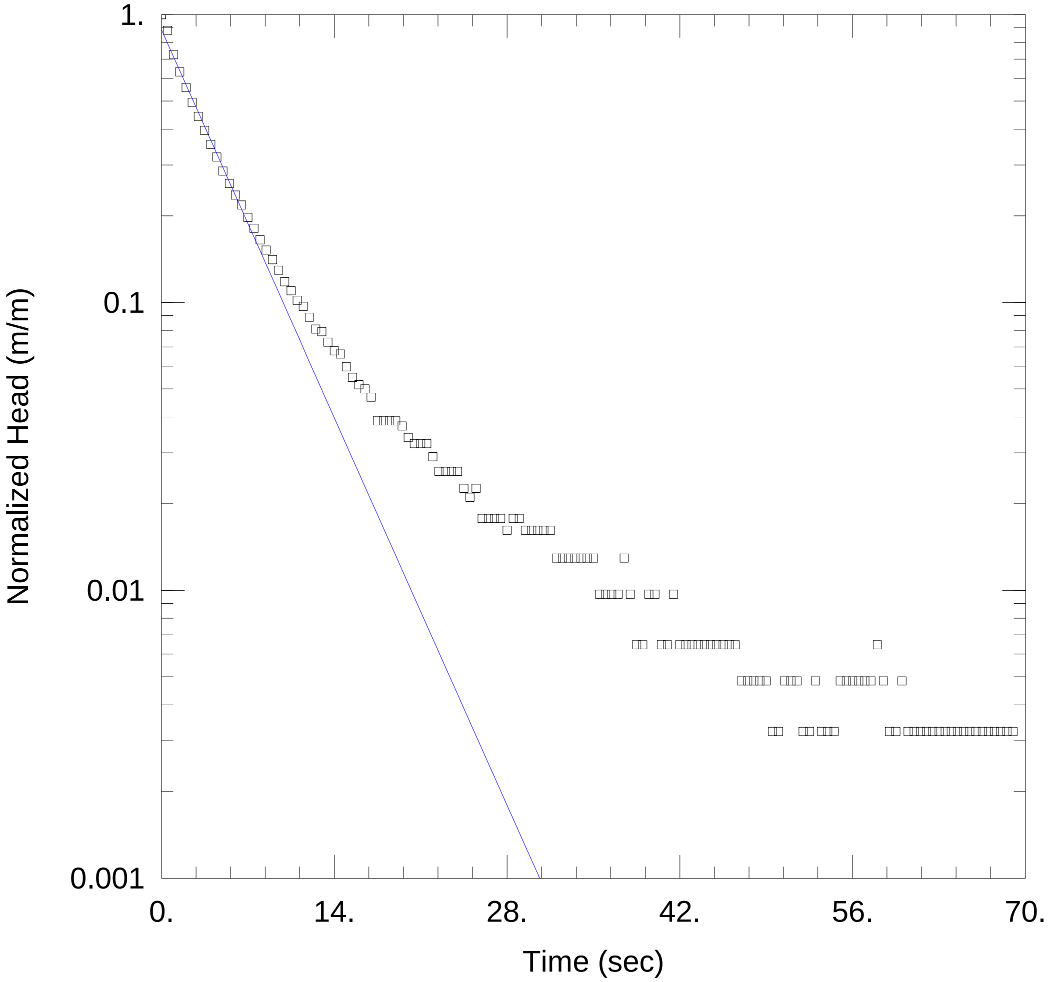
WELL DATA (MW5)

Initial Displacement: 0.49 m
Total Well Penetration Depth: 4.301 m
Casing Radius: 0.026 m
Static Water Column Height: 4.301 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 6.732 m/day
Kz/Kr = 1.
Ss = 0.0002089 m^{-1}



MW5 TEST 2

Data Set: C:\...\MW5 Test 2a.aqt
Date: 04/11/12 Time: 16:51:08

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

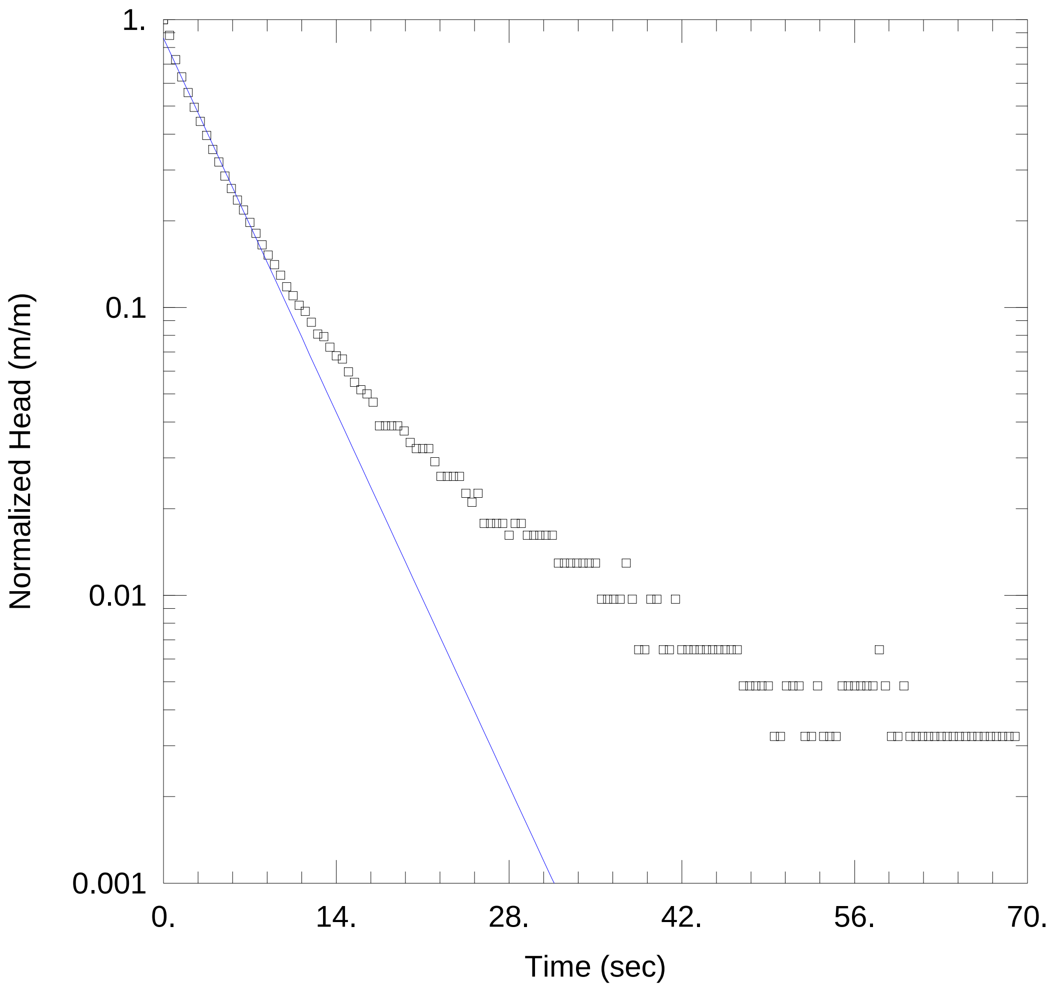
Saturated Thickness: 4.301 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5)

Initial Displacement: 0.619 m Static Water Column Height: 4.301 m
Total Well Penetration Depth: 4.301 m Screen Length: 3. m
Casing Radius: 0.026 m Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 6.018 m/day y0 = 0.5481 m



MW5 TEST 2

Data Set: C:\...\MW5 Test 2a.aqt

Date: 04/11/12

Time: 16:53:06

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 9.301 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5)

Initial Displacement: 0.619 m
Total Well Penetration Depth: 4.301 m
Casing Radius: 0.026 m

Static Water Column Height: 4.301 m
Screen Length: 3. m
Well Radius: 0.1 m

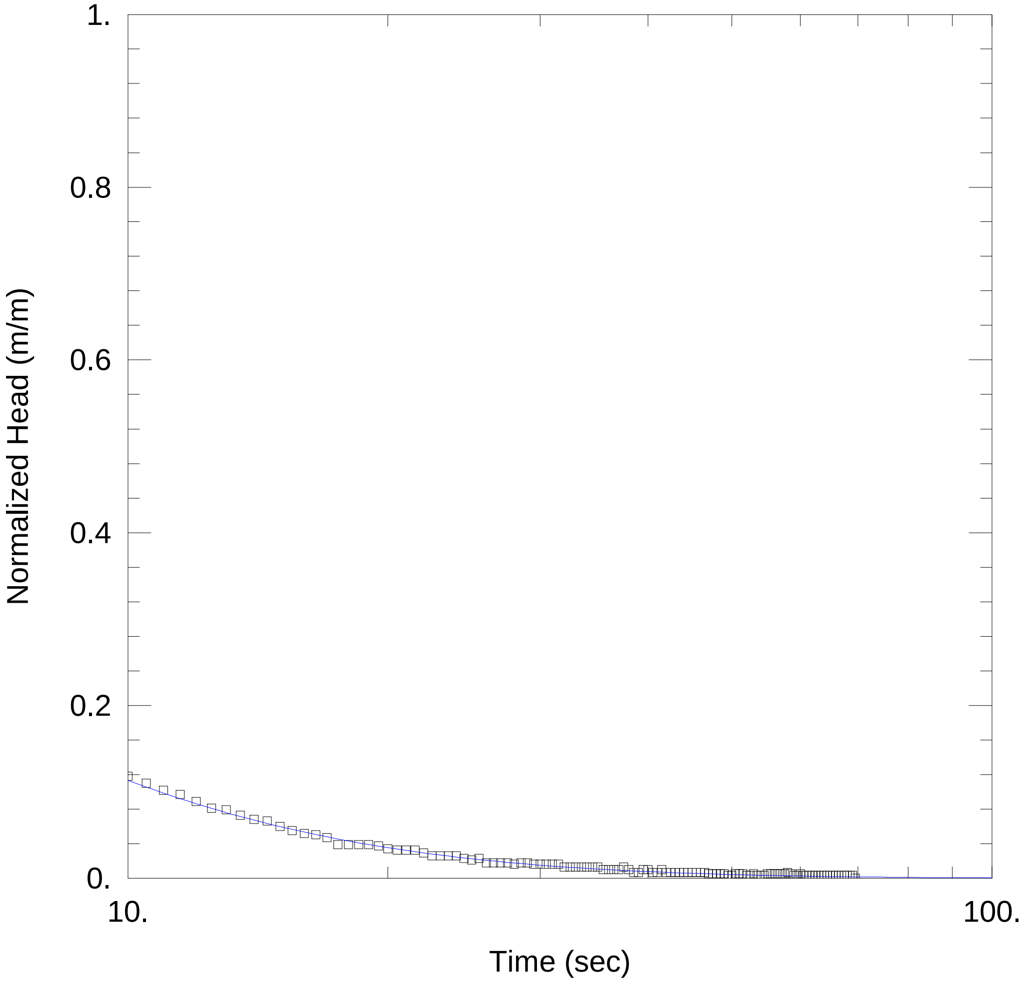
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 4.881 m/day

y0 = 0.5331 m



MW5 TEST 2

Data Set: C:\...\MW5 Test 2a.aqt
Date: 04/11/12
Time: 16:55:14

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 4.301 m

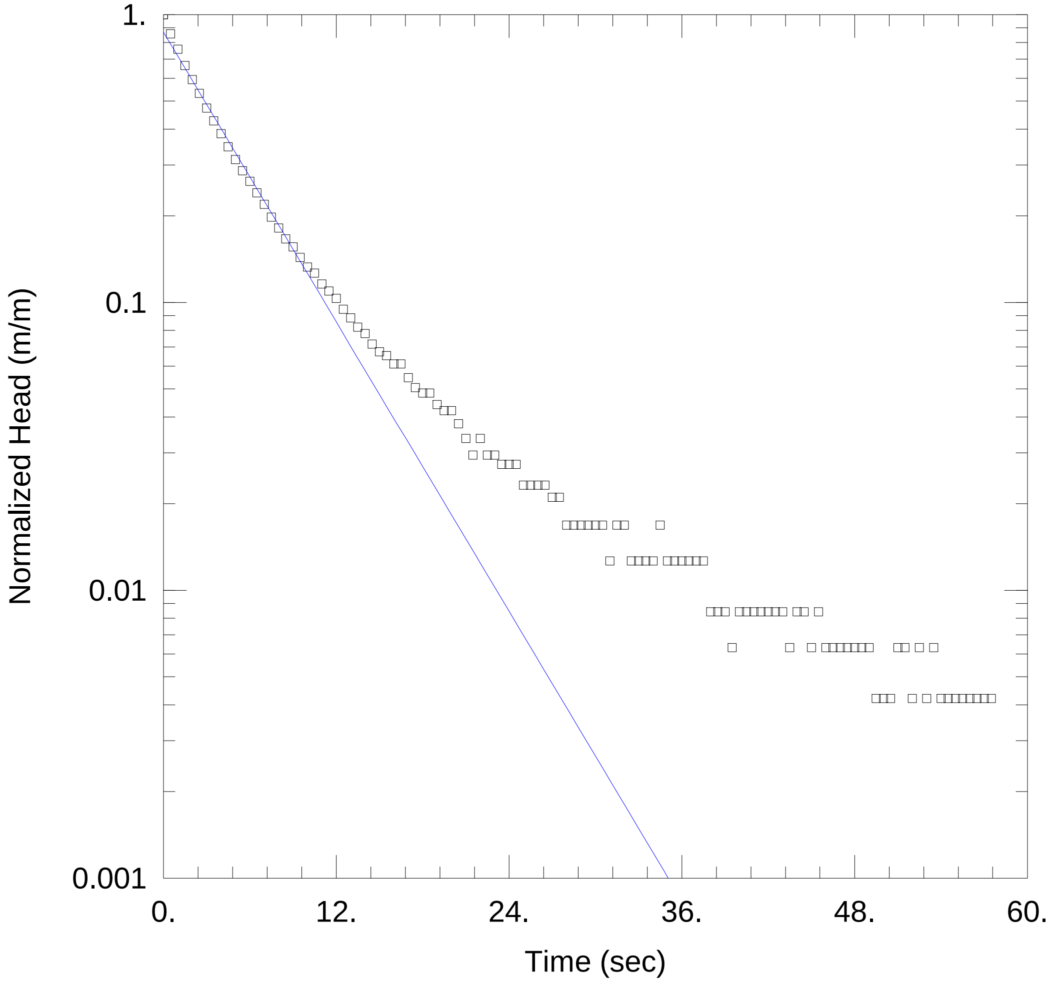
WELL DATA (MW5)

Initial Displacement: 0.619 m
Total Well Penetration Depth: 4.301 m
Casing Radius: 0.026 m
Static Water Column Height: 4.301 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 7.207 m/day
Kz/Kr = 1.
Ss = 0.0003364 m^{-1}



MW5 TEST 3

Data Set: C:\...\MW5 Test 3a.aqt
Date: 04/11/12 Time: 16:59:13

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 4.301 m
Anisotropy Ratio (Kz/Kr): 1.

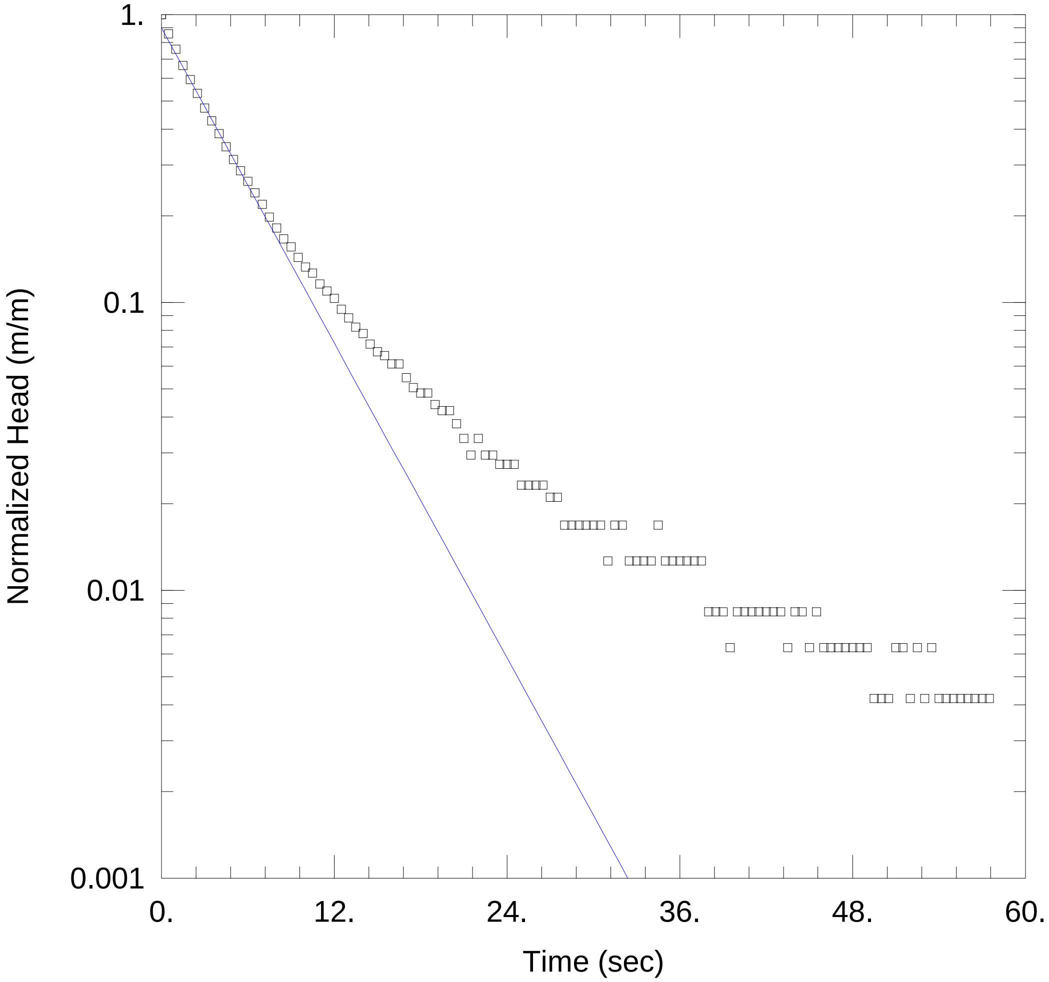
WELL DATA (MW5)

Initial Displacement: 0.475 m
Static Water Column Height: 4.301 m
Total Well Penetration Depth: 4.301 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.248 m/day
y0 = 0.4127 m



MW5 TEST 3

Data Set: C:\...\MW5 Test 3a.aqt
Date: 04/11/12
Time: 17:01:03

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

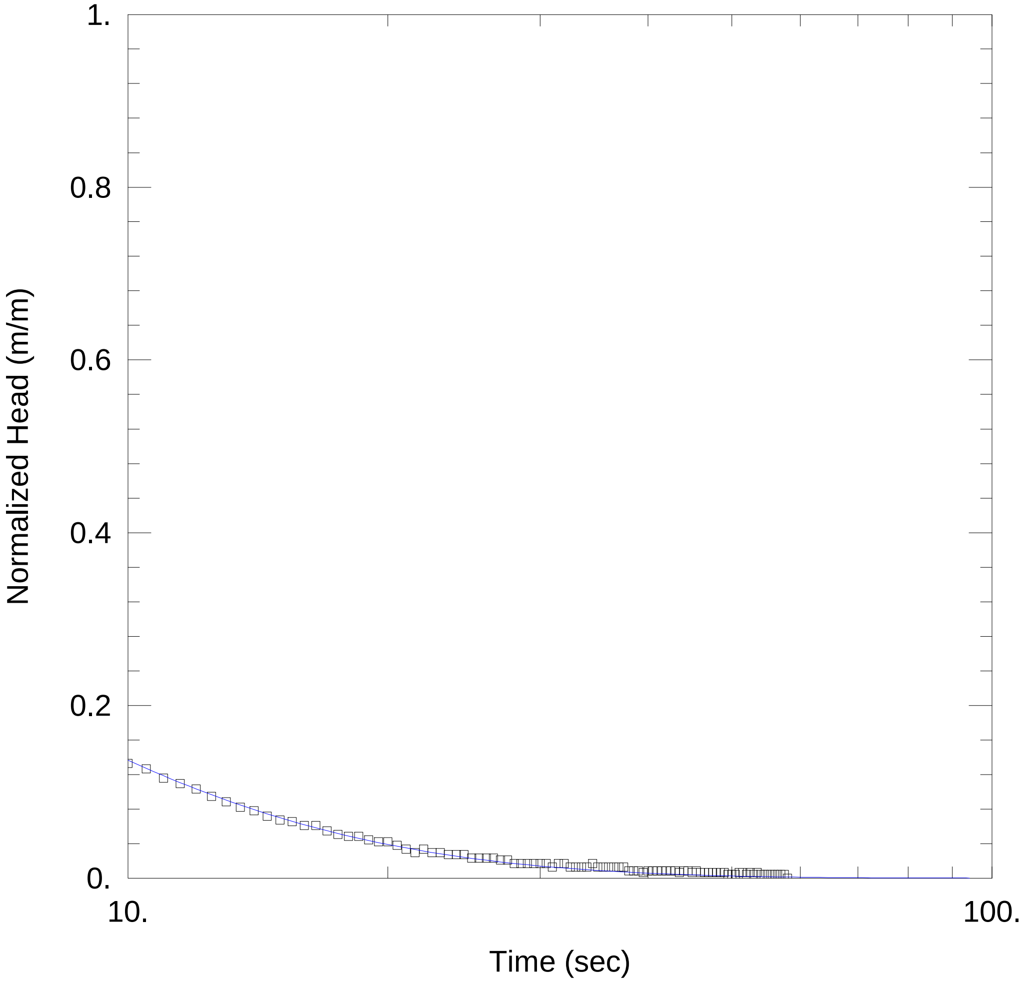
Saturated Thickness: 9.301 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5)

Initial Displacement: 0.475 m
Static Water Column Height: 4.301 m
Total Well Penetration Depth: 4.301 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.801 m/day
y0 = 0.4269 m



MW5 TEST 3

Data Set: C:\...\MW5 Test 3a.aqt
Date: 04/11/12 Time: 17:05:57

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 20 Sept 2011

AQUIFER DATA

Saturated Thickness: 4.301 m

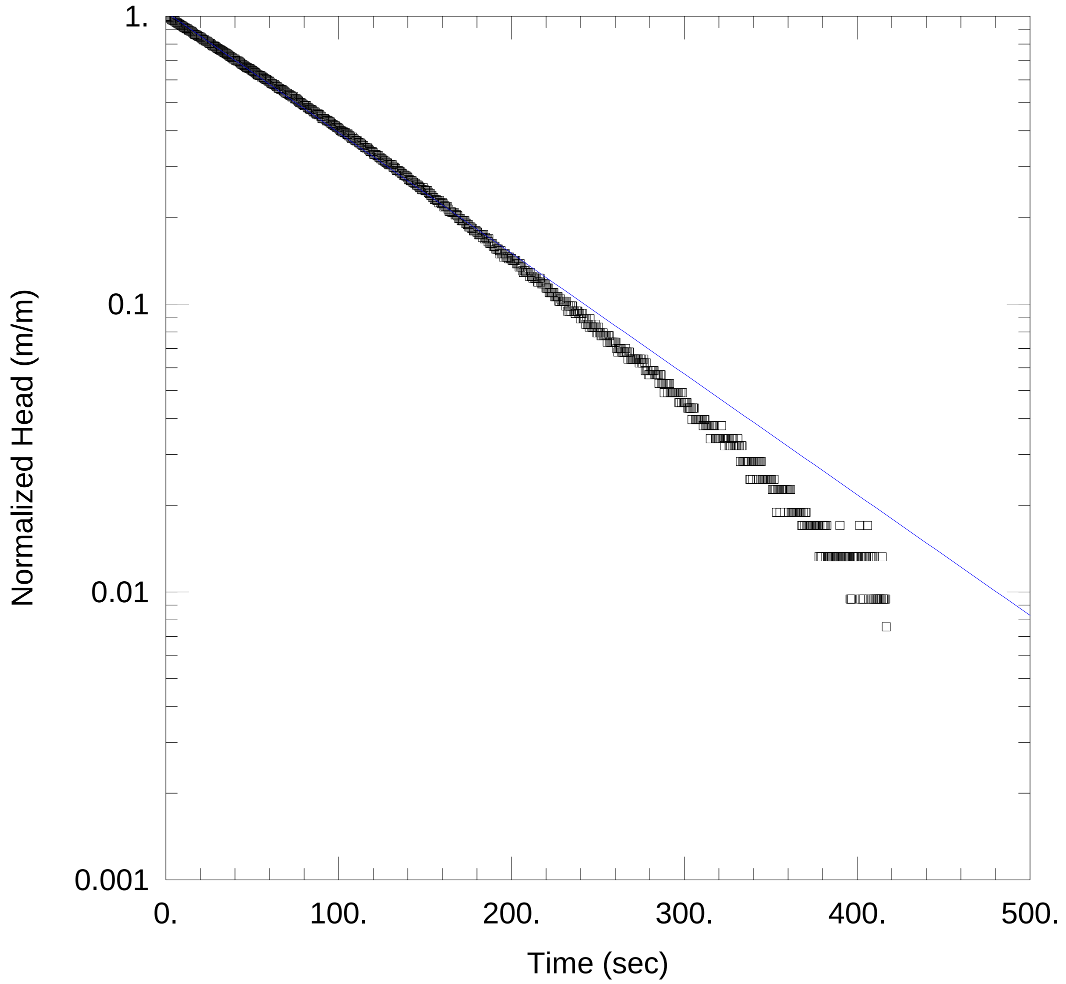
WELL DATA (MW5)

Initial Displacement: 0.475 m
Total Well Penetration Depth: 4.301 m
Casing Radius: 0.026 m
Static Water Column Height: 4.301 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 6.534 m/day
Kz/Kr = 1.
Ss = 0.0001905 m^{-1}



MW1 TEST 2

Data Set: C:\...\MW1 Test 2.aqt
Date: 04/12/12
Time: 07:33:21

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 27 February 2012

AQUIFER DATA

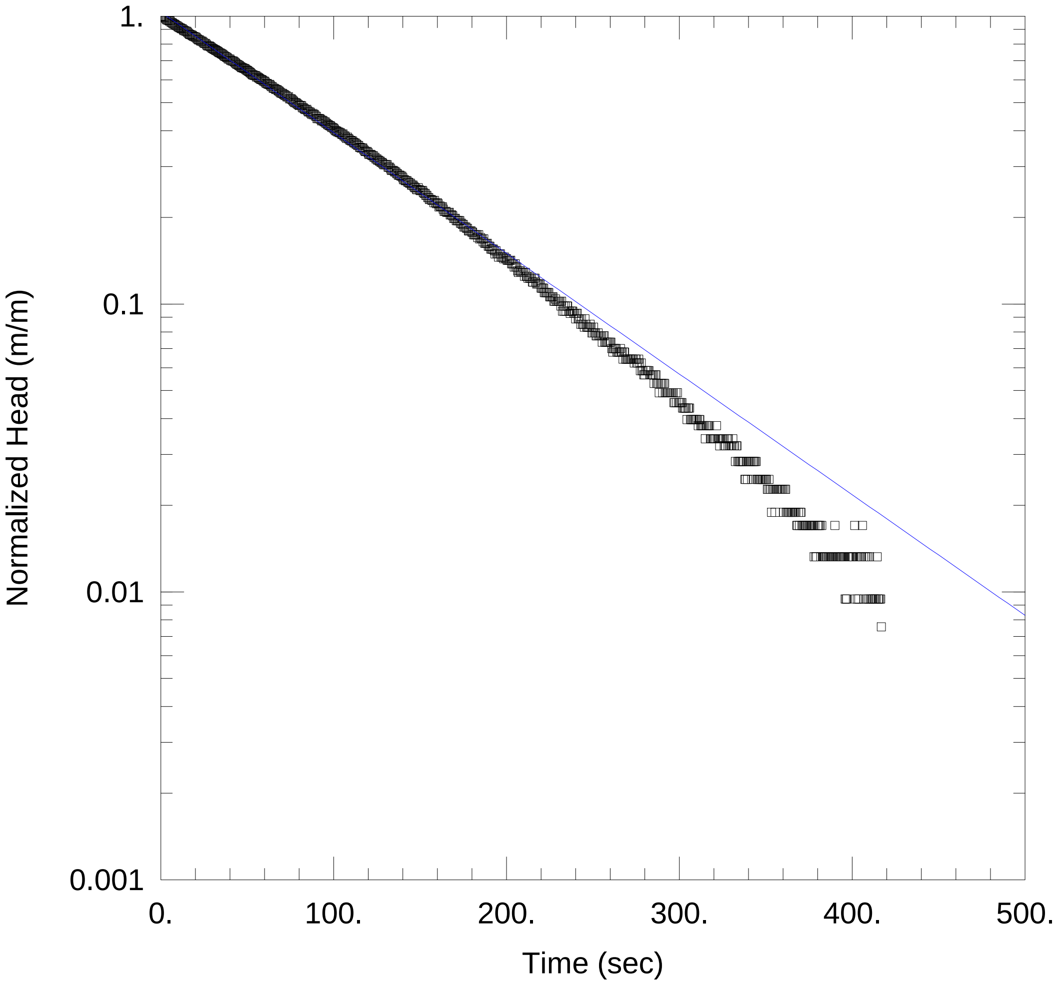
Saturated Thickness: 5.339 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1)

Initial Displacement: 0.529 m
Static Water Column Height: 5.339 m
Total Well Penetration Depth: 5.339 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.2746 m/day
y0 = 0.5466 m



MW1 TEST 2

Data Set: C:\...\MW1 Test 2.aqt
Date: 04/12/12
Time: 07:34:47

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 10.34 m
Anisotropy Ratio (Kz/Kr): 1.

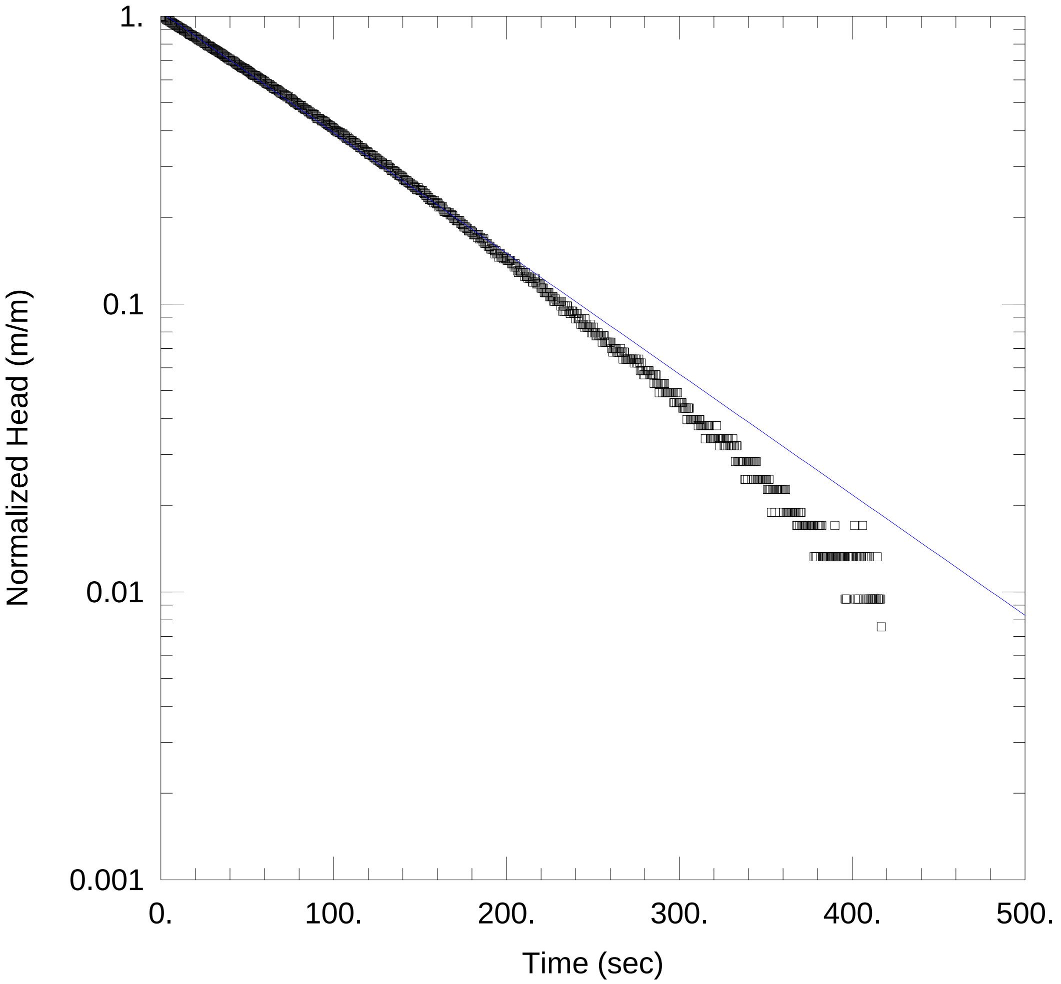
WELL DATA (MW1)

Initial Displacement: 0.529 m
Static Water Column Height: 5.339 m
Total Well Penetration Depth: 5.339 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.2293 m/day
y0 = 0.5466 m



MW1 TEST 2

Data Set: C:\...\MW1 Test 2.aqt
Date: 04/12/12
Time: 07:37:54

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.339 m
Anisotropy Ratio (Kz/Kr): 1.

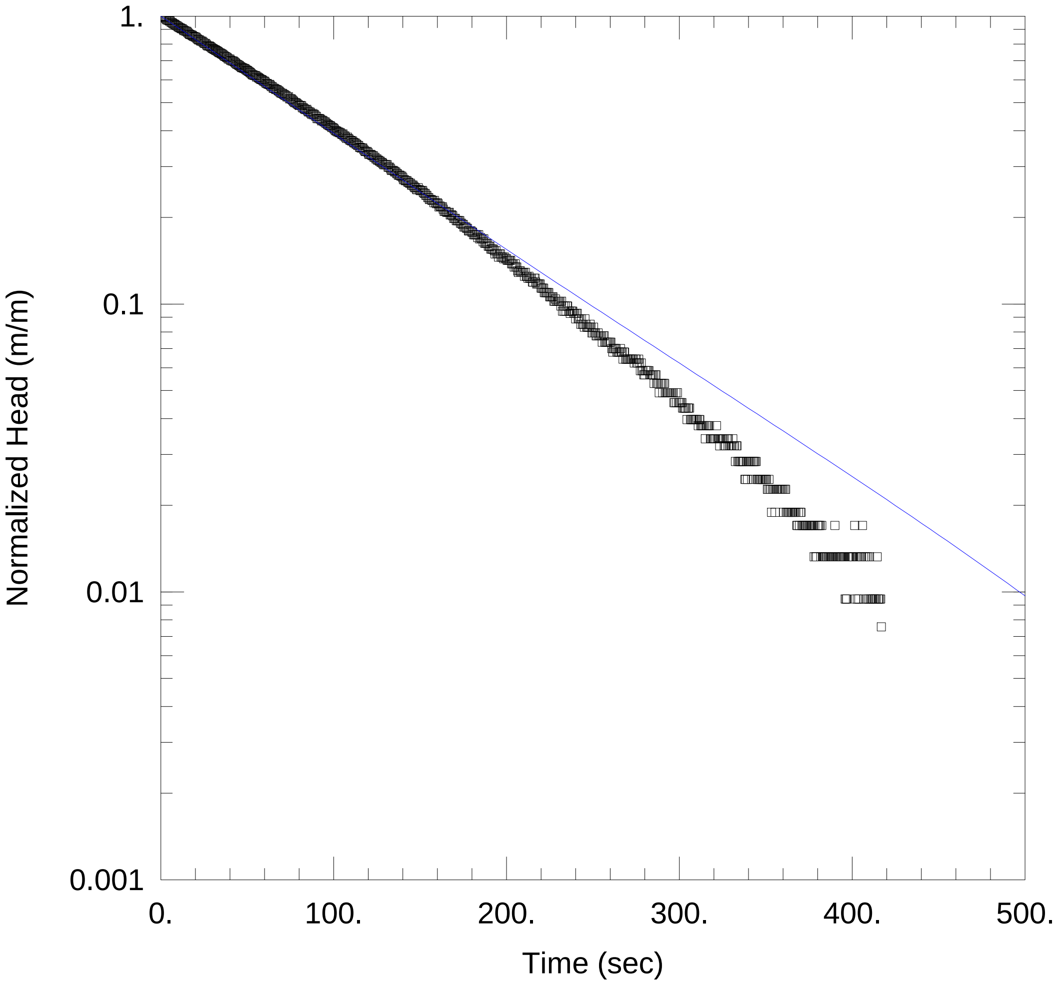
WELL DATA (MW1)

Initial Displacement: 0.529 m
Static Water Column Height: 5.339 m
Total Well Penetration Depth: 5.339 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.3847 m/day
y0 = 0.5466 m



MW1 TEST 2

Data Set: C:\...\MW1 Test 2.aqt
Date: 04/12/12 Time: 07:36:22

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.339 m

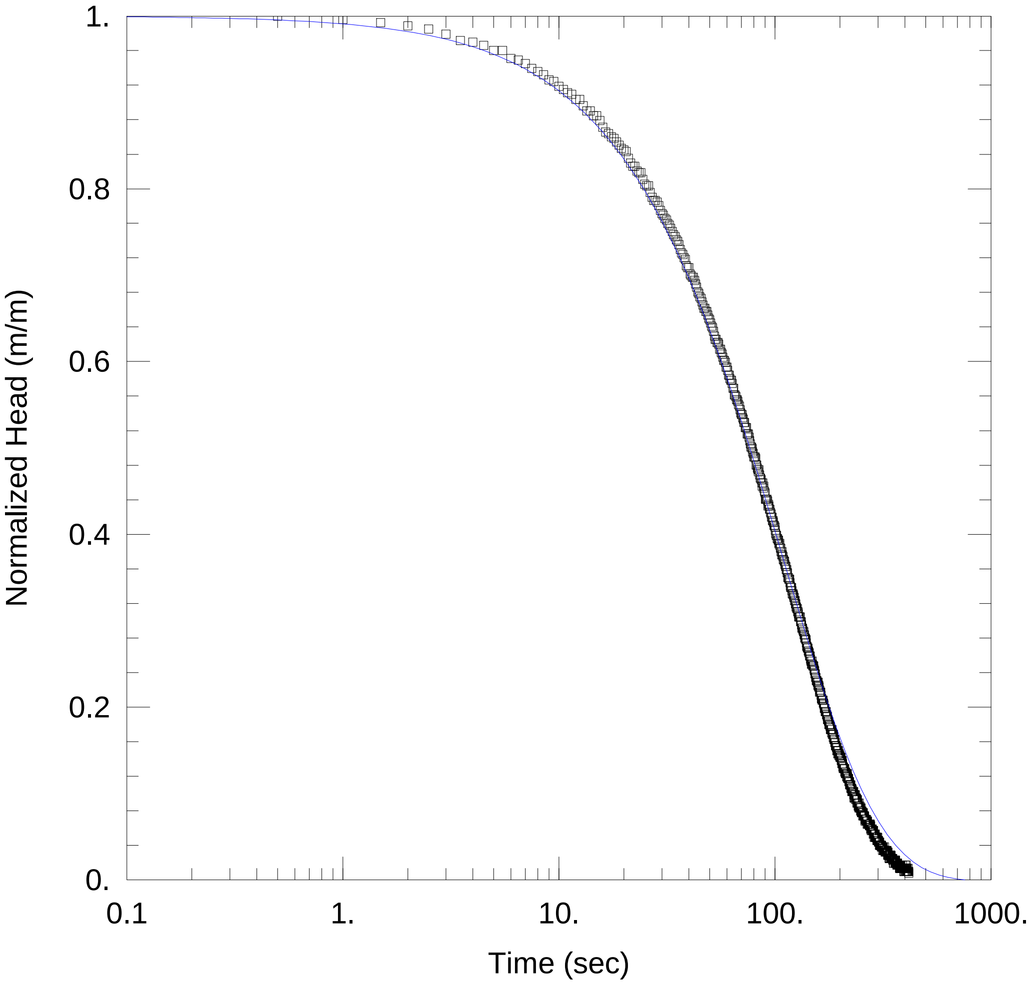
WELL DATA (MW1)

Initial Displacement: 0.529 m
Total Well Penetration Depth: 5.339 m
Casing Radius: 0.026 m
Static Water Column Height: 5.339 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.3101 m/day
Kz/Kr = 1.
Ss = 1.873E-11 m^{-1}



MW1 TEST 2

Data Set: C:\...\MW1 Test 2.aqt
Date: 04/12/12
Time: 07:36:59

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW1
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.339 m

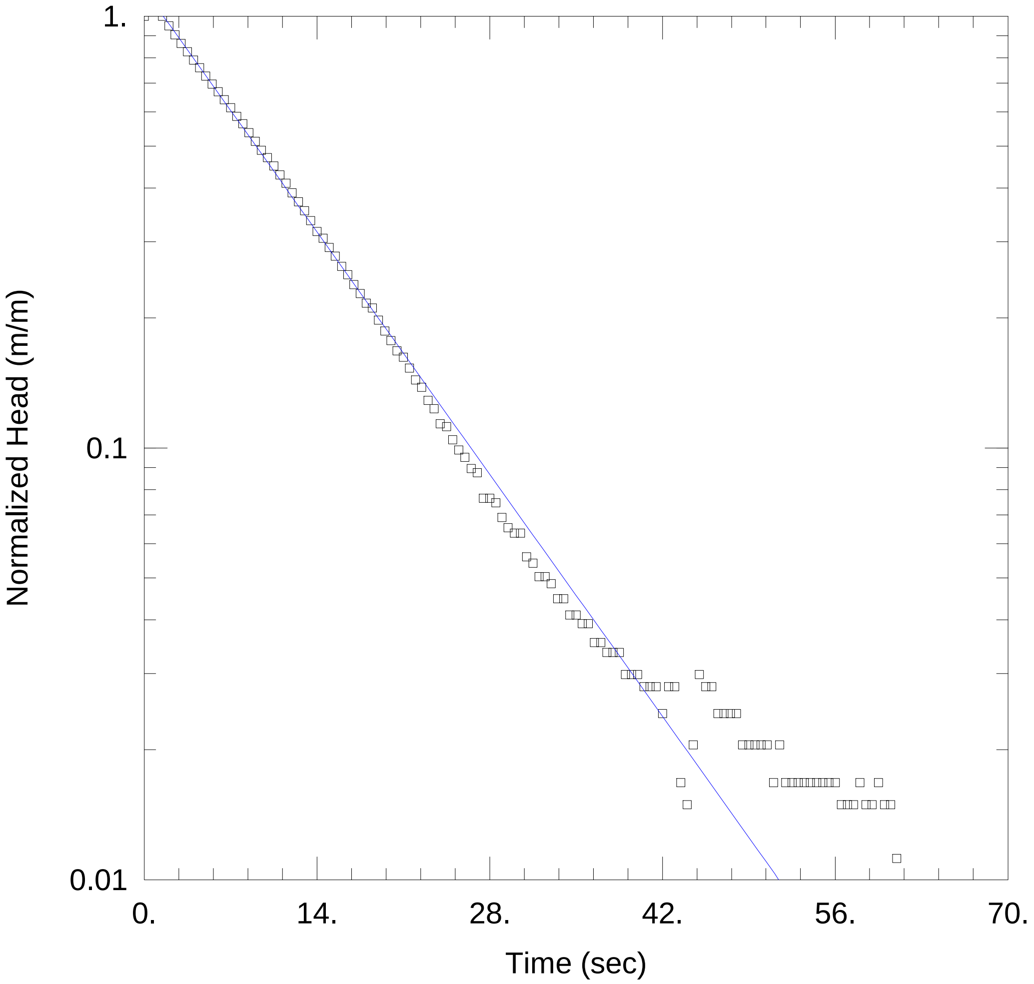
WELL DATA (MW1)

Initial Displacement: 0.529 m
Total Well Penetration Depth: 5.339 m
Casing Radius: 0.026 m
Static Water Column Height: 5.339 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.2997 m/day
Kz/Kr = 1.
Ss = 1.873E-11 m^{-1}



MW2 TEST 2

Data Set: C:\...\MW2 Test 2.aqt
Date: 04/12/12
Time: 07:55:40

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

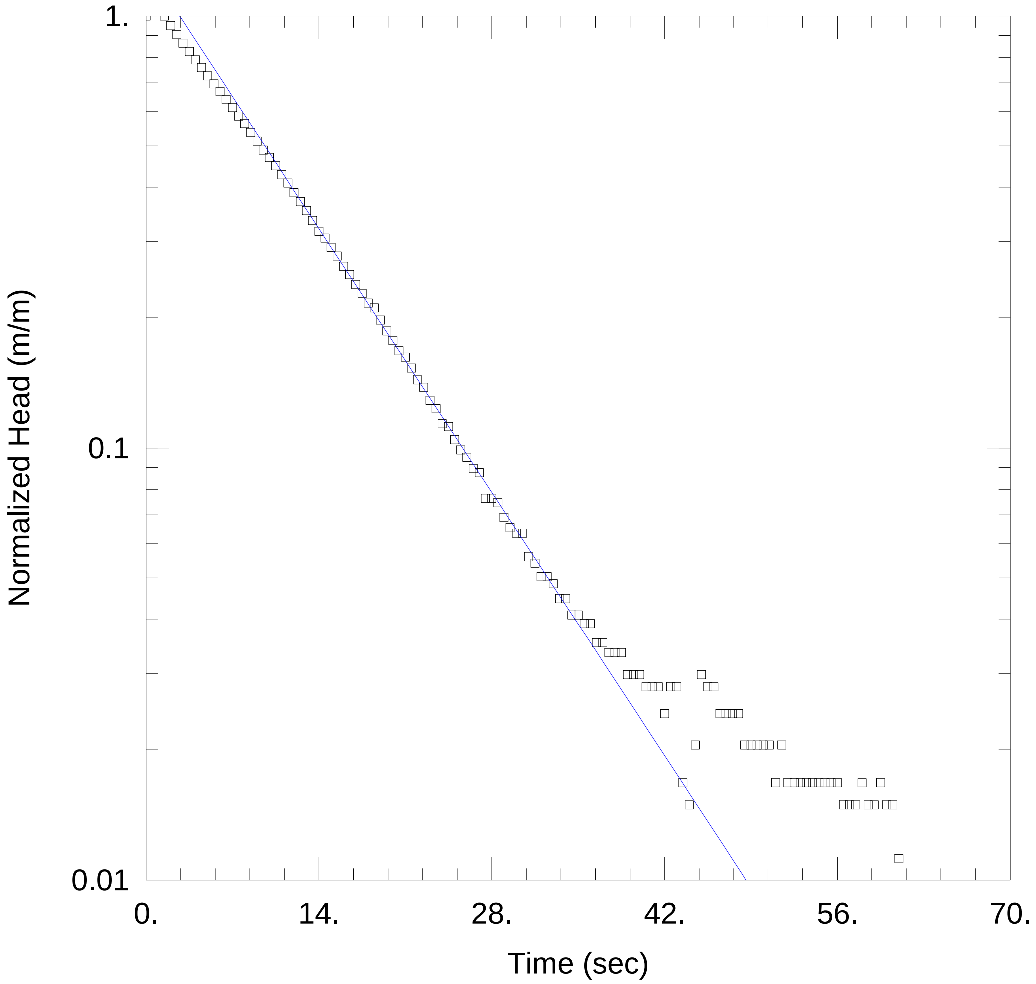
Saturated Thickness: 5.019 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 0.536 m
Static Water Column Height: 5.019 m
Total Well Penetration Depth: 5.019 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.593 m/day
y0 = 0.6184 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2.aqt
Date: 04/12/12
Time: 07:56:31

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.019 m
Anisotropy Ratio (Kz/Kr): 1.

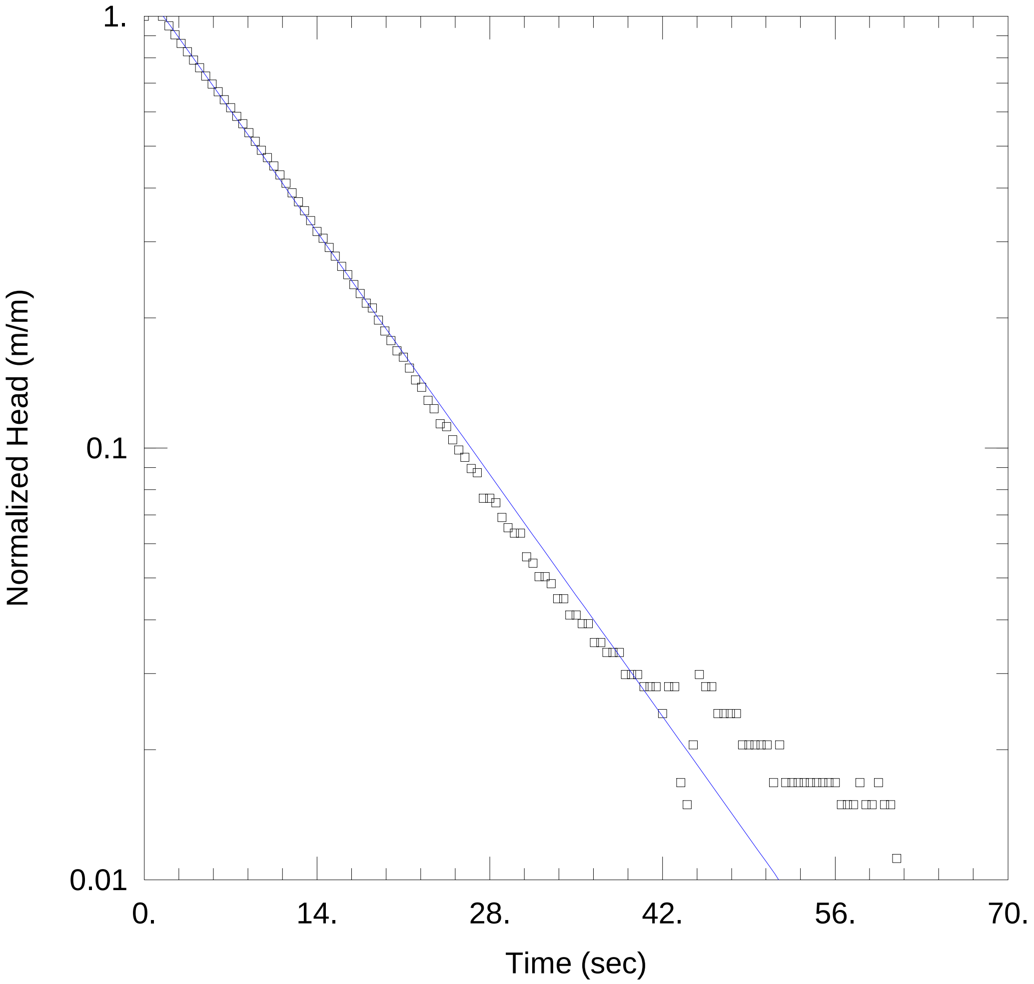
WELL DATA (MW2)

Initial Displacement: 0.536 m
Total Well Penetration Depth: 5.019 m
Casing Radius: 0.026 m
Static Water Column Height: 5.019 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.819 m/day
y0 = 0.704 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2.aqt
Date: 04/12/12
Time: 07:57:07

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 10.02 m
Anisotropy Ratio (Kz/Kr): 1.

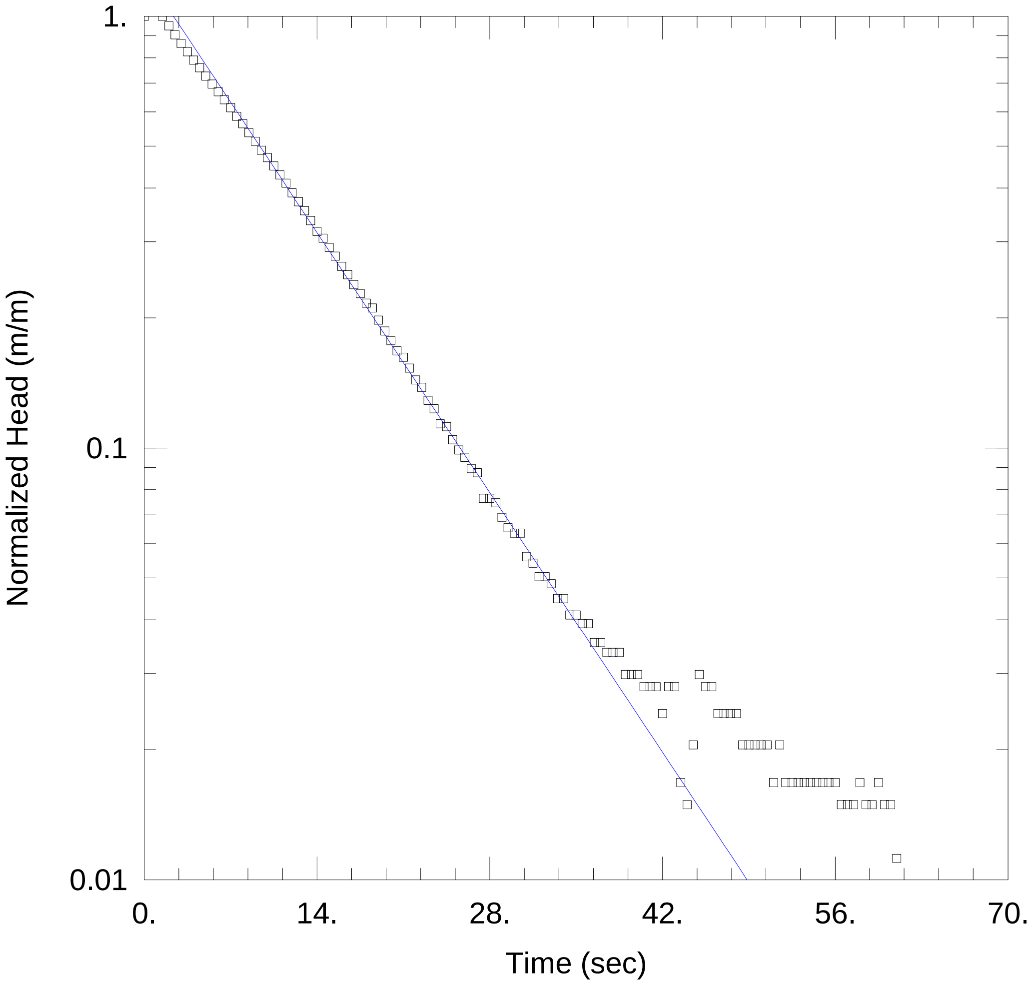
WELL DATA (MW2)

Initial Displacement: 0.536 m
Static Water Column Height: 5.019 m
Total Well Penetration Depth: 5.019 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.169 m/day
y0 = 0.6184 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2.aqt
Date: 04/12/12 Time: 07:57:48

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 10.02 m
Anisotropy Ratio (Kz/Kr): 1.

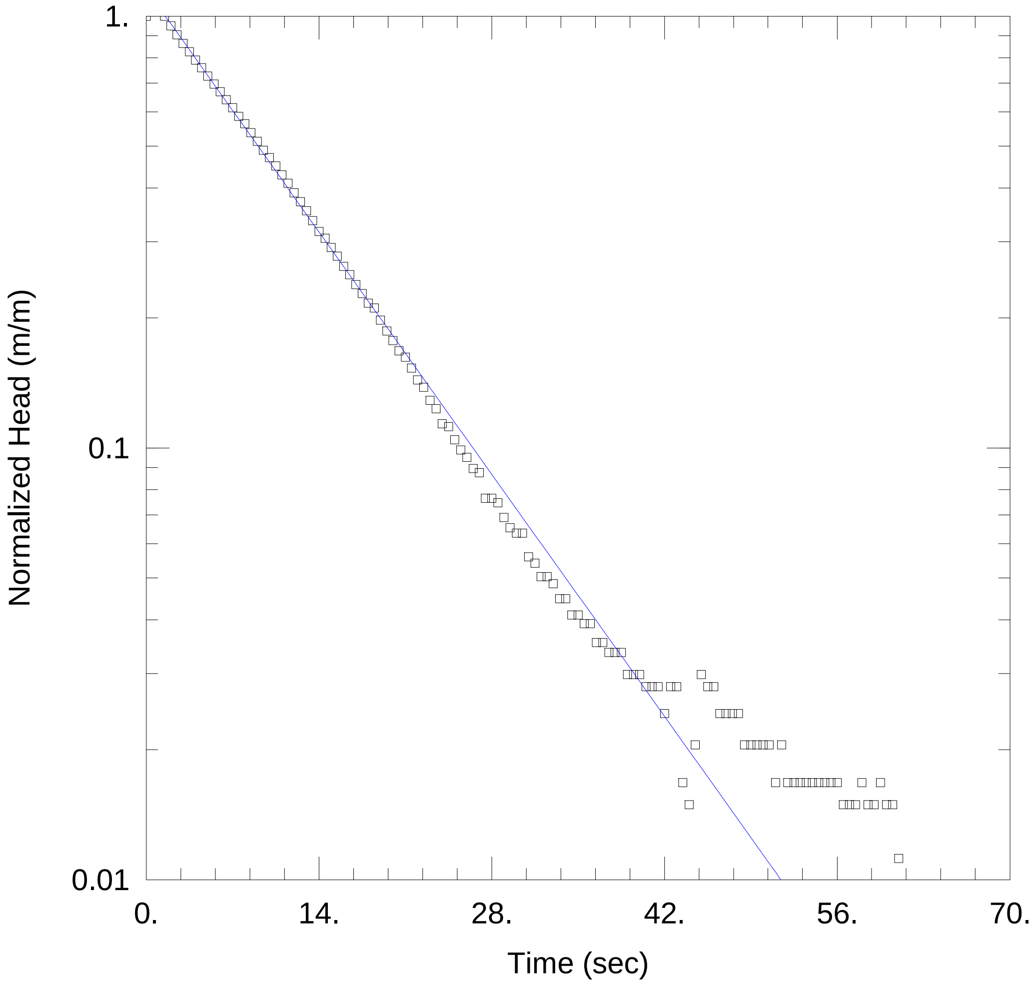
WELL DATA (MW2)

Initial Displacement: 0.536 m
Static Water Column Height: 5.019 m
Total Well Penetration Depth: 5.019 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.328 m/day
y0 = 0.6776 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2.aqt
Date: 04/12/12
Time: 08:00:46

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.019 m
Anisotropy Ratio (Kz/Kr): 1.

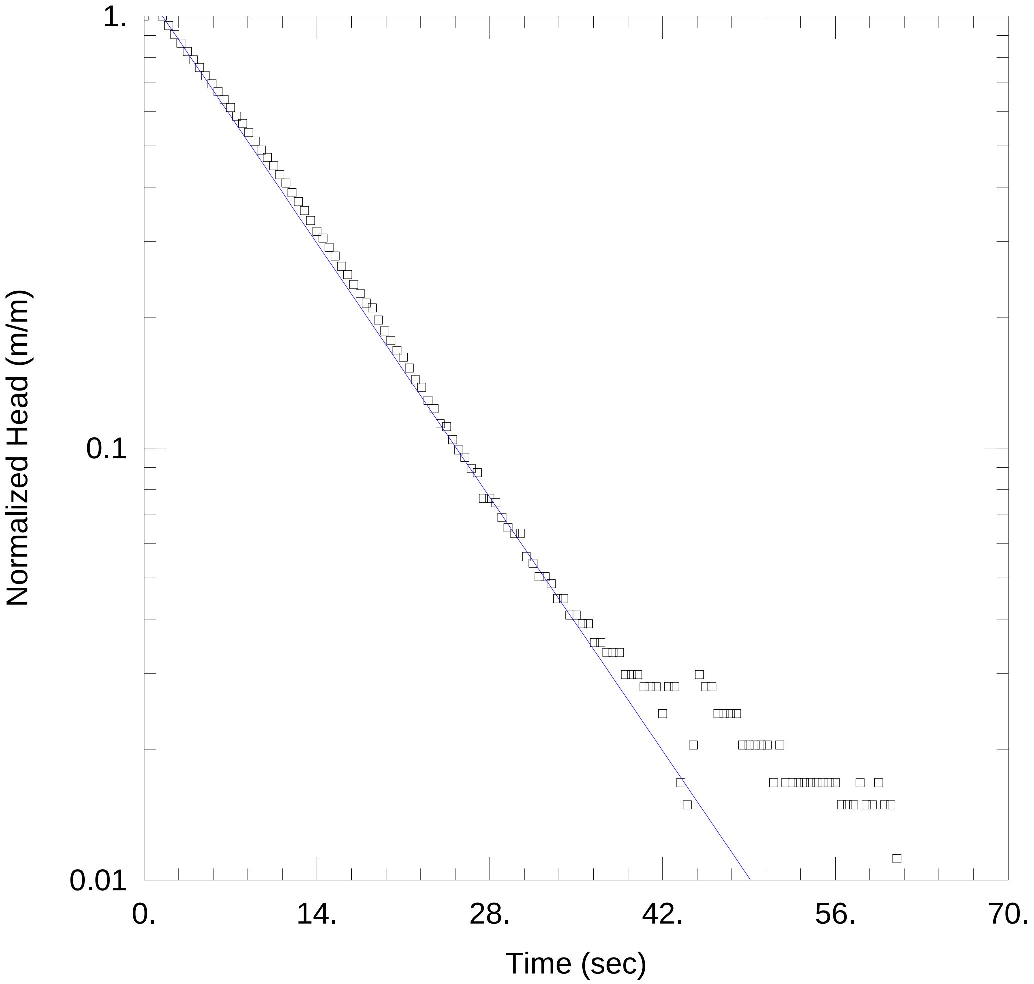
WELL DATA (MW2)

Initial Displacement: 0.536 m
Total Well Penetration Depth: 5.019 m
Casing Radius: 0.026 m
Static Water Column Height: 5.019 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 3.68 m/day
y0 = 0.6184 m



MW2 TEST 2

Data Set: C:\...\MW2 Test 2.aqt
Date: 04/12/12
Time: 08:02:21

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.019 m
Anisotropy Ratio (Kz/Kr): 1.

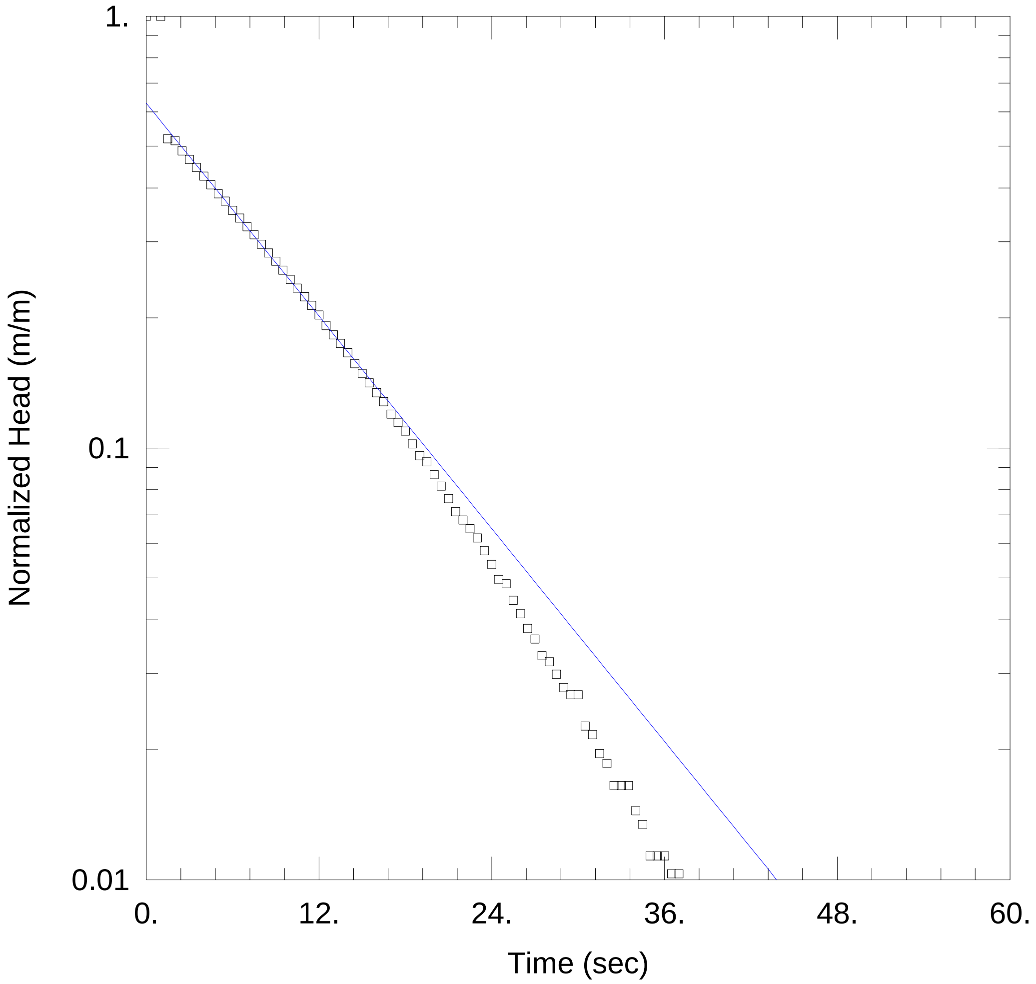
WELL DATA (MW2)

Initial Displacement: 0.536 m
Static Water Column Height: 5.019 m
Total Well Penetration Depth: 5.019 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 3.853 m/day
y0 = 0.6184 m



MW2 TEST 3

Data Set: C:\...\MW2 Test 3.aqt
Date: 04/12/12
Time: 08:06:33

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 5.019 m
Anisotropy Ratio (Kz/Kr): 1.

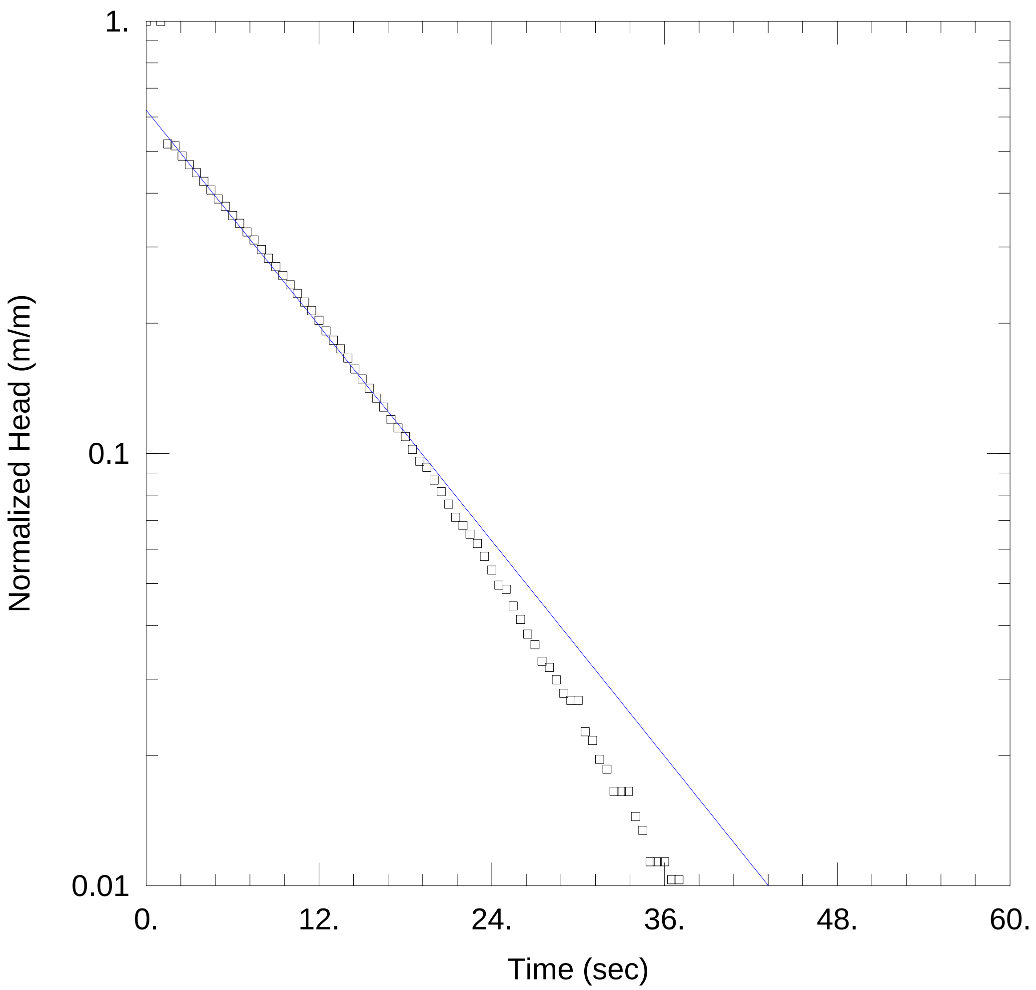
WELL DATA (MW2)

Initial Displacement: 0.969 m
Static Water Column Height: 5.019 m
Total Well Penetration Depth: 5.019 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.655 m/day
y0 = 0.6086 m



MW2 TEST 3

Data Set: C:\...\MW2 Test 3.aqt
Date: 04/12/12
Time: 08:07:52

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW2
Test Date: 27 February 2012

AQUIFER DATA

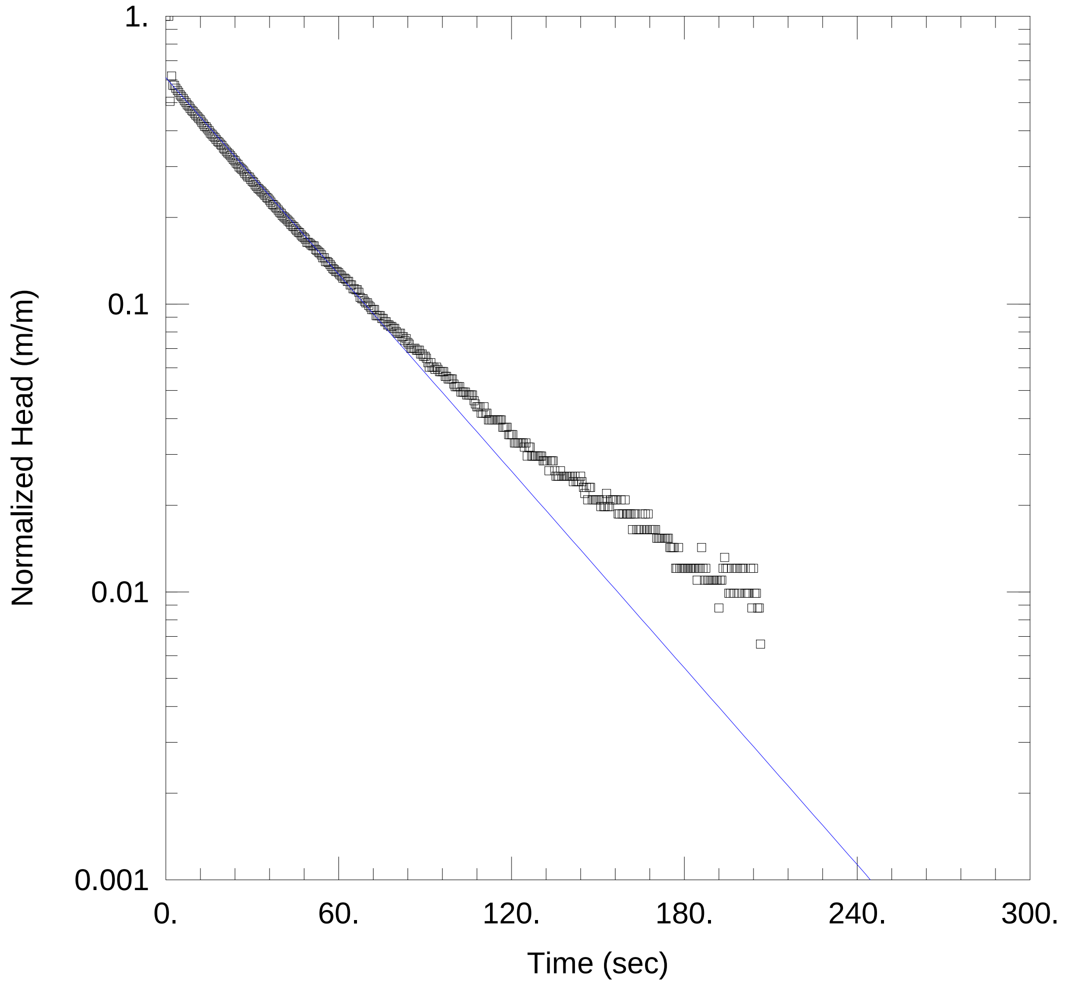
Saturated Thickness: 10.02 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 0.969 m
Static Water Column Height: 5.019 m
Total Well Penetration Depth: 5.019 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 2.247 m/day
y0 = 0.6031 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1.aqt
Date: 04/12/12 Time: 08:21:57

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 6.246 m
Anisotropy Ratio (Kz/Kr): 1.

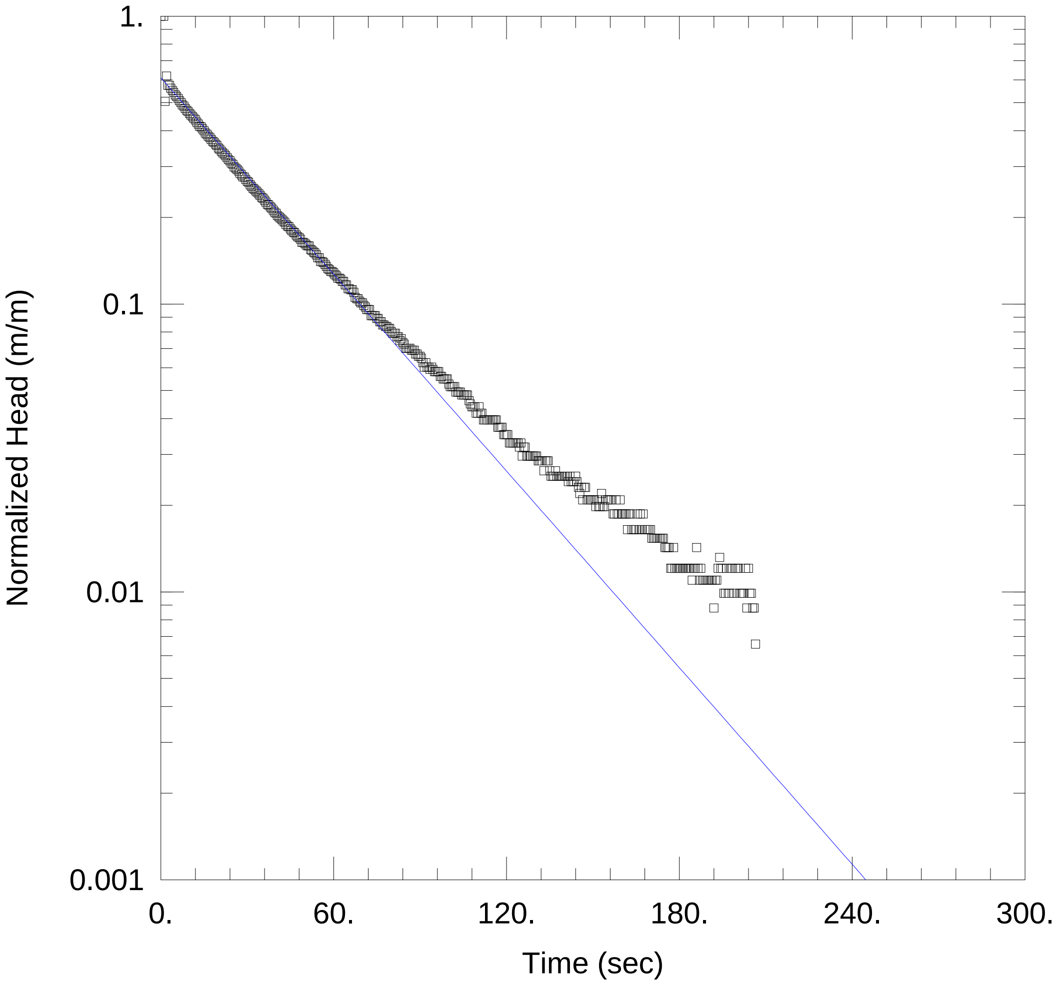
WELL DATA (MW3)

Initial Displacement: 0.911 m
Total Well Penetration Depth: 6.246 m
Casing Radius: 0.026 m
Static Water Column Height: 6.246 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.7697 m/day
y0 = 0.5564 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1.aqt
Date: 04/12/12 Time: 08:23:32

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 12.25 m
Anisotropy Ratio (Kz/Kr): 1.

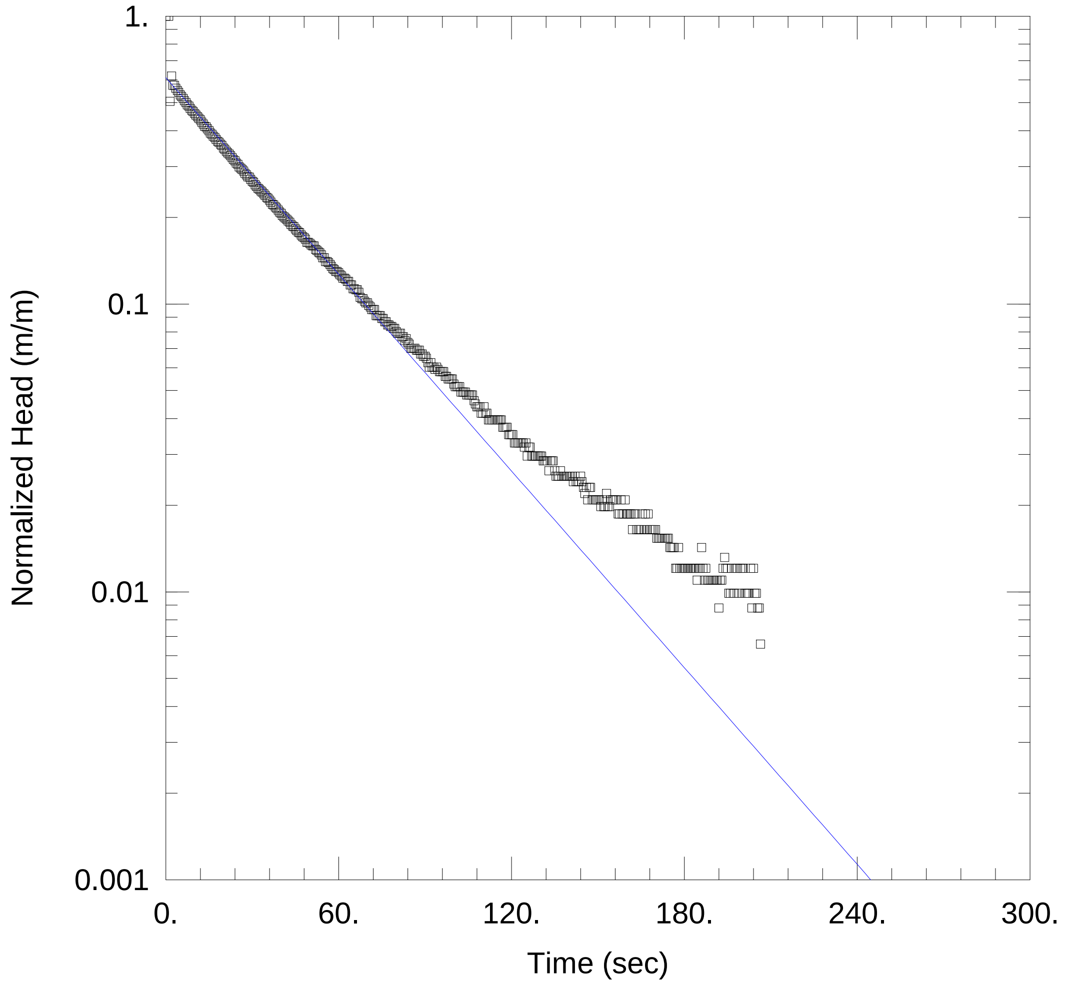
WELL DATA (MW3)

Initial Displacement: 0.911 m
Static Water Column Height: 6.246 m
Total Well Penetration Depth: 6.246 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.6351 m/day
y0 = 0.5563 m



MW3 TEST 1

Data Set: C:\...\MW3 Test 1.aqt
Date: 04/12/12
Time: 08:26:40

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 6.246 m
Anisotropy Ratio (Kz/Kr): 1.

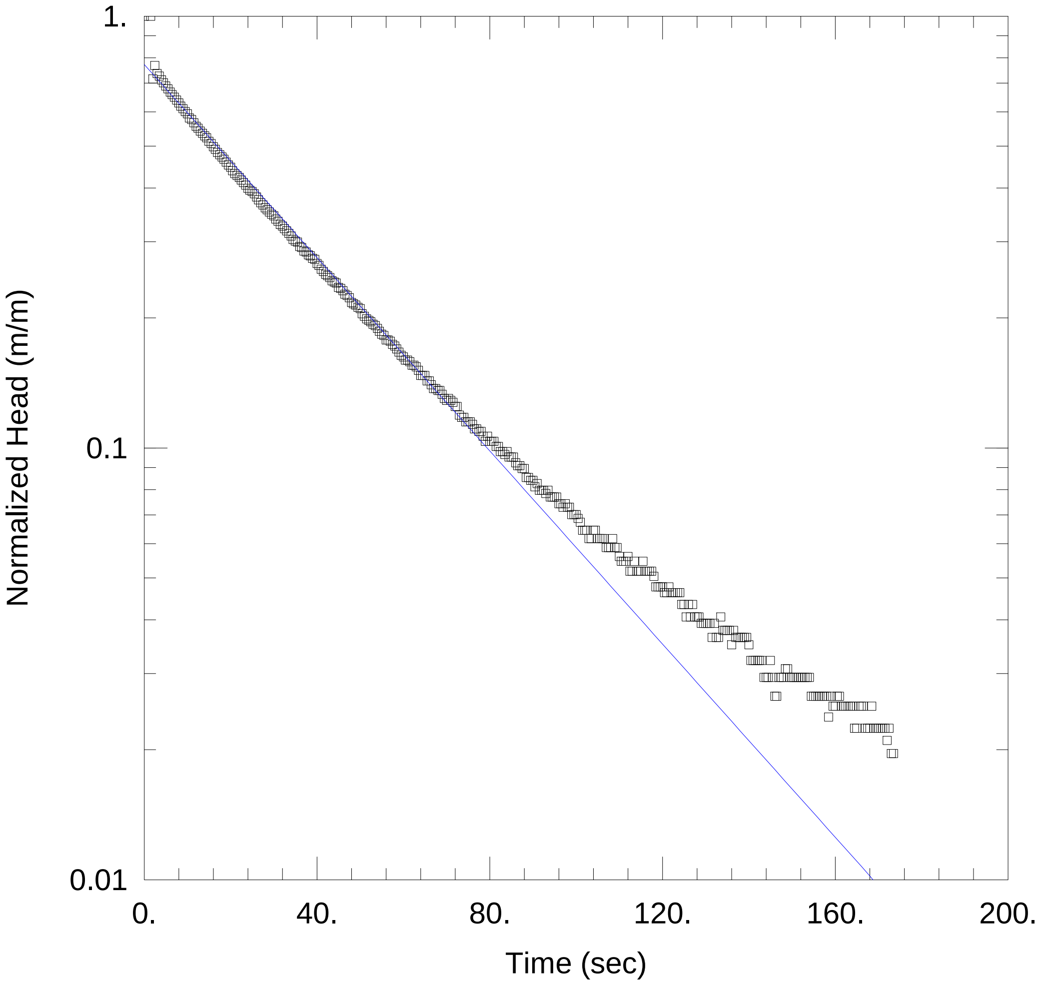
WELL DATA (MW3)

Initial Displacement: 0.911 m
Static Water Column Height: 6.246 m
Total Well Penetration Depth: 6.246 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 1.045 m/day
y0 = 0.5563 m



MW3 TEST 2

Data Set: C:\...\MW3 Test 2.aqt
Date: 04/12/12 Time: 08:31:35

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

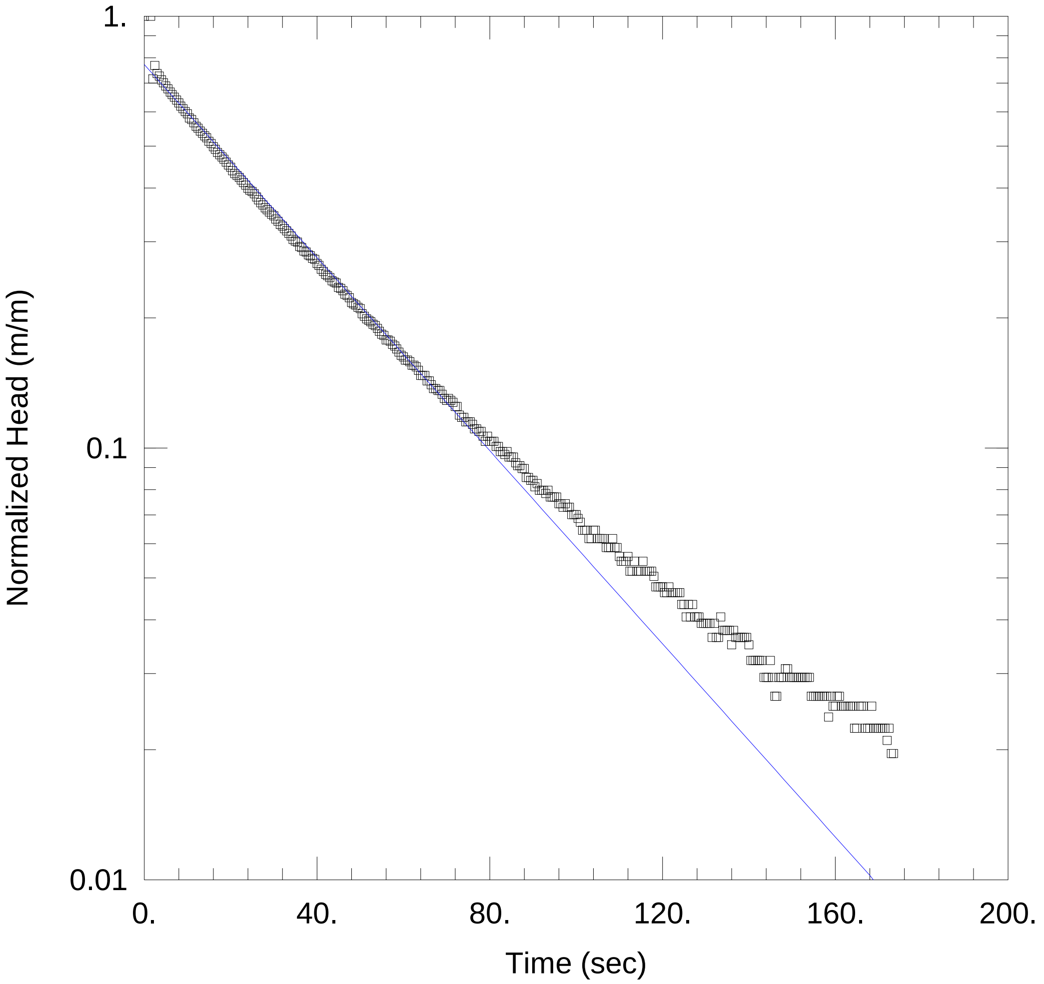
Saturated Thickness: 6.246 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.714 m
Total Well Penetration Depth: 6.246 m
Casing Radius: 0.026 m
Static Water Column Height: 6.246 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.7558 m/day
y0 = 0.5514 m



MW3 TEST 2

Data Set: C:\...\MW3 Test 2.aqt
Date: 04/12/12 Time: 08:36:28

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

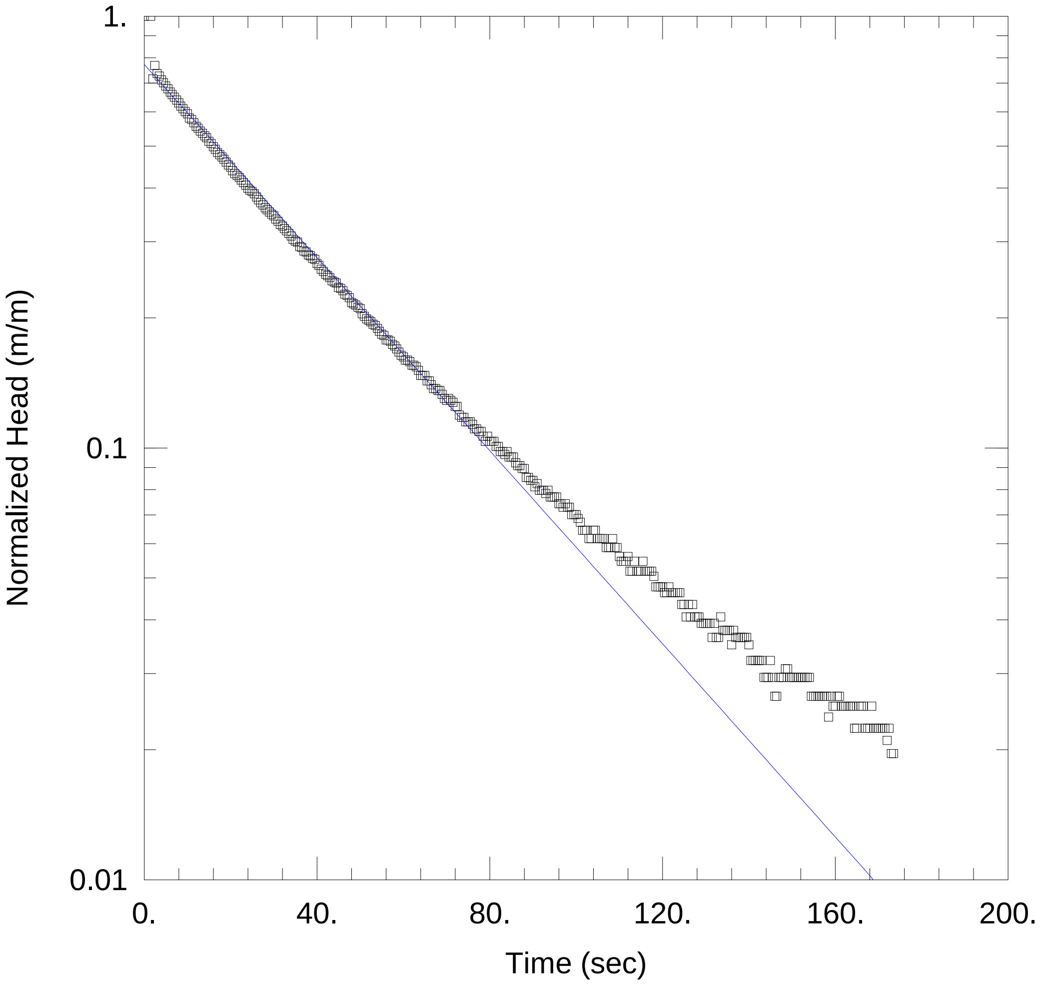
Saturated Thickness: 12.25 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 0.714 m
Static Water Column Height: 6.246 m
Total Well Penetration Depth: 6.246 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.6237 m/day
y0 = 0.5512 m



MW3 TEST 2

Data Set: C:\...\MW3 Test 2.aqt
Date: 04/12/12 Time: 08:41:09

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 6.246 m
Anisotropy Ratio (Kz/Kr): 1.

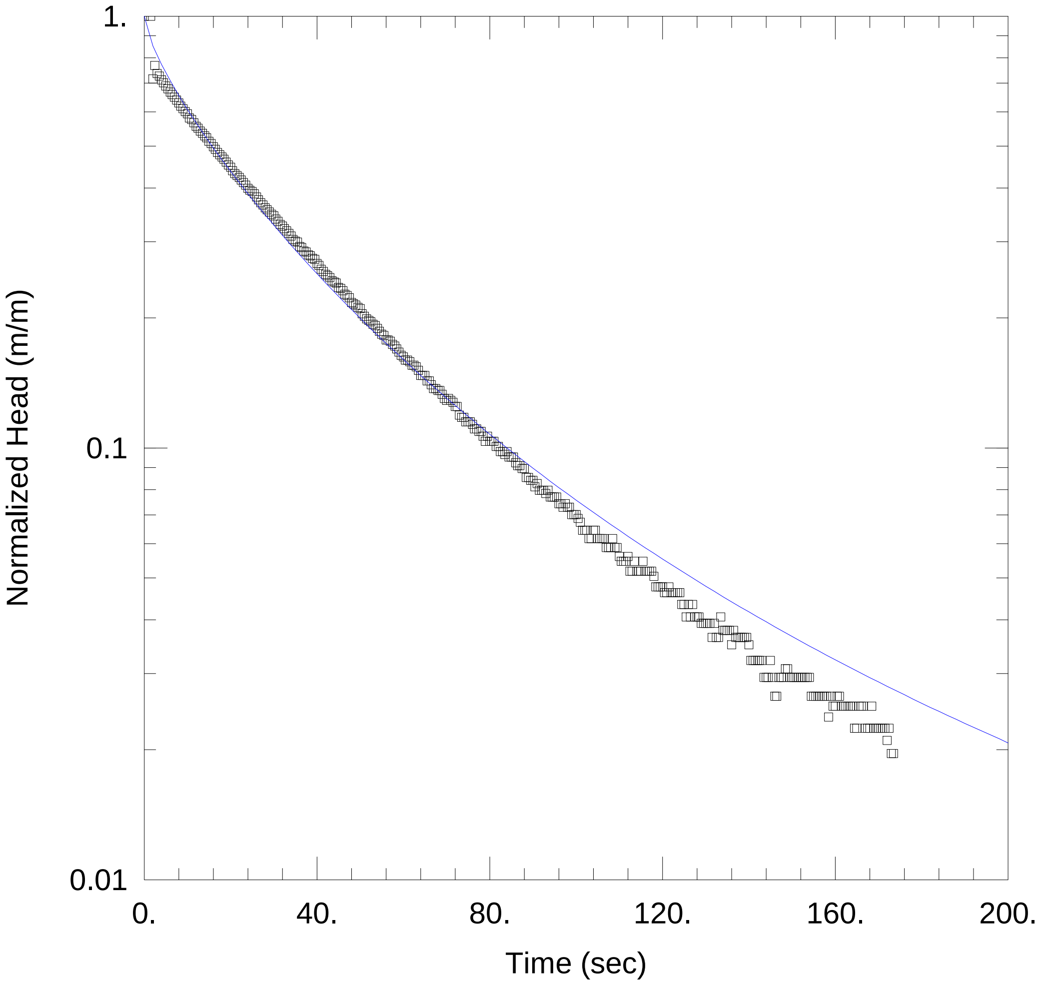
WELL DATA (MW3)

Initial Displacement: 0.714 m
Total Well Penetration Depth: 6.246 m
Casing Radius: 0.026 m
Static Water Column Height: 6.246 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 1.026 m/day
y0 = 0.5513 m



MW3 TEST 2

Data Set: C:\...\MW3 Test 2.aqt
Date: 04/12/12
Time: 08:38:07

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 12.25 m

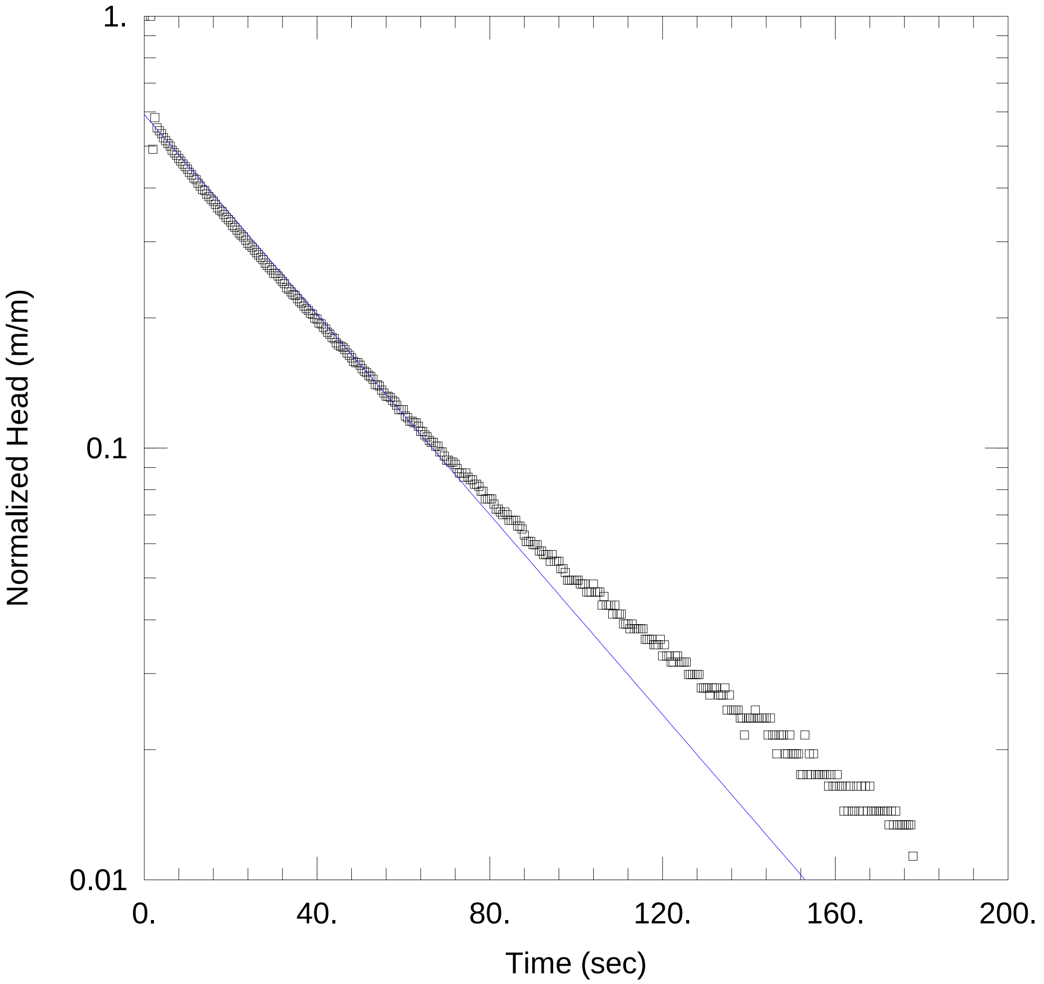
WELL DATA (MW3)

Initial Displacement: 0.714 m
Total Well Penetration Depth: 6.246 m
Casing Radius: 0.026 m
Static Water Column Height: 6.246 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.8152 m/day
Kz/Kr = 1.
Ss = 0.0004411 m^{-1}



MW3 TEST 3

Data Set: C:\...\MW3 Test 3.aqt
Date: 04/12/12
Time: 08:43:18

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 6.246 m
Anisotropy Ratio (Kz/Kr): 1.

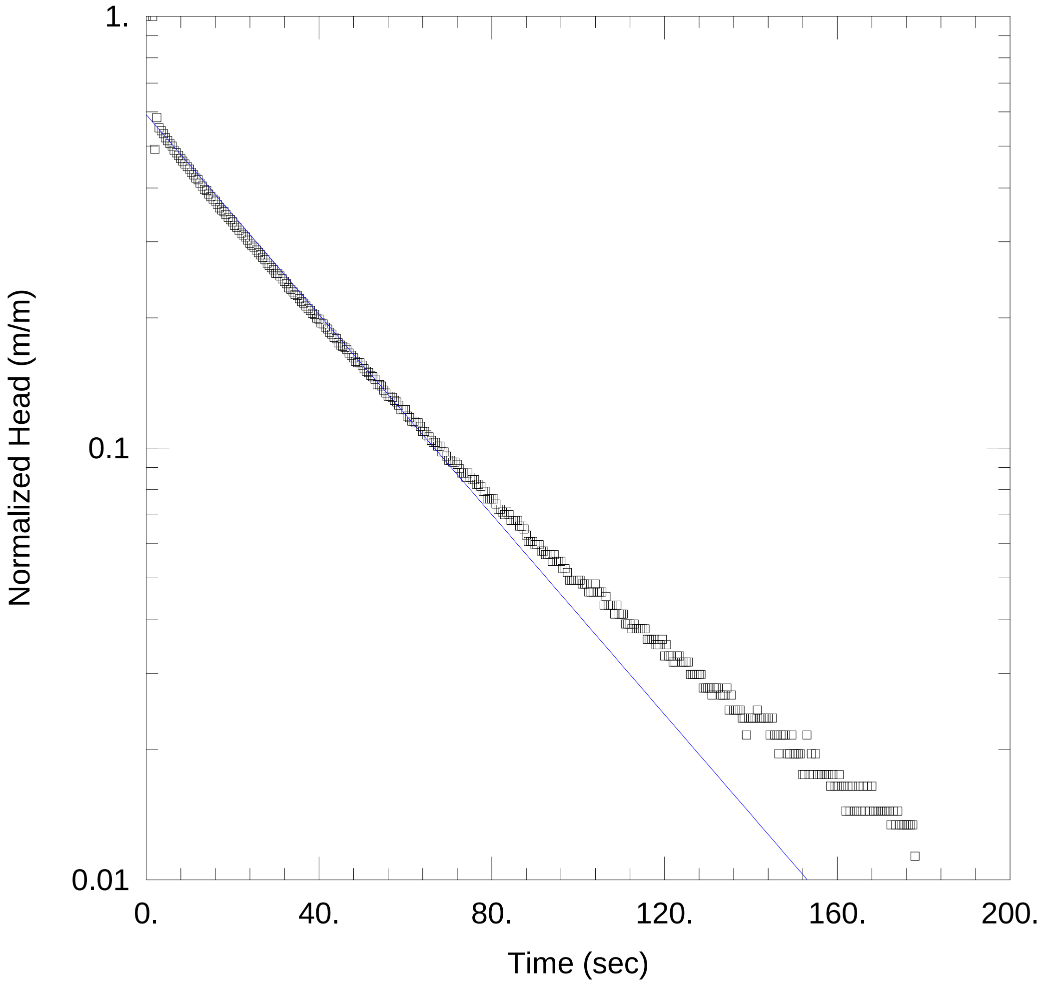
WELL DATA (MW3)

Initial Displacement: 0.971 m
Static Water Column Height: 6.246 m
Total Well Penetration Depth: 6.246 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.7826 m/day
y0 = 0.5743 m



MW3 TEST 3

Data Set: C:\...\MW3 Test 3.aqt
Date: 04/12/12
Time: 08:44:33

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 12.25 m
Anisotropy Ratio (Kz/Kr): 1.

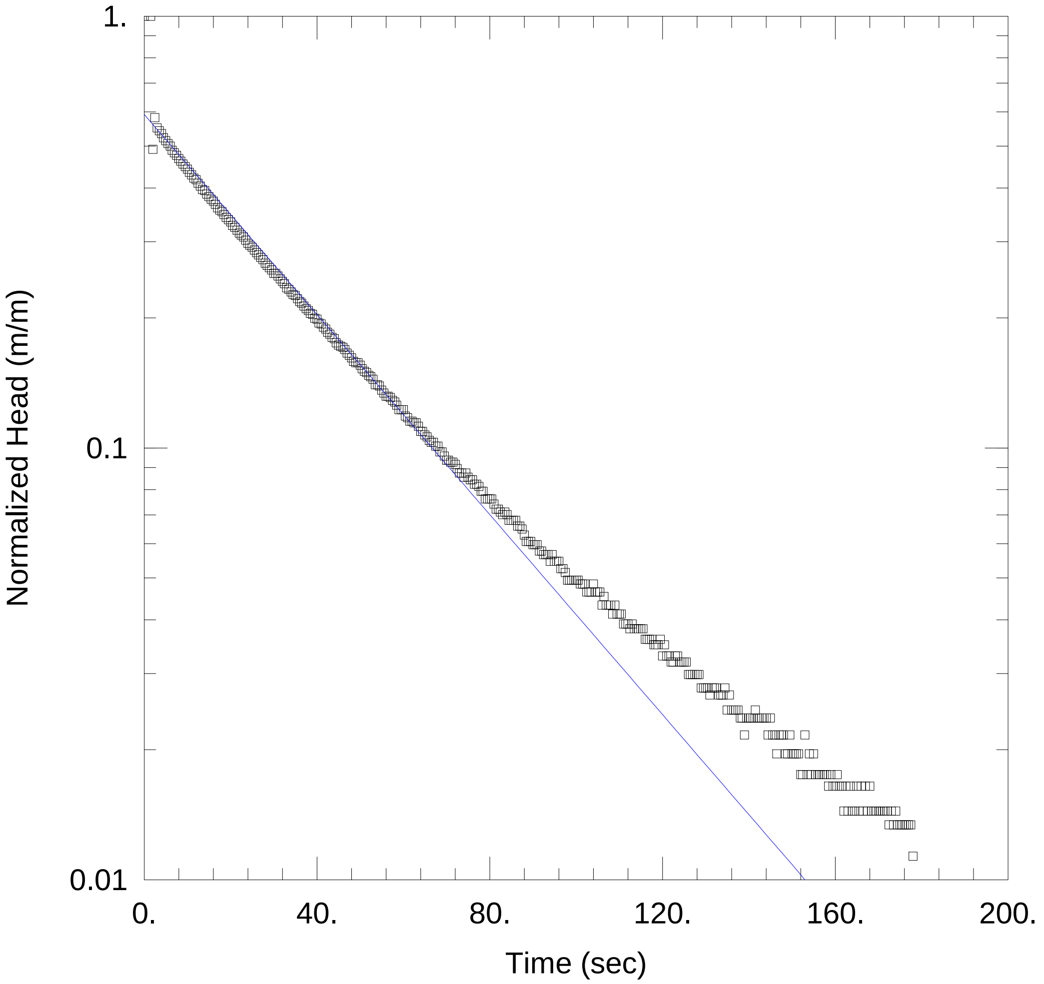
WELL DATA (MW3)

Initial Displacement: 0.971 m
Static Water Column Height: 6.246 m
Total Well Penetration Depth: 6.246 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.6459 m/day
y0 = 0.5741 m



MW3 TEST 3

Data Set: C:\...\MW3 Test 3.aqt
Date: 04/12/12
Time: 08:47:22

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW3
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 6.246 m
Anisotropy Ratio (Kz/Kr): 1.

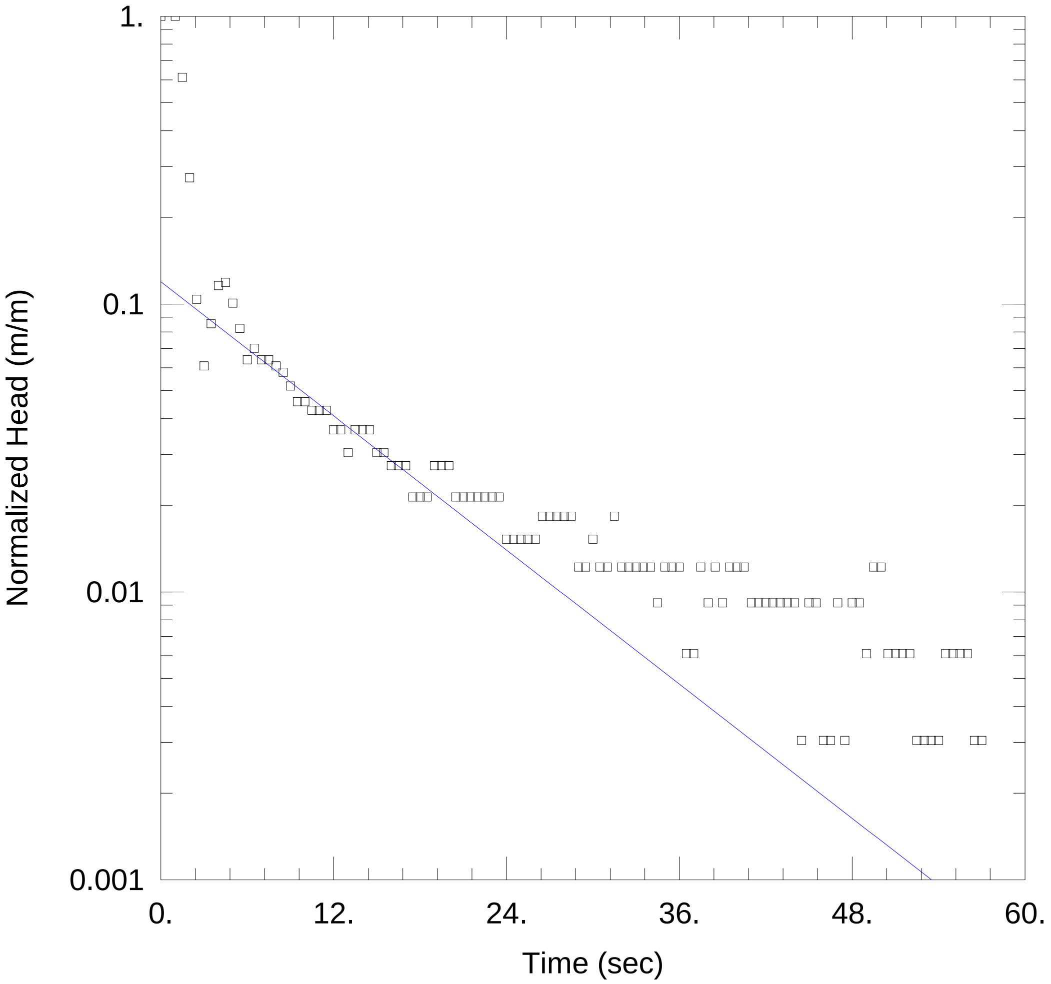
WELL DATA (MW3)

Initial Displacement: 0.971 m
Static Water Column Height: 6.246 m
Total Well Penetration Depth: 6.246 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 1.063 m/day
y0 = 0.5743 m



MW4 TEST 1

Data Set: C:\...\MW4 Test 1.aqt
Date: 04/12/12
Time: 08:58:23

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 3.65 m
Anisotropy Ratio (Kz/Kr): 1.

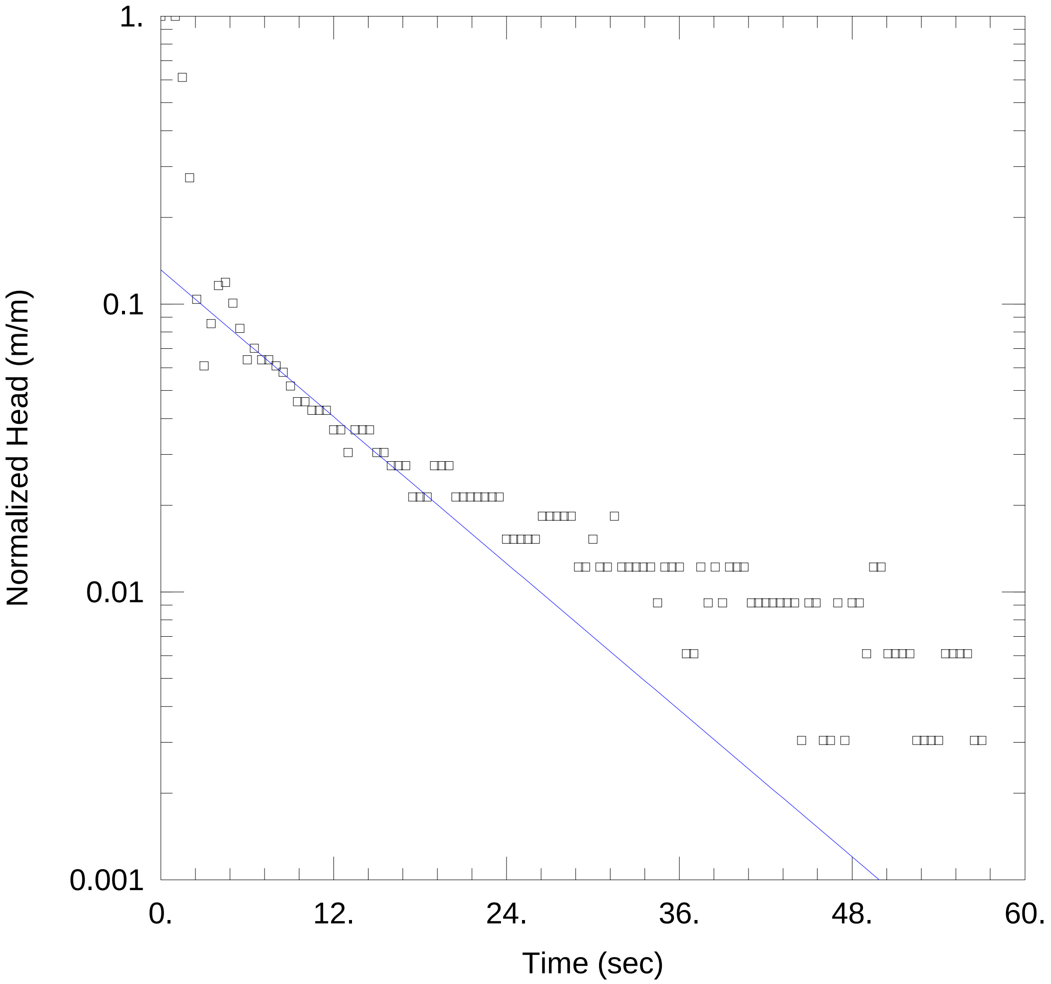
WELL DATA (MW4)

Initial Displacement: 0.328 m
Static Water Column Height: 3.65 m
Total Well Penetration Depth: 3.65 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.344 m/day
y0 = 0.0392 m



MW4 TEST 1

Data Set: C:\...\MW4 Test 1.aqt
Date: 04/12/12
Time: 09:00:16

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 8.65 m
Anisotropy Ratio (Kz/Kr): 1.

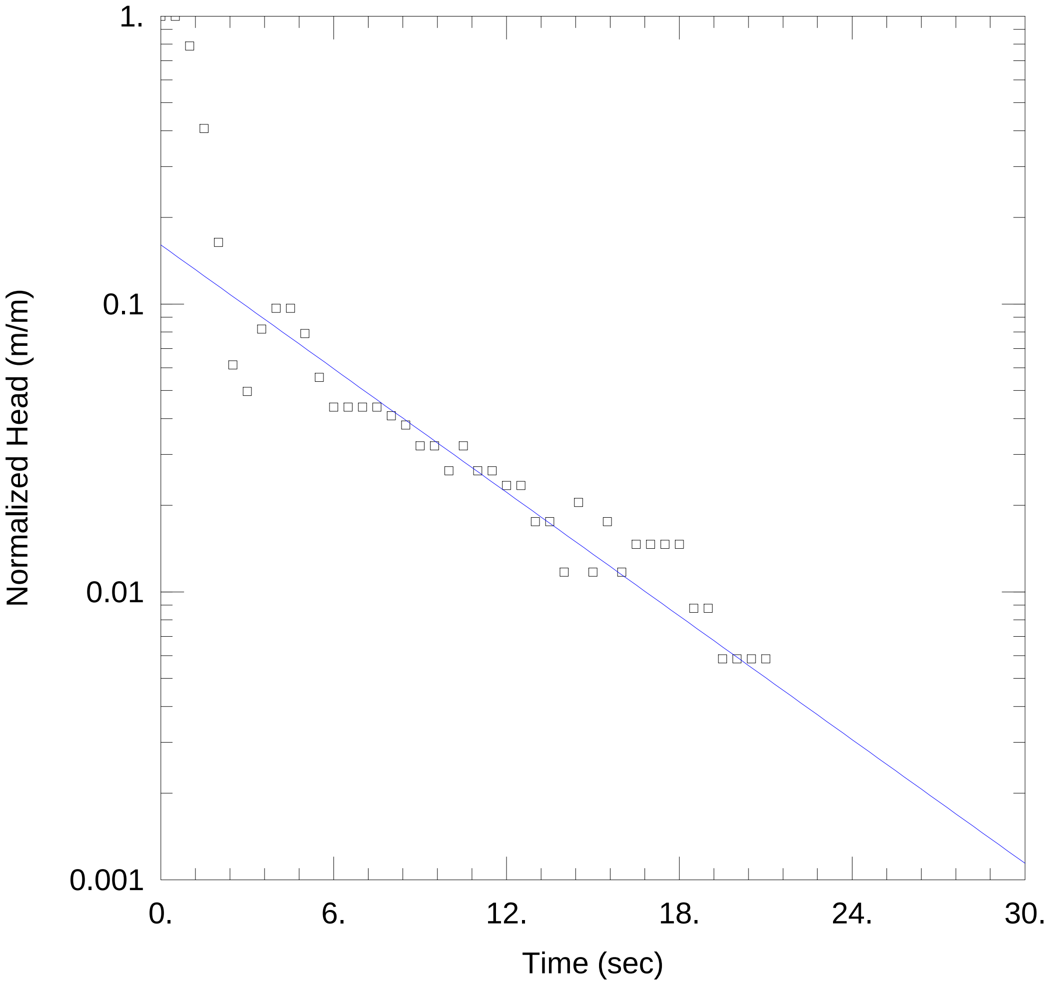
WELL DATA (MW4)

Initial Displacement: 0.328 m
Static Water Column Height: 3.65 m
Total Well Penetration Depth: 3.65 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.168 m/day
y0 = 0.04305 m



MW4 TEST 2

Data Set: C:\...\MW4 Test 2.aqt
Date: 04/12/12
Time: 09:12:12

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 3.65 m
Anisotropy Ratio (Kz/Kr): 1.

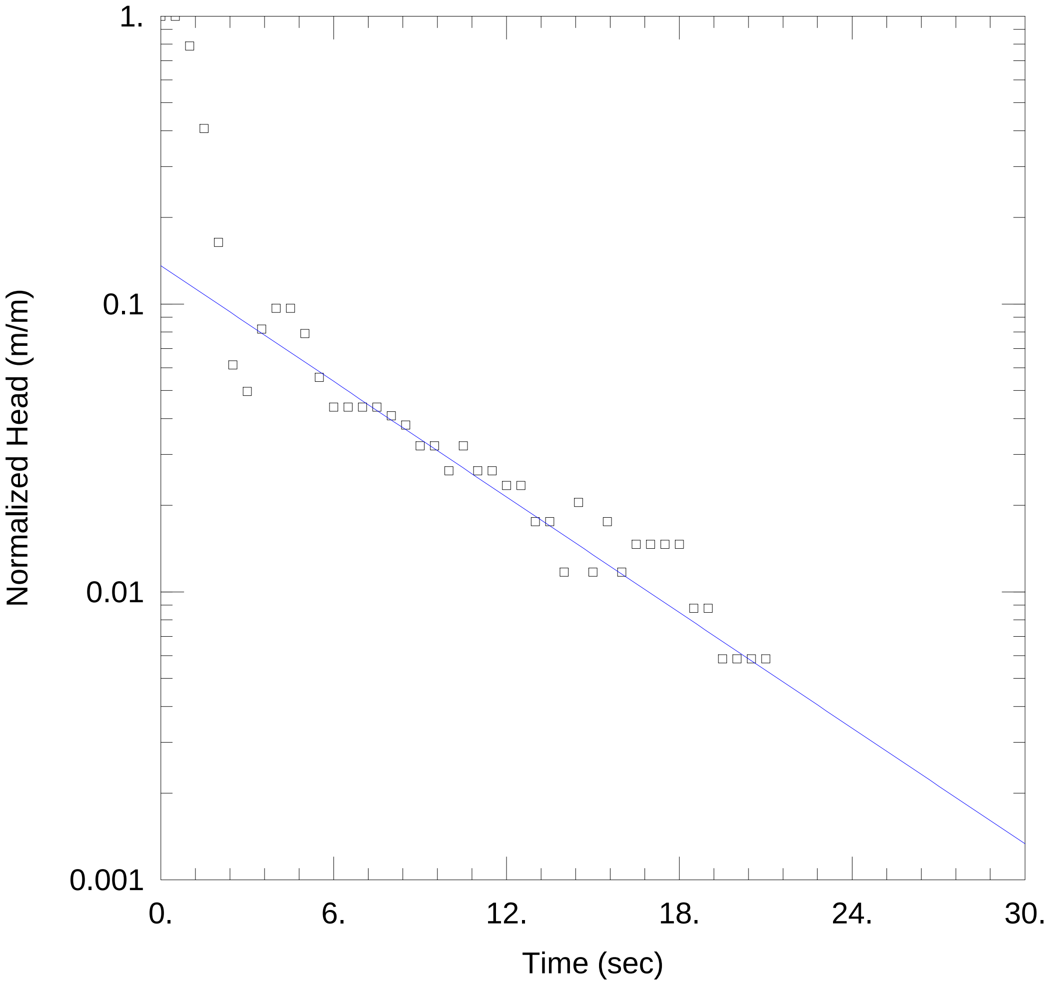
WELL DATA (MW4)

Initial Displacement: 0.342 m
Static Water Column Height: 3.65 m
Total Well Penetration Depth: 3.65 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.322 m/day
y0 = 0.05485 m



MW4 TEST 2

Data Set: C:\...\MW4 Test 2.aqt
Date: 04/12/12 Time: 09:14:27

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 27 February 2012

AQUIFER DATA

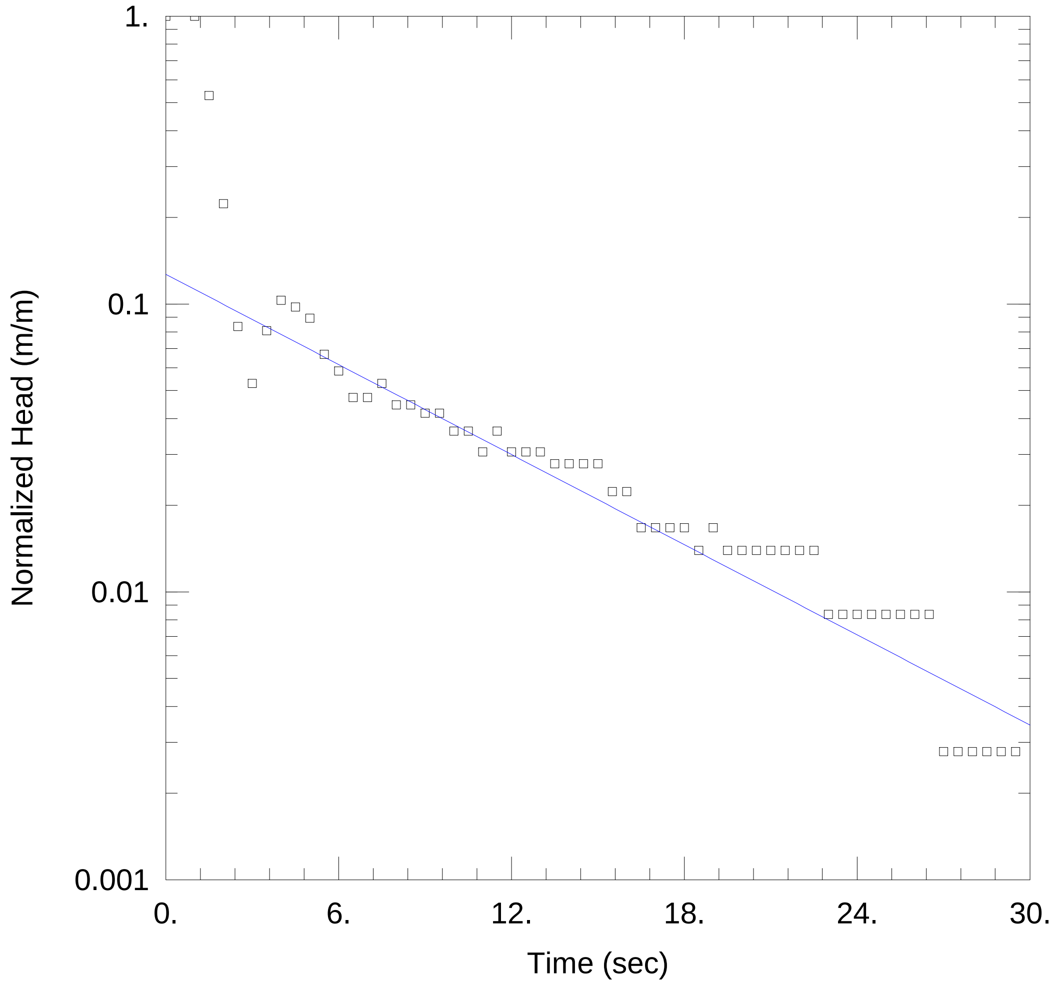
Saturated Thickness: 8.65 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4)

Initial Displacement: 0.342 m
Static Water Column Height: 3.65 m
Total Well Penetration Depth: 3.65 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.417 m/day
y0 = 0.04645 m



MW4 TEST 3

Data Set: C:\...\MW4 Test 3.aqt
Date: 04/12/12 Time: 09:20:01

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 27 February 2012

AQUIFER DATA

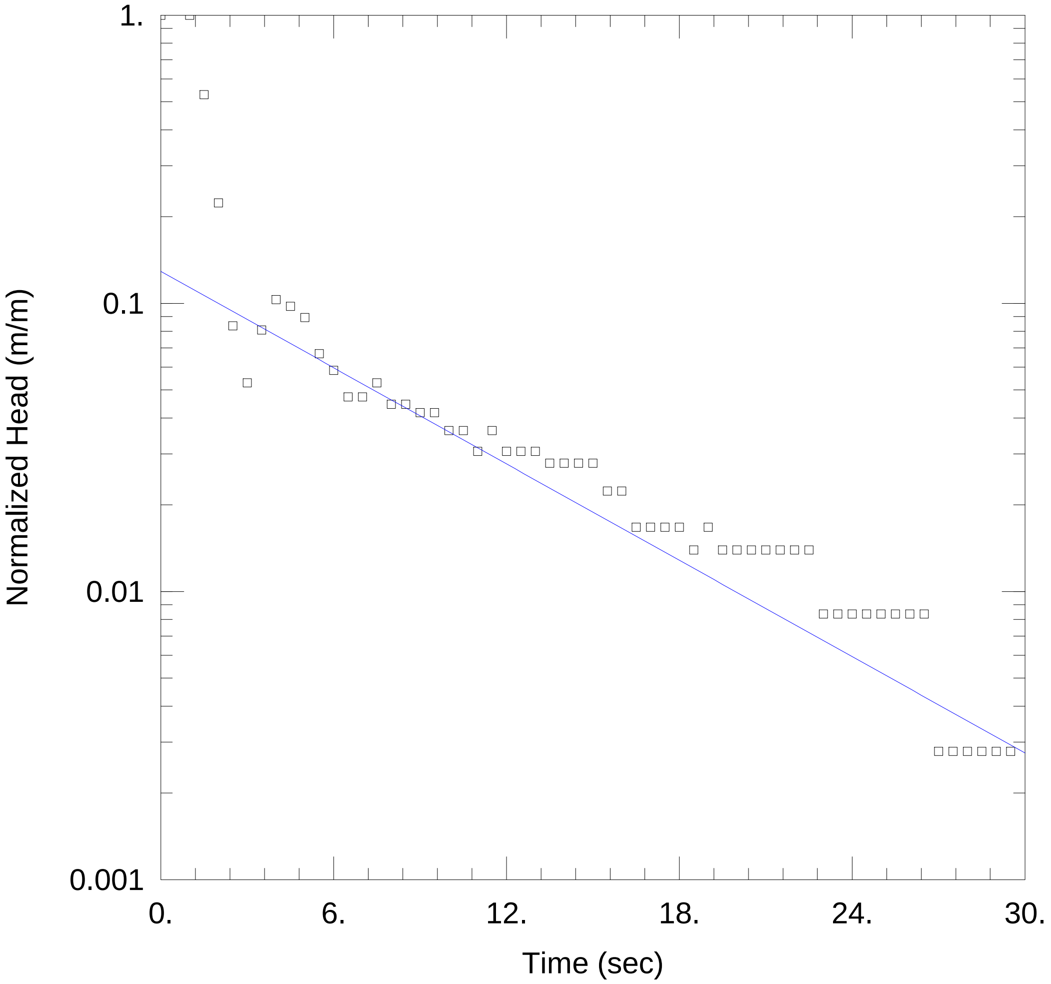
Saturated Thickness: 3.65 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4)

Initial Displacement: 0.359 m
Static Water Column Height: 3.65 m
Total Well Penetration Depth: 3.65 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.149 m/day
y0 = 0.0455 m



MW4 TEST 3

Data Set: C:\...\MW4 Test 3.aqt
Date: 04/12/12
Time: 09:21:12

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW4
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 8.65 m
Anisotropy Ratio (Kz/Kr): 1.

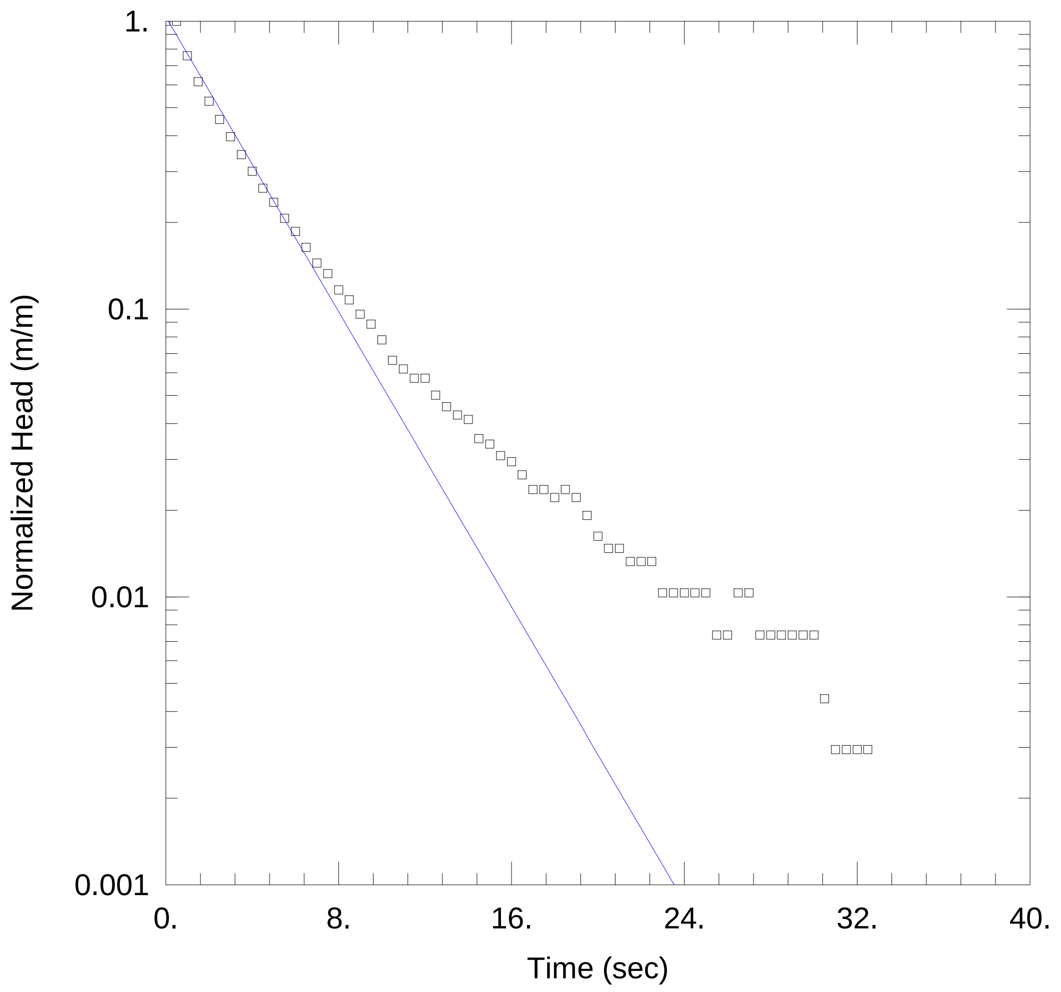
WELL DATA (MW4)

Initial Displacement: 0.359 m
Static Water Column Height: 3.65 m
Total Well Penetration Depth: 3.65 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.844 m/day
y0 = 0.04634 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1.aqt
Date: 04/12/12 Time: 09:32:00

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 4.473 m
Anisotropy Ratio (Kz/Kr): 1.

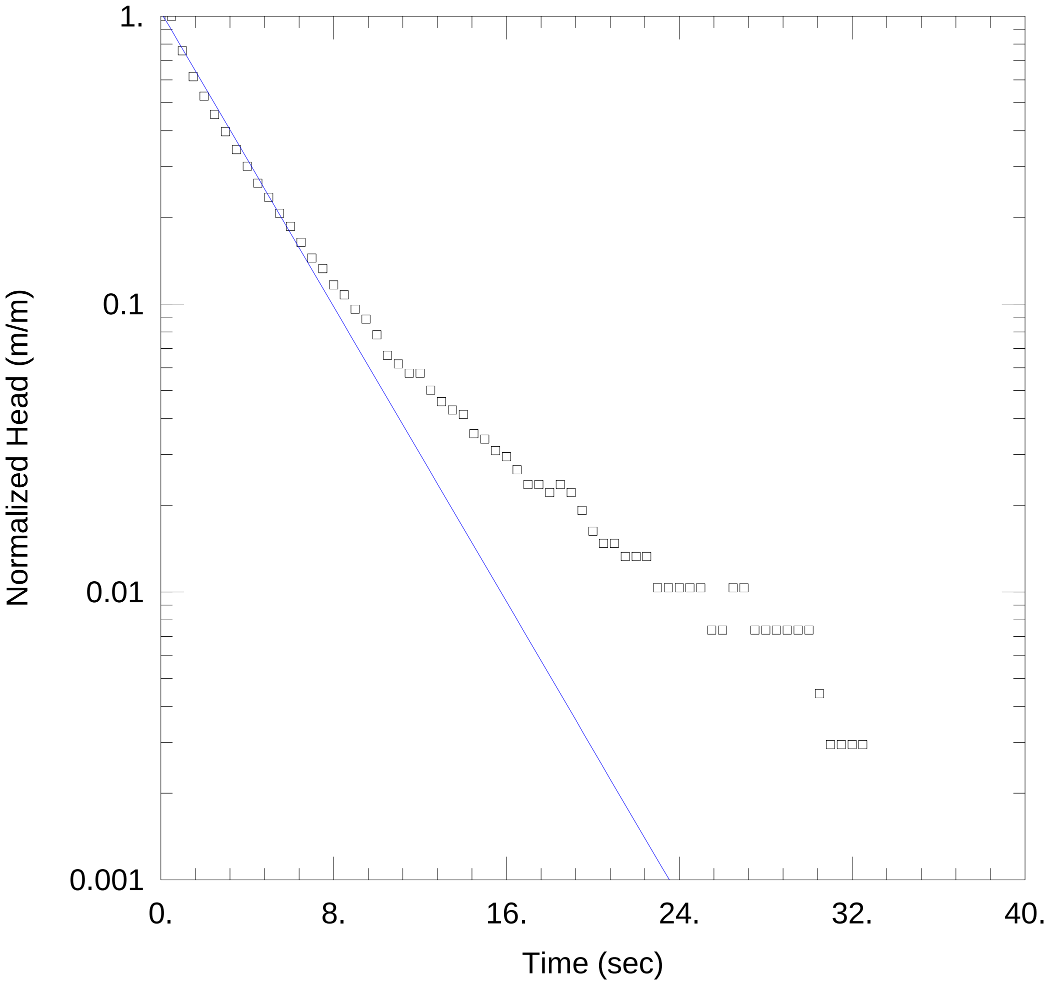
WELL DATA (MW5)

Initial Displacement: 0.678 m
Static Water Column Height: 4.473 m
Total Well Penetration Depth: 4.473 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 8.085 m/day
y0 = 0.7012 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1.aqt
Date: 04/12/12 Time: 09:33:11

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 9.473 m
Anisotropy Ratio (Kz/Kr): 1.

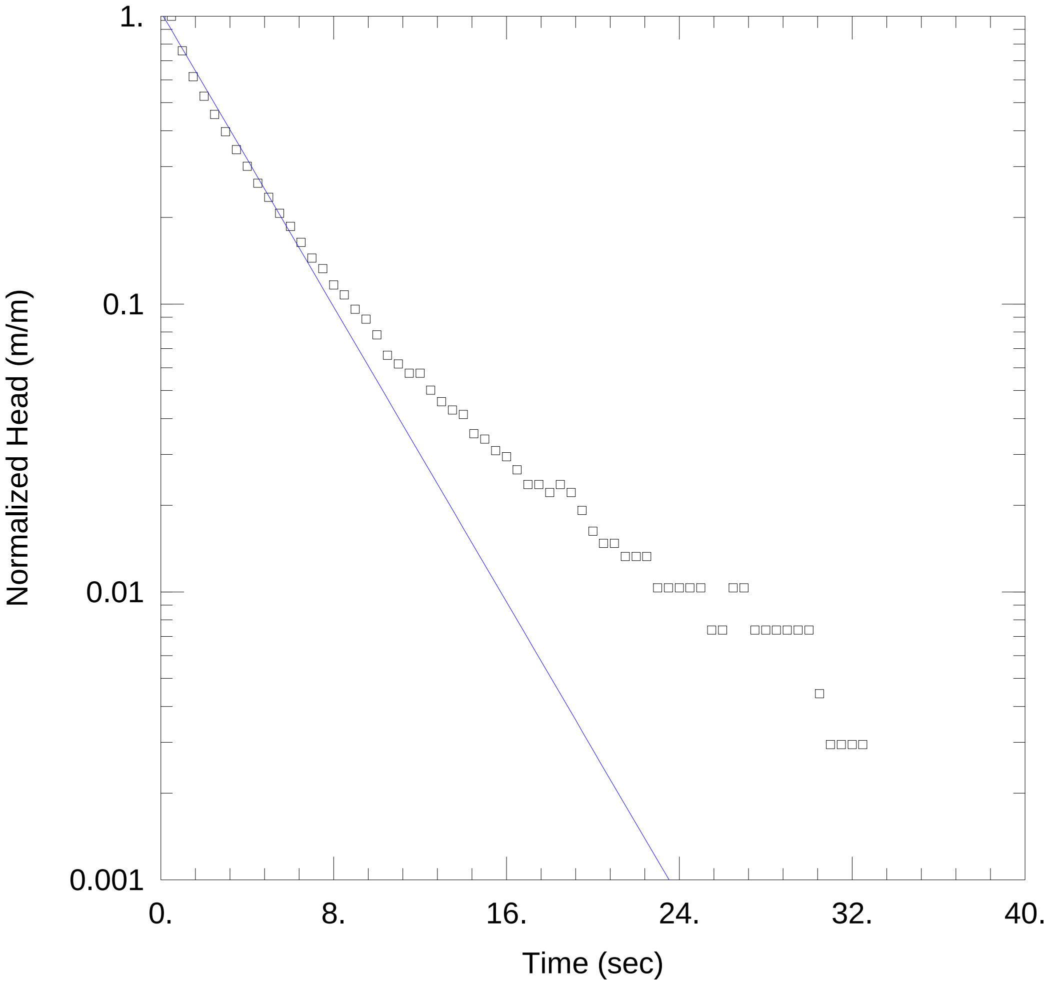
WELL DATA (MW5)

Initial Displacement: 0.678 m
Total Well Penetration Depth: 4.473 m
Casing Radius: 0.026 m
Static Water Column Height: 4.473 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 6.79 m/day
y0 = 0.7012 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1.aqt
Date: 04/12/12 Time: 11:38:43

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 4.473 m Anisotropy Ratio (Kz/Kr): 0.1

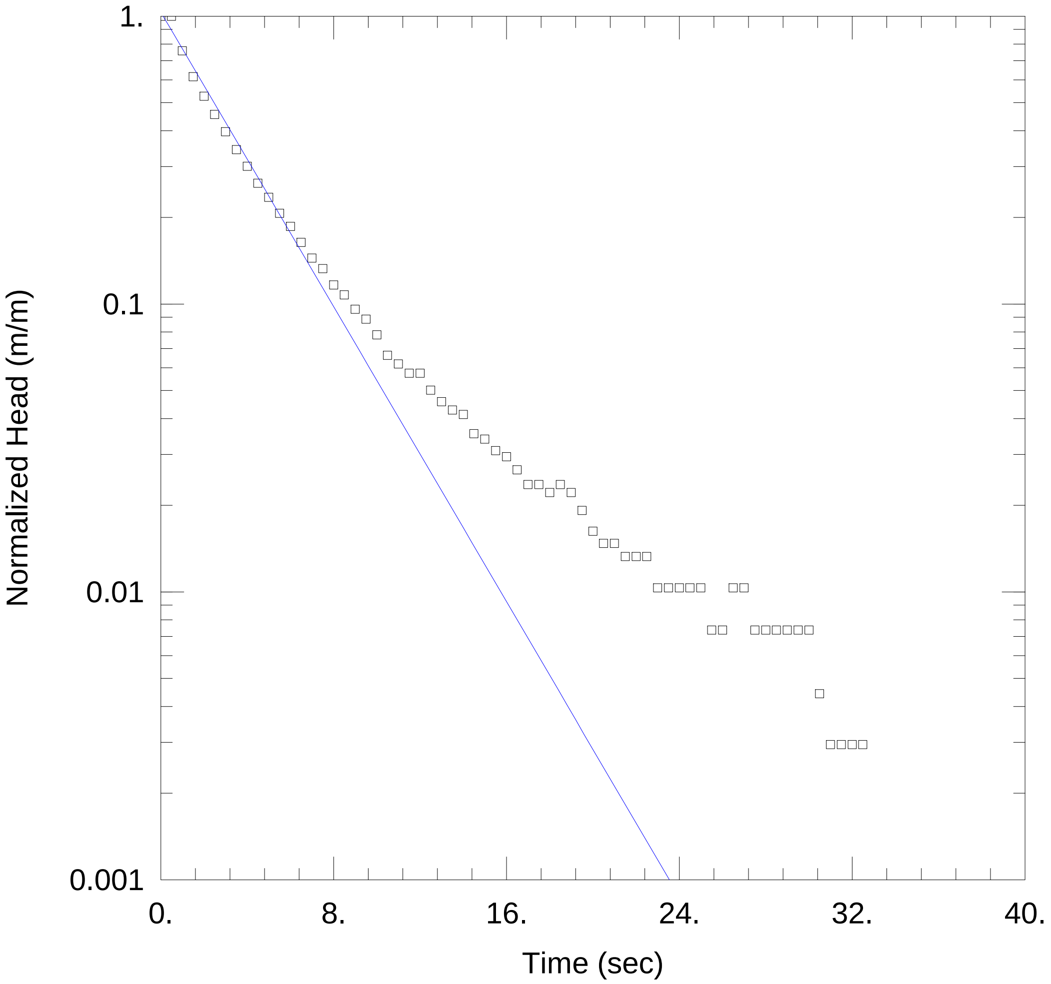
WELL DATA (MW5)

Initial Displacement: 0.678 m
Total Well Penetration Depth: 4.473 m
Casing Radius: 0.026 m
Static Water Column Height: 4.473 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 10.79 m/day y0 = 0.7014 m



MW5 TEST 1

Data Set: C:\...\MW5 Test 1.aqt
Date: 04/12/12 Time: 09:37:06

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 4.473 m
Anisotropy Ratio (Kz/Kr): 1.

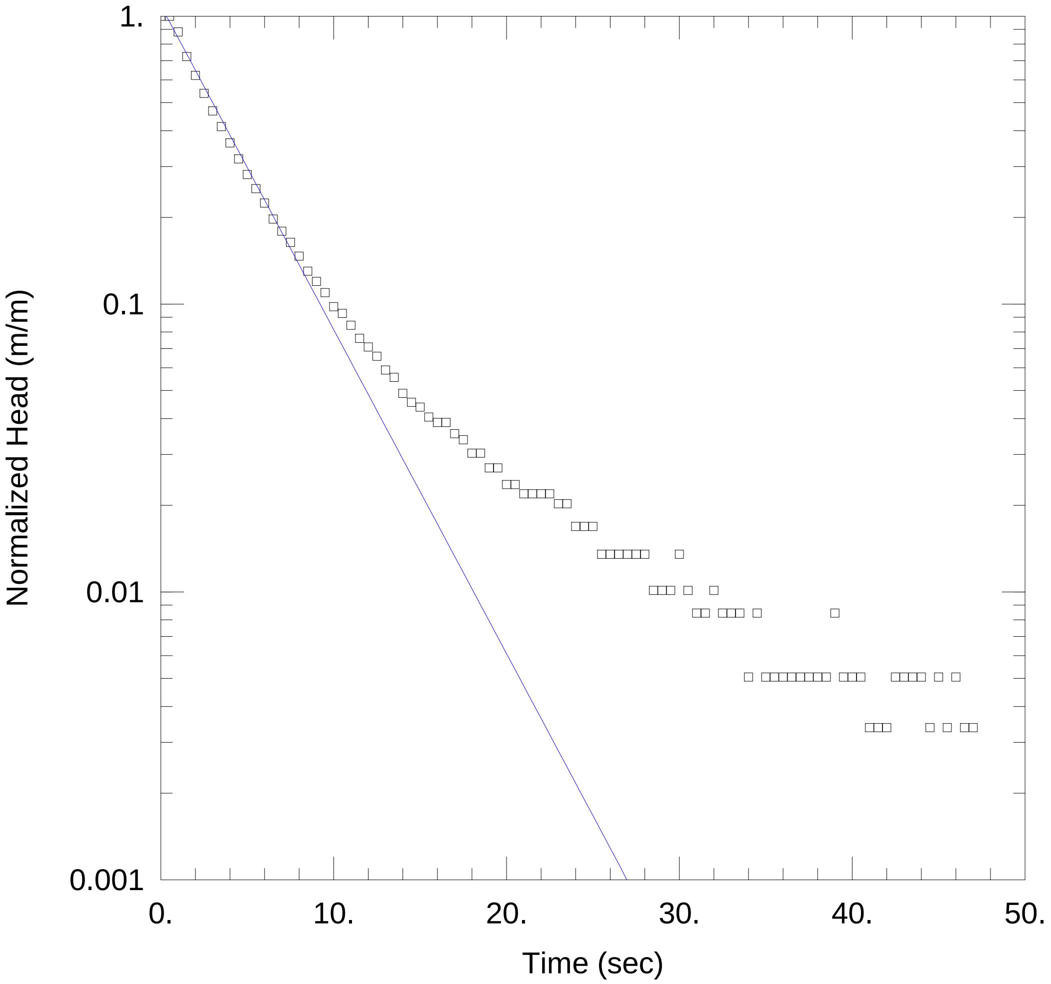
WELL DATA (MW5)

Initial Displacement: 0.678 m
Static Water Column Height: 4.473 m
Total Well Penetration Depth: 4.473 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 11.75 m/day
y0 = 0.701 m



MW5 TEST 2

Data Set: C:\...\MW5 Test 2.aqt
Date: 04/12/12
Time: 10:05:55

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

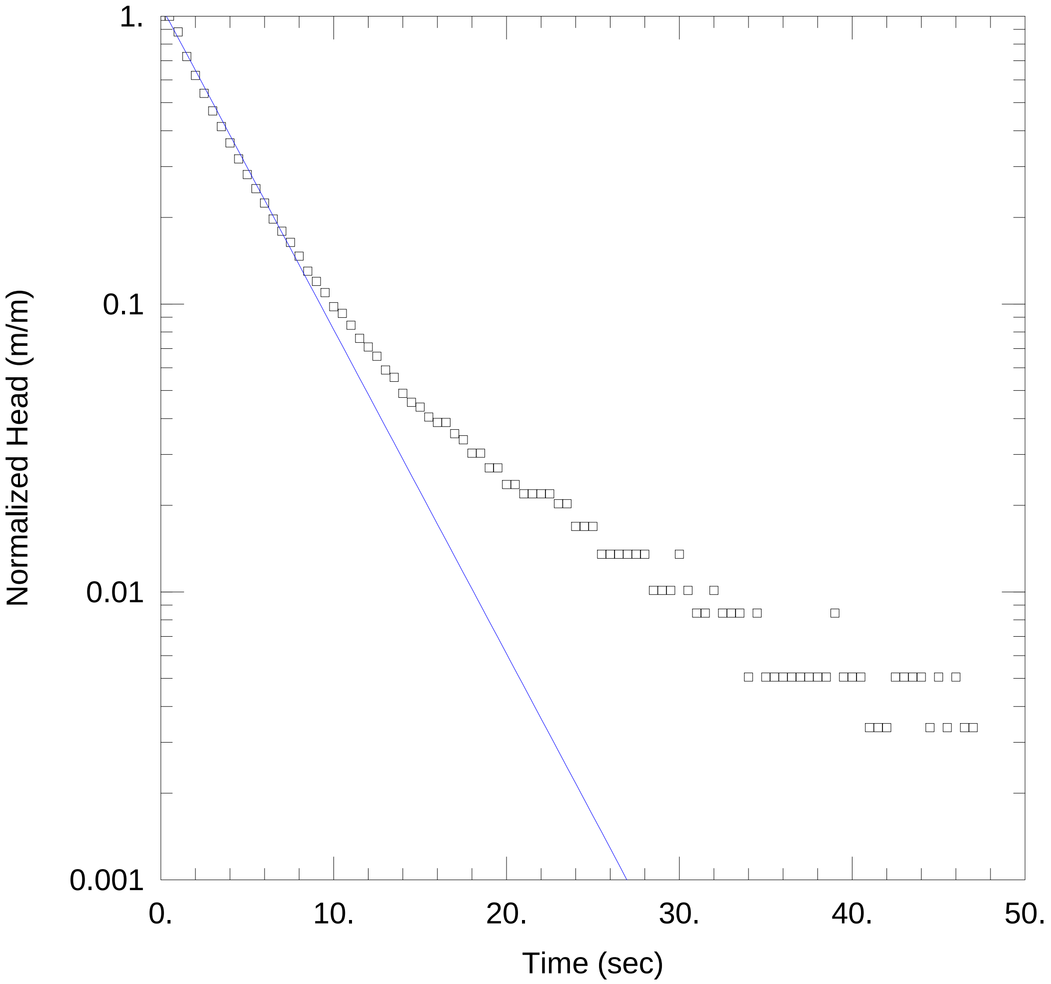
Saturated Thickness: 4.471 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5)

Initial Displacement: 0.593 m
Total Well Penetration Depth: 4.471 m
Casing Radius: 0.026 m
Static Water Column Height: 4.471 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 7.106 m/day
y0 = 0.6454 m



MW5 TEST 2

Data Set: C:\...\MW5 Test 2.aqt
Date: 04/12/12 Time: 10:07:25

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 9.471 m
Anisotropy Ratio (Kz/Kr): 1.

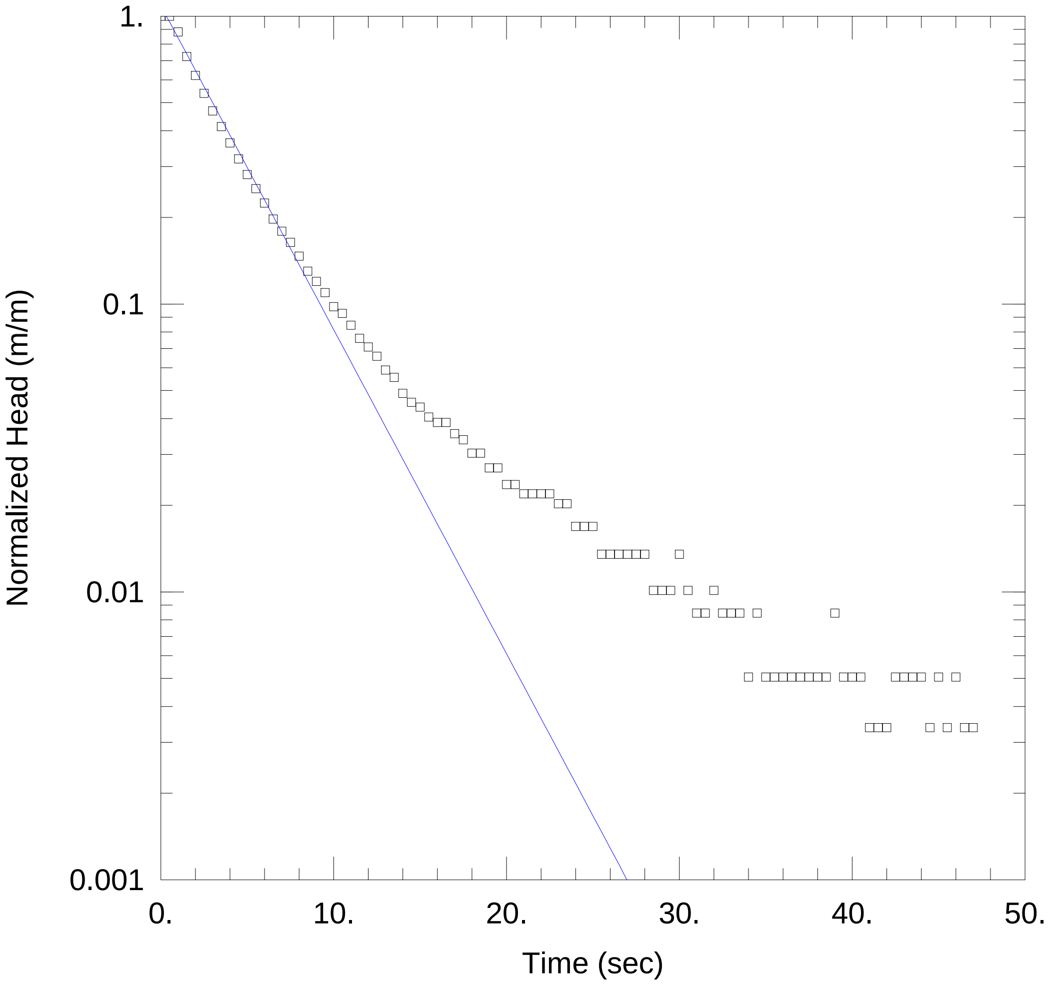
WELL DATA (MW5)

Initial Displacement: 0.593 m
Static Water Column Height: 4.471 m
Total Well Penetration Depth: 4.471 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.969 m/day
y0 = 0.6454 m



MW5 TEST 2

Data Set: C:\...\MW5 Test 2.aqt
Date: 04/12/12 Time: 11:40:18

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 4.471 m Anisotropy Ratio (Kz/Kr): 0.1

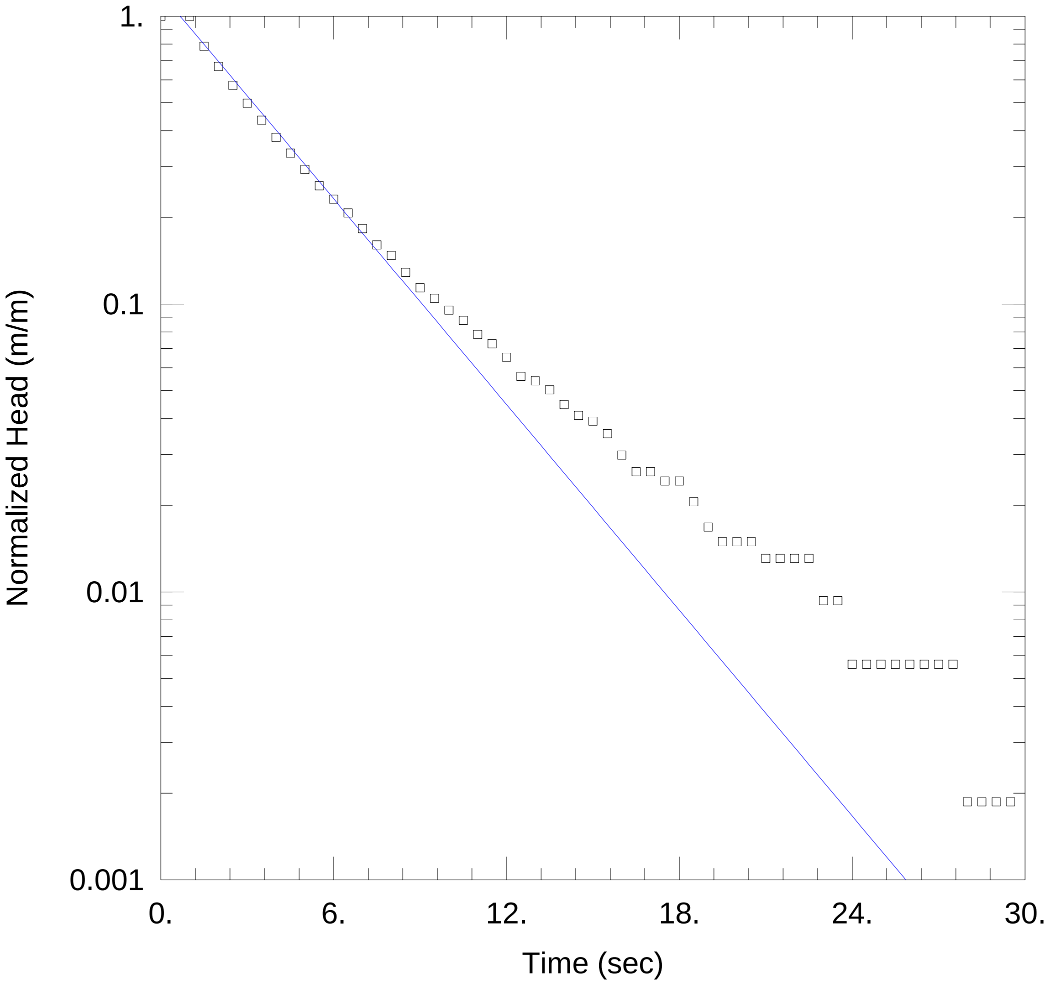
WELL DATA (MW5)

Initial Displacement: 0.593 m Static Water Column Height: 4.471 m
Total Well Penetration Depth: 4.471 m Screen Length: 3. m
Casing Radius: 0.026 m Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 9.484 m/day y0 = 0.6454 m



MW5 TEST 3

Data Set: C:\...\MW5 Test 3.aqt
Date: 04/12/12
Time: 10:12:33

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 4.464 m
Anisotropy Ratio (Kz/Kr): 1.

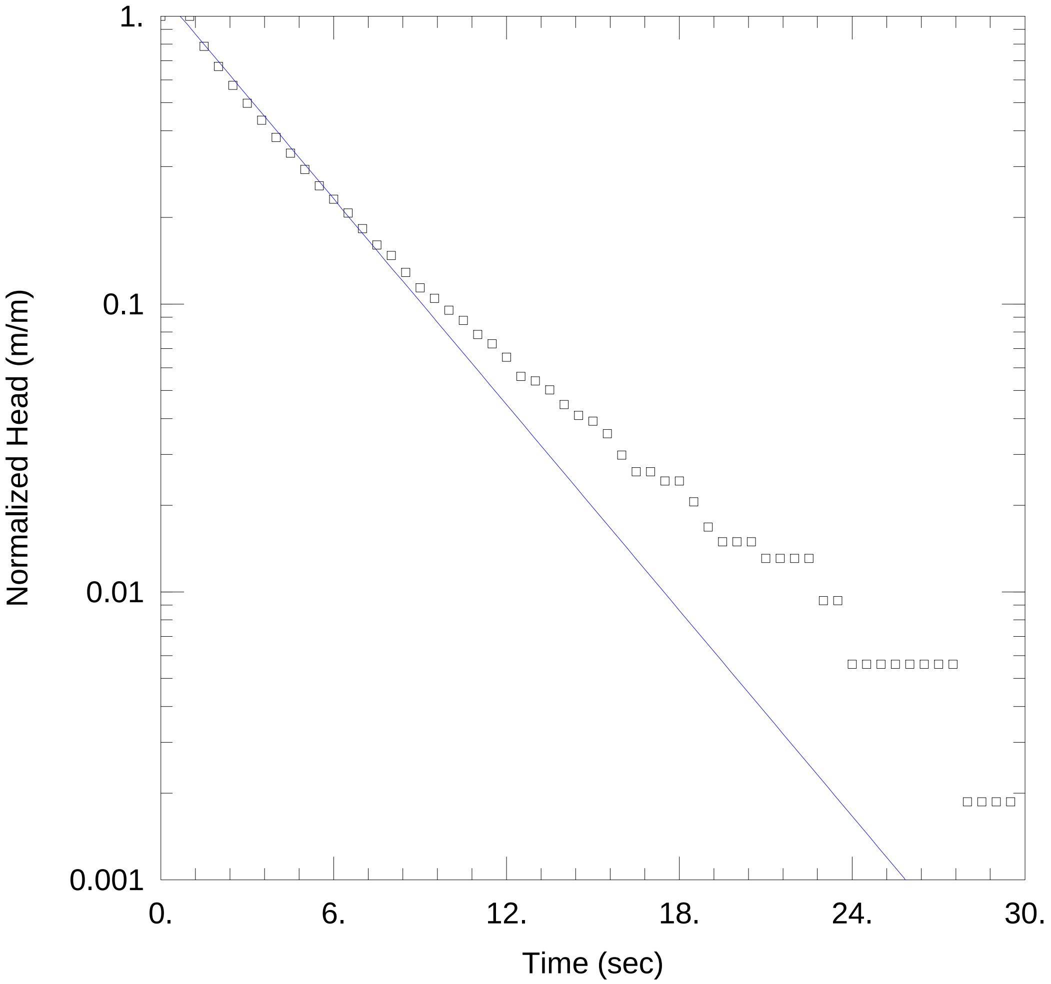
WELL DATA (MW5)

Initial Displacement: 0.536 m
Total Well Penetration Depth: 4.464 m
Casing Radius: 0.026 m
Static Water Column Height: 4.464 m
Screen Length: 3. m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 7.518 m/day
y0 = 0.6452 m



MW5 TEST 3

Data Set: C:\...\MW5 Test 3.aqt
Date: 04/12/12
Time: 10:13:43

PROJECT INFORMATION

Company: ERM Australia
Client: Burrup Nitrates
Project: 0086269
Location: Burrup Peninsula
Test Well: MW5
Test Date: 27 February 2012

AQUIFER DATA

Saturated Thickness: 9.464 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5)

Initial Displacement: 0.536 m
Static Water Column Height: 4.464 m
Total Well Penetration Depth: 4.464 m
Screen Length: 3. m
Casing Radius: 0.026 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 6.317 m/day
y0 = 0.6453 m

MW No	Date	Test No	K (m/day)	Solution	Saturated thickness (m)	Anisotropy Ratio
MW1	Sep-11	1	0.19	BR	5.35	1
MW1	Sep-11	1	0.26	H	5.35	1
MW1	Sep-11	2	0.19	BR	5.35	1
MW1	Sep-11	2	0.15	BR	10.35	1
MW1	Sep-11	3	0.19	BR	10.35	1
MW1	Sep-11	3	0.21	BR	5.35	1
		Median	**0.2**			
		Min	**0.2**			
		Max	**0.3**			

MW No	Date	Test No	K (m/day)	Solution	Saturated thickness (m)	Anisotropy Ratio
MW2	Sep-11	1	2.24	BR	5.11	1
MW2	Sep-11	1	1.88	BR	10.11	1
MW2	Sep-11	1	3.17	H	5.11	1
MW2	Sep-11	2	2.36	BR	5.11	1
MW2	Sep-11	2	1.97	BR	10.11	1
MW2	Sep-11	2	2.99	BR	5.11	0.1
MW2	Sep-11	2	2.61	KGS	5.11	
MW2	Sep-11	2	2.61	KGS	5.11	
MW2	Sep-11	2	2.29	KGS	10.11	
MW2	Sep-11	2	2.16	Dagan	5.11	1
MW2	Sep-11	2	2.1	Dagan	10.11	1
MW2	Sep-11	3	2.7	BR	5.11	1
MW2	Sep-11	3	1.9	BR	10.11	1
MW2	Sep-11	3	3.21	H	5.11	1
MW2	Sep-11	3	2.67	H	10.11	1
		Median	**2.4**			
		Min	**1.9**			
		Max	**3.2**			

MW No	Date	Test No	K (m/day)	Solution	Saturated thickness (m)	Anisotropy Ratio
MW3	Feb-12	1	0.77	BR	6.25	1
MW3	Feb-12	1	0.64	BR	12.25	1
MW3	Feb-12	1	1.05	H	6.25	1
MW3	Feb-12	2	0.76	BR	6.25	1
MW3	Feb-12	2	0.62	BR	12.25	1
MW3	Feb-12	2	0.82	KGS	12.25	
MW3	Feb-12	2	1.03	H	6.25	1
MW3	Feb-12	3	0.78	BR	6.25	1
MW3	Feb-12	3	0.65	BR	12.25	1
MW3	Feb-12	3	1.06	H	6.25	1
MW3	Sep-11	1	0.68	BR	6.2	1
MW3	Sep-11	1	0.57	BR	11.2	1
MW3	Sep-11	1	0.85	KGS	6.2	
MW3	Sep-11	1	0.85	KGS	6.2	
MW3	Sep-11	1	0.93	H	6.2	1
MW3	Sep-11	2	0.71	BR	6.2	1
MW3	Sep-11	2	0.59	BR	11.2	1
MW3	Sep-11	2	0.85	KGS	6.2	
MW3	Sep-11	2	0.73	KGS	11.2	
MW3	Sep-11	3	0.71	BR	6.2	1
MW3	Sep-11	3	0.59	BR	11.22	1
MW3	Sep-11	3	0.83	KGS	6.2	
		Median	**0.8**			
		Min	**0.6**			
		Max	**1.1**			

MW No	Date	Test No	K (m/day)	Solution	Saturated thickness (m)	Anisotropy Ratio
MW4	Sep-11	1	2.6	BR	3.95	1
MW4	Sep-11	1	3.69	BR	8.95	1
MW4	Sep-11	1	2.3	BR	8.95	1
MW4	Sep-11	1	6	KGS	3.95	
MW4	Sep-11	2	1.63	BR	8.95	1
MW4	Sep-11	2	7.06	KGS	3.95	
MW4	Sep-11	3	4.08	BR	3.95	1
MW4	Feb-12	1	2.34	BR	3.65	1
MW4	Feb-12	1	2.17	BR	8.65	1
MW4	Feb-12	2	4.3	BR	3.65	1
MW4	Feb-12	2	3.42	BR	8.65	1
MW4	Feb-12	3	3.15	BR	3.65	1
MW4	Feb-12	3	2.84	BR	8.65	1
		Median	**3.2**			
		Min	**1.6**			
		Max	**7.1**			

MW No	Date	Test No	K (m/day)	Solution	Saturated thickness (m)	Anisotropy Ratio
MW5	Feb-12	1	8.09	BR	4.5	1
MW5	Feb-12	1	6.8	BR	9.5	1
MW5	Feb-12	1	10.8	BR	4.5	0.1
MW5	Feb-12	1	11.75	H	4.5	1
MW5	Feb-12	2	7.11	BR	4.5	1
MW5	Feb-12	2	5.99	BR	9.5	1
MW5	Feb-12	2	9.5	BR	4.5	0.1
MW5	Feb-12	3	7.5	BR	4.5	1
MW5	Feb-12	3	6.3	BR	9.5	1
MW5	Sep-11	1	5.3	BR	4.3	1
MW5	Sep-11	1	4.5	BR	9.3	1
MW5	Sep-11	1	6.7	KGS	4.3	
MW5	Sep-11	2	6.02	BR	4.3	1
MW5	Sep-11	2	4.88	BR	9.3	1
MW5	Sep-11	2	7.21	KGS	4.3	
MW5	Sep-11	3	5.25	BR	4.3	1
MW5	Sep-11	3	4.8	BR	9.3	1
MW5	Sep-11	3	6.5	KGS	4.3	
		Median	**6.6**			
		Min	**4.5**			
		Max	**11.8**			

Annex I

QAQC Summary

1 *QA/QC SUMMARY*

Field duplicates, field triplicates, equipment rinsate and transport blanks were collected as field based quality control samples. Results are discussed below.

1.1 *PRIMARY/DUPLICATE ANALYSIS*

RPD% were calculated for primary/field-duplicate sample pairs where possible (i.e. where concentrations of an analyte were above the LOR in both the primary and quality control sample). In this project RPD% in the range of 0 - 30% were considered to represent adequate accuracy and precision, with only those RPD% falling outside this range scrutinised for further detailed assessment.

Three primary/duplicate sample pairs were collected over the course of this investigation representing a rate of one in five. Of the 63 RPD% able to be determined for the primary/duplicate or triplicate pairs only 2 were above 30%.

RPD% exceeding 30% were calculated from groundwater concentrations of Kjeldahl Nitrogen (40%) and Total Suspended Solids (44%) for the MW5/DUP01 primary/duplicate pair collected during the February 2012 groundwater monitoring event.

Given the low concentration of Nitrogen the actual difference in concentrations between the two samples is actually quite small. On this basis any apparent lack of accuracy or precision in the analytical data is not considered to negatively affect the interpretative value of the dataset for the purpose of this investigation.

1.2 *TRIP BLANK AND RINSATE ANALYSIS*

Rinsate samples using laboratory supplied water were collected during each of the groundwater investigations to provide confidence in the decontamination procedures used to prevent cross contamination between monitoring wells. Samples were analysed for a metals suite consistent with that used in the analysis of primary samples.

Trip blanks were included in the eskies used to transport samples to the laboratory to provide assurance in the sample handling procedure and to identify any potential cross contamination between samples during transportation. Trip blanks comprised of laboratory prepared bottles containing a blank water sample.

Analytes detected at concentrations greater than the laboratory limits of reporting in QA/QC samples are described below:

1) Zinc (0.009 mg/L) and aluminium (0.002 mg/L) were identified in the rinsate sample collected during the April 2011 GME;

2) Zinc (0.012 mg/L) was identified in the trip blank sample analysed during the April 2011 GME;

3) Zinc (0.005 mg/L) was identified in the rinsate sample collected during the September 2011 GME;

4) Toluene (0.6 mg/L) was identified in the trip blank sample analysed during the September 2011 GME; and

5) Sodium (2 mg/L), magnesium (0.1 mg/L) and zinc (0.007 mg/L) were identified in the rinsate sample collected during the February 2012 GME.

Zinc was identified in all rinsate and trip blank samples at very low concentrations. Given the presence of zinc in the trip blank sample which did not come in contact with any of the sampling equipment it is considered likely that the zinc identified in the rinsate samples is in fact a product of the laboratory supplied water. Furthermore, the fact that the concentrations identified in the QA/QC samples are significantly lower than those identified in the groundwater samples, any perceived lack of precision associated with the analysis of zinc is unlikely to affect the interpretative value of the data.

The concentrations of sodium and magnesium identified in the February 2012 rinsate sample are only marginally above or on the laboratory limits of reporting and are not considered to represent contamination during the rinsing of sampling equipment. Any perceived lack of precision associated with the analysis of these analytes is unlikely to affect the interpretative value of the data for the purpose of this investigation.

Given that toluene was not identified in any of the primary groundwater and is not considered to be a chemical of potential concern at the Site it is unlikely that the concentrations identified in the trip blank sample analysed as part of the September 2011 GME represents a cross contamination issue. On this basis, its detection in the QA/QC sample is not considered to be representative of any impacts of groundwater at the Site and has not been considered further during the interpretation of data during this investigation.

Overall the QA/QC samples collected during the three groundwater investigations provide confidence in the decontamination procedures and transportation of samples to the laboratory.

1.3 *LABORATORY QA/QC*

The analytical methods implemented and reported by the laboratories were performed in accordance with their scope of NATA accreditation and consistent with Schedule B(3) of the NEPM. The laboratories generally reported an adequate range and frequency of data quality information (including laboratory duplicates, control samples, surrogate recoveries and spike recoveries) for the purposes of this assessment. The reported laboratory data quality information was acceptable with the following exceptions and their potential effects on data quality are summarised below.

SGS Job Number PE057307

Holding times were exceeded for the analysis of alkalinity and hexavalent chromium. As a result there is the potential that these analytes have been under reported due to potential sample decomposition. The results for alkalinity during this round of analysis are consistent with those reported for the following investigations and therefore considered to be suitable for the purpose of this investigation. Given that hexavalent chromium was not identified in four out of five samples and at very low concentrations in the fifth any minor variation in the concentrations associated with the breach in holding times is not considered to affect the interpretative value of the data for the purpose of this investigation.

The matrix spike recovery for manganese was outside of the laboratory acceptability criteria due to concentrations in the primary sample exceeding that of the spike. Given the volume of compliant data quality information provided by the laboratories, the potential lack of accuracy represented by issues with a limited number of spike recoveries for some compounds is not considered to compromise the quality of the data overall.

SGS Job Number PE060993

Holding times were exceeded for the analysis of alkalinity and acidity. As a result there is the potential that these parameters have been under reported due to potential sample decomposition. The results for both parameters during this round of analysis are consistent with those reported for the other investigations and therefore considered to be suitable for the purpose of this investigation.

Spike recoveries for aluminium, iron and sulphate were all outside of the acceptance criteria due to high background concentrations. Given the volume of compliant data quality information provided by the laboratories, the potential lack of accuracy represented by issues with a limited number of spike recoveries for some compounds is not considered to compromise the quality of the data overall.

SGS Job Number PE065491

Holding times were exceeded for the analysis of alkalinity, acidity, sulphide and total suspended solids (TSS). The results for alkalinity, acidity and TSS during this round of analysis are consistent with those reported for the previous investigations and therefore considered to be suitable for the purpose of this investigation. There is the potential that concentrations of sulphides have been under reported as a result of the extended holding times. However sulphides were not detected above the laboratory limits of reporting in the samples that were analysed both within and outside of holding time limits. On this basis it is considered that the interpretative value of the data collected from those samples analysed outside of the recommended is suitable for the purpose of this investigation.

Matrix spike recovery for iron was outside of the acceptance criteria due to high background concentrations. Given the volume of compliant data quality information provided by the laboratories, the potential lack of accuracy represented by issues with a limited number of spike recoveries for some compounds is not considered to compromise the quality of the data overall.

Attachment 8B

Letter to OEPA, dated 12 February 2014, providing rationale for Groundwater Monitoring Well Re-Locations.

Environmental Resources Management Australia

6th Floor,
172 St. Georges Terrace
Perth WA 6000

PO Box 7338
Cloisters Square WA 6850

Telephone +61 8 9321 5200
Facsimile +61 8 9321 5262

www.erm.com

12 February, 2014

Kim Taylor
General Manager
Office of the Environmental Protection Authority
The Atrium Level 8
168 St Georges Terrace
Perth, Western Australia 6000

Our Reference: 0220651

OEPA Reference: CA01-2013-0018

Dear Mr Taylor,

RE: GROUNDWATER MONITORING WELL RE-LOCATION

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by Yara Pilbara Nitrates Pty Ltd (YPNPL) to support them in addressing environmental non-compliances (NC) highlighted in the OEPA's letter dated 15 January 2014. This letter specifically responds to the request for:

'Details of the design, construction and location of the bores installed to replace groundwater monitoring bores MW1 and MW4 and the reasons and rationale for replacing the bores…'

The OEPA require action by 14 February 2014 to resolve the NC. This letter sets out the information required together with *Annexes A* and *B* which provide location details and the *'Monitoring Well Installation'* report issued by GHD respectively.

2. PROJECT APPRECIATION

The site (including temporary laydown areas) occupies approximately 35 ha of land in the north-western section of Lot 3017. Lot 3017 totals approximately 49 ha and is located within the Burrup Industrial Estate (BIE). The existing ammonia fertiliser plant is situated adjacent to the western boundary of Lot 3017.

The civil works for the TANPF have now been completed and construction works commenced. The Project is on target for commissioning in Q1 2015. During civil works activities, 2 of the 5 groundwater monitoring bores (MW1 and MW4) installed by ERM to periodically monitor groundwater conditions under Condition 8-4 of Ministerial Statement No. 870 were damaged and have been replaced.

3. REPLACEMENT WELL INSTALLATION

3.1 INTRODUCTION

Figure 1 of *Annex B* (p4) has been marked up to show the approximate original location of wells MW1 and MW4 in relation the proposed TANPF layout. MW1 was originally located in the vicinity of proposed site road no. 3 to the north west of the TANPF, and MW4 within the proposed Nitric Acid plant to the south west of the TANPF. As a result, YPNPL sought to find viable relocation sites for the wells.

3.2 NEW LOCATIONS

New representative well locations were selected by ERM in consultation with YPNPL (*Annex A* and *Figure 1* of *Annex B*). The well positions were relocated in consideration of updated proposed TANPF layout, intending to fulfil the same purpose as the original positioned wells while being located in locations protected from construction activities.

A location for replacement MW1 was chosen to the north west of the original well location, just within the fenced site boundary. A location for replacement MW4 was chosen to the south east and immediately down gradient of the original well location between Contaminated Surface Water Storage Ponds 4 and 5, as close to the fence line as practicable.

The location of the current wells in relation to the original locations is also shown in *Annex A*. *Table 1* of *Annex B (*p3) provides the coordinates of the relocated wells MW1 and MW4.

It is noted that the replacement wells were drilled as near to the original locations as possible but do differ in terms of elevations.

3.3 REASONS AND RATIONALE FOR REPLACING THE BORES

The reasons for relocation as stated in the previous section are related to the proposed layout of the TANPF. The Project's Construction Water Quality Management Plan (reference 2-250-329-PRO-TRE-0118) prepared for YPNPL's principal contractor noted that *'Existing groundwater monitoring well locations shall be retained where possible, however, it is noted that several locations are present within the building footprint. Groundwater monitoring wells present within the building footprint will be decommissioned in accordance with relevant WA guidelines and internationally recognised industry standards at the commencement of construction.'*

To avoid interference with construction activities and proposed operations, the wells have been relocated to representative sites with respect of location and the likely interception of analytes as related to particular parts of the facility.

ERM consider that the locations of the replacement wells are representative of the original well locations on the following basis:

- MW 1 is positioned at an up hydraulic gradient location near the northern perimeter of the Site to continue to monitor background groundwater quality; and
- MW 4 is installed adjacent to potential sources of contamination in Contaminated Surface Water Ponds 4 and 5 and down hydraulic and topographic gradient of the Site to enable the evaluation of any potential impacts in relation to water quality contamination as a result of construction activities.

It is noted that the contaminated water pond design has changed from a single membrane to a double membrane design with a leak detection system between the membranes. A leak would trigger action to replace the membranes. The risk of a leak from the ponds to groundwater is therefore considered low.

3.4 CONSTRUCTION

Section 2 of *Annex B* provides details of the well installation methodology. In summary, the replacement wells were redrilled on Saturday 7 September 2013 using an airlift method (to remove introduced fluids) in accordance with:

- Water Quality Protection Note 30: Groundwater Monitoring Bores, Department of Water, Government of Western Australia; and
- Minimum Construction Requirements for Water Bores in Australia, February 2012, Third Edition.

3.5 DESIGN

The replacement wells were constructed with 50 mm Class 18 PVC casing and a lockable protective casing extending approximately 700 mm above ground level. *Appendix A* of *Annex B* to this report provides well logs which detail the design of the wells. The design of the replacement wells is considered consistent with the objectives of the original well design in terms of intercepting groundwater analytes/ contaminants.

It is noted that the drilling and installation of replacement wells MW1 and MW4, has resulted in a variation of well depth. The deeper screens in the replacement wells could potentially lead to variation in groundwater chemistry where sampled as compared with the original MW1 and MW4 wells. This is due to different part of the aquifer is being sampled (i.e. the deeper in the bedrock profile and closer to the tidal flats the likelihood of higher salinity). Should future sampling show consistent concentrations representative of natural background conditions in these replacement wells that are outside of the current trigger limits, there may be a need to review and propose revised trigger levels.

4. SUMMARY

Overall, the replacements wells MW1 and MW4 are considered fit for purpose in continued groundwater monitoring in accordance with Condition 8-4 of Ministerial Statement No. 870 given the relative locations of the well in relation to the objectives of groundwater construction monitoring. While there are minor variations in the design of the wells when compared to the original installations, it is considered that these differences will only affect the interception of natural groundwater chemistry in the monitoring process, and will not affect the effectiveness of the wells in monitoring potential contaminants connected with the construction and operation of the TANPF.

Should you require any clarification please contact the undersigned.

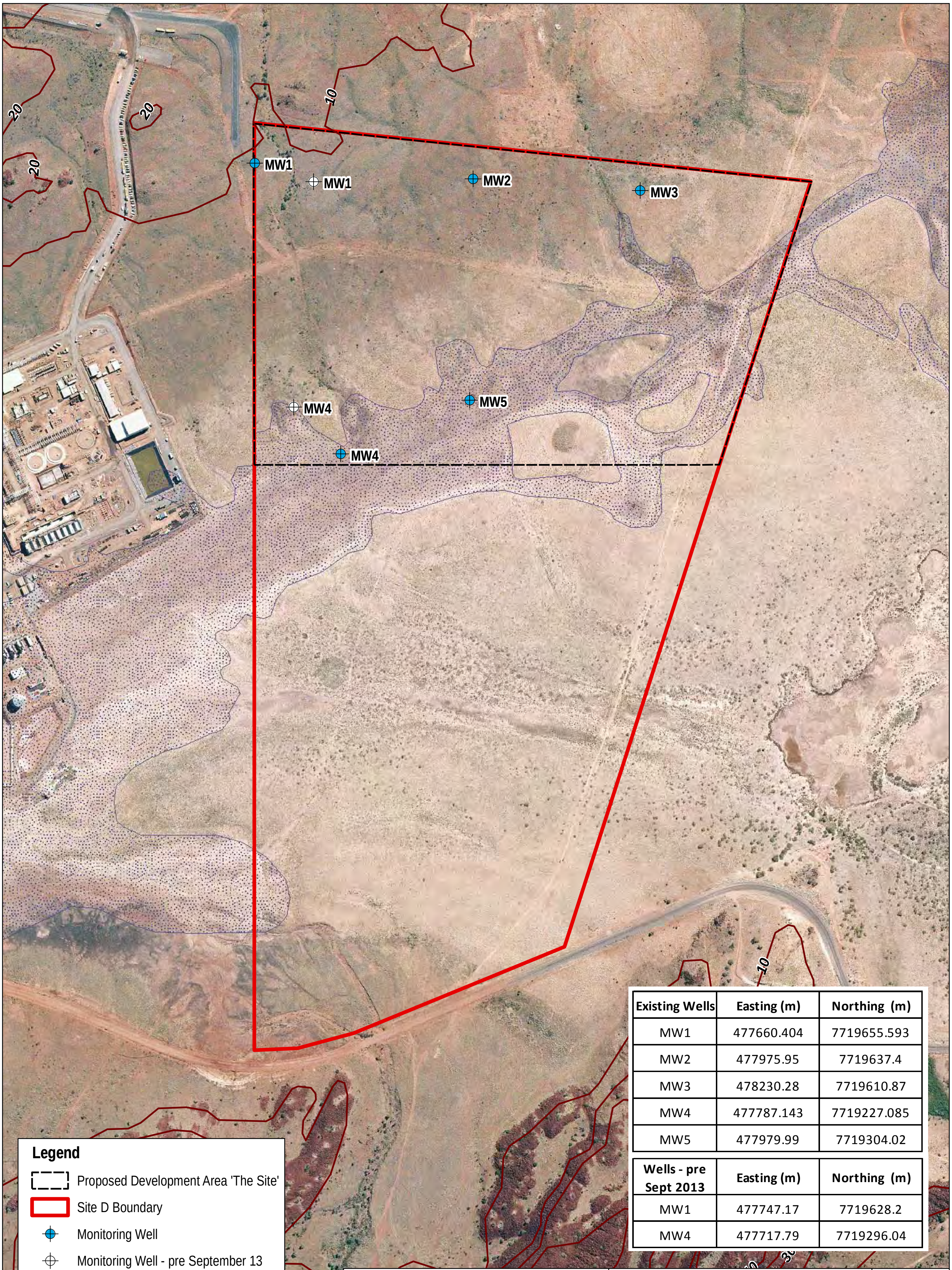
Yours sincerely,
for Environmental Resources Management Australia Pty Ltd

Sean Scaife	Paul Myers-Allen
Project Manager	Partner

Attachments:
Annex A – Well Locations
Annex B – Monitoring Well Installation report (GHD, 2013)

Annex A

WELL LOCATIONS



Existing Wells	Easting (m)	Northing (m)
MW1	477660.404	7719655.593
MW2	477975.95	7719637.4
MW3	478230.28	7719610.87
MW4	477787.143	7719227.085
MW5	477979.99	7719304.02

Wells - pre Sept 2013	Easting (m)	Northing (m)
MW1	477747.17	7719628.2
MW4	477717.79	7719296.04

Client:	Yarra Pilbara Nitrates Pty Ltd	
Drawing No:	0220651p_G001_R0.mxd	
Date:	11/02/2014	Drawing Size: A4
Drawn By:	DN	Reviewed By: SLS

Figure 1 - Well Locations

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

Annex B

MONITORING WELL INSTALLATION REPORT

Tecnicas Reunidas

TAN Burrup Project
Monitoring Well Installation

September 2013

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1. Introduction....2
   1.1 Background....2
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2. Installation....3
3. Conclusion....5

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Figure index

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Appendices

Appendix A – Well Logs

Appendix B – Site photographs

1. Introduction

This report describes the installation of two (2) monitoring wells on the Technical Ammonium Nitrate (TAN) production site, to replace existing wells that had been destroyed during facility construction.

1.1 Background

Yara Pilbara Nitrates Pty Ltd (YPNPL) formerly Burrup Nitrates Pty Ltd (BNPL) is joint venture between Yara, Orica and Apache. YPNPL is developing a Technical Ammonium Nitrate (TAN) production facility on the Yara Pilbara Peninsula near Karratha in the Shire of Roebourne, Western Australia. When completed, the TAN will be owned by YPNPL, operated by Yara International ASA and marketed by Orica Limited.

The TAN production facility will be located adjacent to the existing ammonia plant in the Burrup industrial estate is operated by Yara Fertilisers Pty Ltd, and will include:

- Process plants;
- Utilities area;
- Storages for finished product; and,
- Several buildings including a workshop, central control room, laboratory, safety and security gatehouse, administration office and staff amenities.
- Regulatory approval has been requested for Site D within King Bay/Hearson Cove Industrial Precinct on the Burrup Peninsula, approximately 13km northwest of Karratha Western Australia (WA) and construction commenced in 2012 with the TAN expected to be fully commissioned by the last quarter of 2014.

1.2 Assumptions and Limitations

This report: has been prepared by GHD for Tecnicas Reunidas and *may only be used and relied on by Tecnicas Reunidas for the purpose agreed between GHD and the Tecnicas Reunidas as set out Section 1 of this report.*

GHD otherwise disclaims responsibility to any person other than Tecnicas Reunidas arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

2. Monitoring Well Installation

Monitoring wells MW1 and MW4 were installed by Envirotech Drilling with a Comacchio MC405 rotary drill rig by Rotary Air Blast (RAB) and down hole hammer, on Saturday 7th September 2013. The well locations are presented in Figure 1 and installation details are summarised on Table 1.

Table 1 Installation Summary

Well Number	Easting[1]	Northing[1]	Screen interval (mbgl)	Groundwater Intersection (mbgl)
MW1	477660	7719655	7.5 – 16.5	10
MW2	477787	7719227	7.5 – 13.5	8.25

[1] GDA94 MGA zone 50

Both wells were constructed with 50 mm Class 18 PVC casing, screened across the interpreted water table (groundwater intersection), and completed with lockable protective casing extending approximately 700 mm above ground level. Well construction and lithology encountered is presented in Appendix A and photographs are presented in Appendix B.

The wells were developed by airlift methods to remove introduced fluids. The development yields were low, with the southern bore, MW4, yielding approximately 0.1 L/s. The development yield of MW1 was lower and intermittent. The low yields are attributable to the low conductivity of the lithology encountered, which largely comprised clayey materials and rock (granophyre). Consequently, it was not possible to measure yields or water quality parameters during drilling.

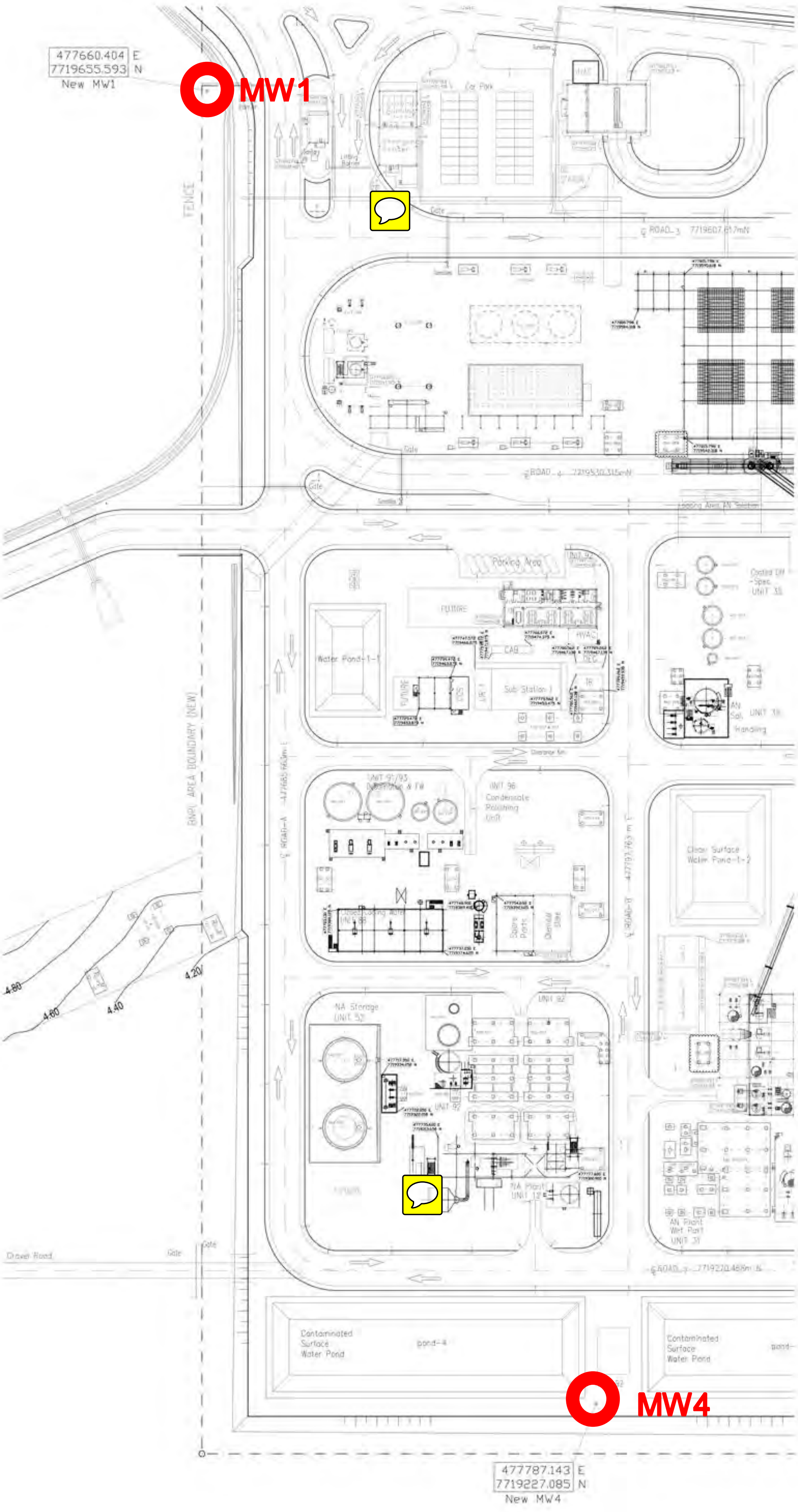


Figure 1 Well Locations

3. Conclusion

While the low yield of the wells during and after construction is a consequence of the lithology encountered, these wells will be suitable for groundwater level and quality monitoring purposes.

Appendix A – Well Logs

BOREHOLE LOG

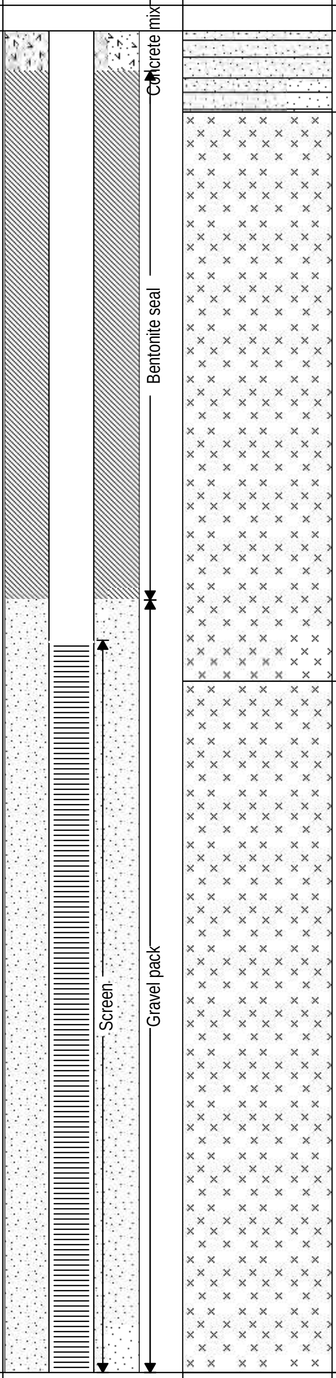
HYDROGEOLOGICAL

Bore No.: MW1

Page: 1 of 1

Client: YPNPL	Drill Co: EnviroTech	Easting: 477660
Project: Monitoring Well Installation Tan Burrup	Driller: RF	Northing: 7719655
Project No.: 6129922	Rig Type: Hydraulic Hammer	Grid Ref: GDA94_MGA_zone_50
Location: Burrup Peninsula	Total Depth (m): 16.5	Collar RL: Elevation: 0
Date Drilled: 7/09/2013 to: 7/09/2013	Diameter (mm): 90	Logged by: S Fernando Checked by:

Casing: CL18 50mm PVC Screen: CL18 50mm PVC Screen Slot Size (mm): 0.5mm



Depth (m)	Water	Piezometer Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS	Elevation / Depth (m)
				Ground Surface:		0.00
0.0				Clayey SAND Clayey sand. Grey with some fine to medium gravel fragments.	Water added due to dust	0.00 -1.00
1.0 2.0 3.0 4.0 5.0 6.0 7.0				GRANOPHYRE Rock. Recovered as fine to medium grey sandy particles.		1.00 -8.00
8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0				GRANOPHYRE Rock. Recovered as fine grey particles.		8.00 -16.50
17.0						16.50

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

RW(x)	Rotary Wash	PSC(x)	Percussion Simultanous Casing
RT(x)	Rotary Triple Tube	AS	Augering - Solid Flight
PC(x)	Percussion Cable Tool	AH	Augering - Hollow Flight
PD(x)	Percussion Down Hole	H	Hand Augering

Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

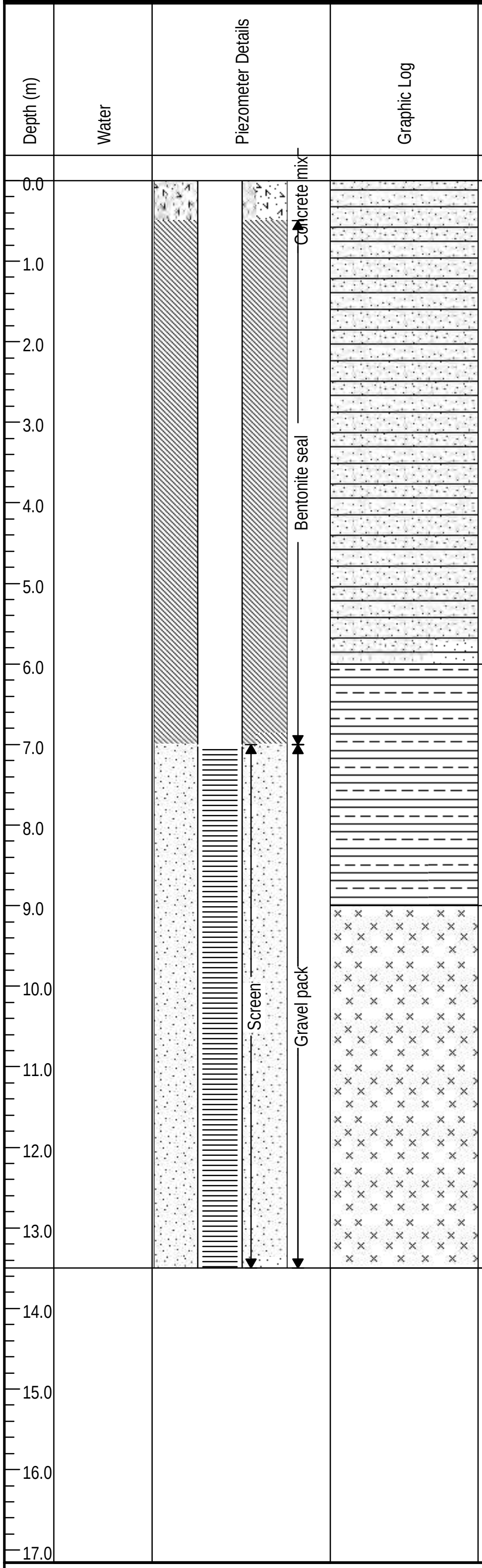
Granular Soils		Cohesive Soils	
(VL) Very Loose	(D) Dense	(VS) Very Soft	(ST) Stiff
(L) Loose	(VD) Very Dense	(S) Soft	(VST) Very Stiff
(MD) Medium Dense		(F) Firm	(H) Hard

BOREHOLE LOG
HYDROGEOLOGICAL

Bore No.: MW4
Page: 1 of 1

Client: YPNPL	Drill Co: EnviroTech	Easting: 477787
Project: Monitoring Well Installation Tan Burrup	Driller: RF	Northing: 7719227
Project No.: 6129922	Rig Type: Hydraulic Hammer	Grid Ref: GDA94_MGA_zone_50
Location: Burrup Peninsula	Total Depth (m): 13.5	Collar RL: Elevation: 0
Date Drilled: 7/09/2013 to: 7/09/2013	Diameter (mm): 90	Logged by: S Fernando Checked by:

Casing: CL18 50mm PVC   Screen: CL18 50mm PVC   Screen Slot Size (mm): 0.5mm



LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS	Elevation / Depth (m)
Ground Surface:		0.00
Clayey SAND Clayey sand. Red/brown with mid-size gravel.		0.00
Silty CLAY Silty Clay. Red brown with some sand. Minor cobbles.		-6.00 6.00
	Becoming moist	
GRANOPHYRE Rock. Recovered as fine/sandy grey particles.		-9.00 9.00
		-13.50 13.50

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:
RW(x) Rotary Wash
RT(x) Rotary Triple Tube
PC(x) Percussion Cable Tool
PD(x) Percussion Down Hole
PSC(x) Percussion Simultanous Casing
AS Augering - Solid Flight
AH Augering - Hollow Flight
H Hand Augering
Where "x" is flushing medium: (W) Water, (M) Mud, (A) Air, (F) Foam.

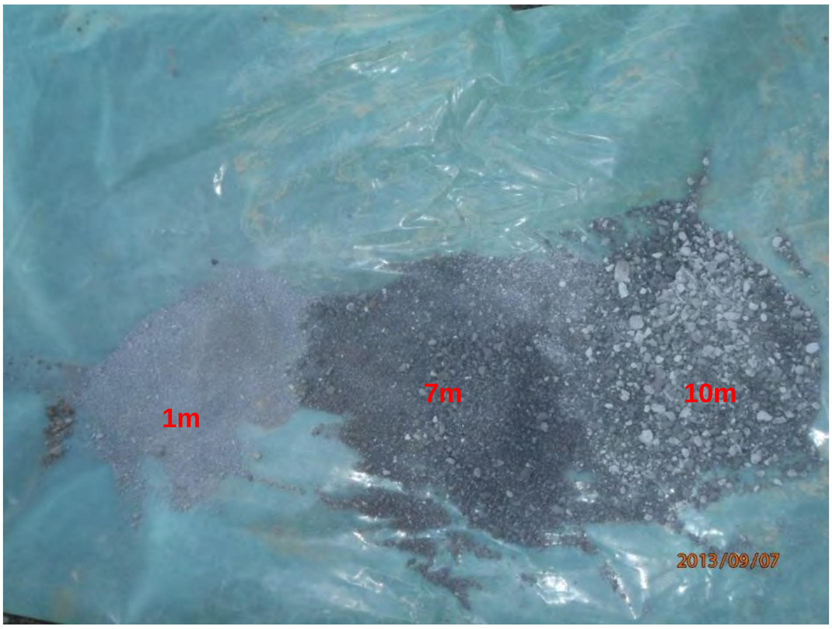
Moisture Abbreviations:
D Dry
M Moist
W Wet

Consistency:

Granular Soils
(VL) Very Loose
(L) Loose
(MD) Medium Dense
(D) Dense
(VD) Very Dense

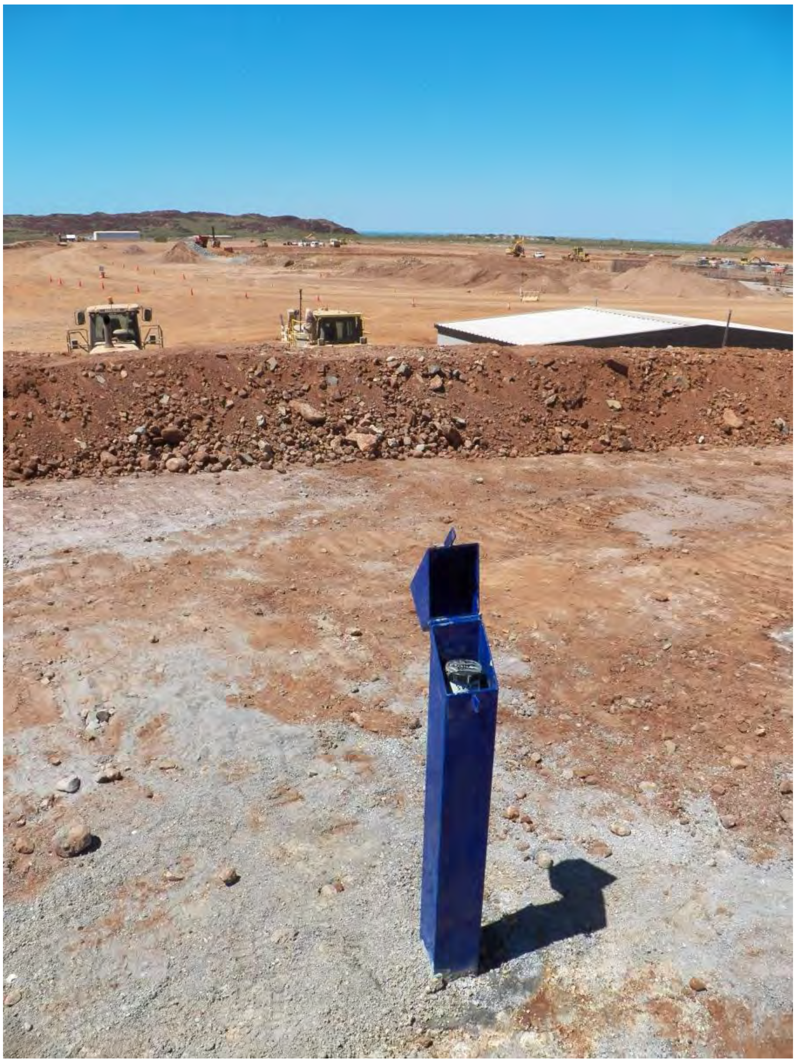
Cohesive Soils
(VS) Very Soft
(S) Soft
(F) Firm
(ST) Stiff
(VST) Very Stiff
(H) Hard

Appendix B – Site photographs



MW1

From 1 metre depth, the lithology encountered in MW1 was rock (granophyre). The photograph above shows 3 samples from depths of 1, 7, and 10 metres.



MW1


Yara Pilbara Nitrates Pty Ltd
NO ACCESS
Surrounding areas are of Aboriginal Heritage Significance
NO ACCESS BEYOND THIS FENCE LINE
Without Permission from Yara Pilbara Nitrates Pty Ltd
MUSTER POINT

MW1

2013/09/07

MW4 1 metres

MW4 2 metres


MW4 3 metres


MW4 5 metres


MW4 6 metres

MW4 9 metres

MW4 12 metres

MW4 13 metres

MW4

MW4

GHD

GHD House, 239 Adelaide Tce. Perth, WA 6004
P.O. Box 3106, Perth WA 6832
T: 61 8 6222 8222   F: 61 8 6222 8555   E: permail@ghd.com.au

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	S Fernando	C Kraut		N Dawe		11/09/2013

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Attachment 8C-1

Letter to OEPA, dated 12 December 2015, providing explanation of November 2015 Groundwater Monitoring Results.

BURRUP TAN PROJECT TEAM

To
Mark Rust
Senior Environmental Officer
Office of the Environmental Protection Authority
Locked Bag 10, East Perth
WA - 6892

Date: **21/12/2015**

Attn: Mr. Mark Rust

Subject: Report to OEPA for Groundwater Monitoring Result as per Conditions 8-4 of Ministerial Statement No. 870 for Month of November 2015.

Dear Sir,

Reference is made to Contractor's letter 02080-TRS-BNP-L-01212 dated 14 December 2015 Condition 8-4 of Ministerial Statement No. 870, requires YPNPL to sample/monitor all groundwater bores every six months as per Condition 8-3 on a biannual basis. The condition sets a trigger value of 10% above the screening contaminant concentrations as established based on the 2011 data. In accordance with Condition 8-5 of Ministerial Statement No. 870, YPNPL is required to report findings to the CEO of the OEPA within 7 days of the exceedance being identified. It is anticipated that this will be the last pre-operational groundwater monitoring event (GME) prior to the start of plant operations, planned for February 2016.

This letter is intended to inform the OEPA on the outcomes of the latest GME which was undertaken by ERM on behalf of YPNPL at the five existing bores on 23.11.2015, using the consistent sampling methodology applied for the last GMEs (i.e. peristaltic pump low –flow).

In general the results of the recent GME display similar (or even improved) conditions to those documented in the previous GMEs with several parameters having values closer to those identified at the beginning of the construction works in 2012-2013. There were fewer exceedances of the trigger values in November 2015 compared to previous events and in most cases as previously stated, these are considered to be reflective of a natural variability rather than a result of site related potential contamination sources as a result of ongoing construction activities.

More specific, in November 2015 reactive phosphorus, manganese, total nitrogen (oxidised and neutral forms), total Kjendahl nitrogen and total alkalinity were detected at concentrations slightly above trigger values. Due to high salinity of water in the sample from MW4 the detection limit for specific parameters had to be raised (dilution required) by the laboratory. It is noted that three of the seven exceedances relate to various nitrogen based parameters being identified at well MW04.

The details of the exceedances are outlined below:

Reactive Phosphorus as P

- Exceedance at MW3 – 0.021 mg/L compared to the maximum acceptable screening value of 0.011 mg/L Historical results have been below the maximum acceptable screening value with concentrations between <0.002 and 0.021 mg/L, with a previous exceedance of 0.020 mg/L in April 2015 .

Manganese (Filtered)

- Exceedance at MW4 - 0.975mg/L (value actually identified in the field duplicate QC01 of MW04) compared to the maximum acceptable screening value of 0.242 mg/L, however improved compared to Apr 2015 Historical results have been mostly below the maximum acceptable screening value with concentrations between 0.0029 and 0.277 mg/L, with the highest exceedance of 3.29 mg/L in Apr 2015.

Nitrogen (Total oxidised)

- Exceedance at MW2 – 5.44 mg/L compared to the maximum acceptable screening value of 3.63 mg/L. Historical results have been mostly below the maximum acceptable screening value with concentrations between 0.51 and 3.55 mg/L, with a previous exceedance of 4.95 mg/L in Apr 2014.

Nitrogen (Total)

- Exceedance at MW2 – 6,840 mg/L compared to the maximum acceptable screening value of 5,610 mg/L. Historical results have been consistently below the maximum acceptable screening value with concentrations between 700 and 4,960 mg/L.

Kjeldahl Nitrogen Total

- Exceedance (marginal) at MW5 – 3.05 mg/L compared to the maximum acceptable screening value of 2.97 mg/L. Historical results have been consistently general below the maximum acceptable screening value with concentrations between 0.17 and 2.7 mg/L.

Total alkalinity

- Exceedance (marginal) at MW3 - 582 mg/L compared to the maximum acceptable screening value of 561 mg/L. Historical results have been generally below the maximum acceptable screening value with concentrations between 400 and 560 mg/L and one previous exceedance of 570 mg/L in Apr 2015.

Fluoride

- Exceedance at MW03 – 1.9 mg/L compared to the maximum acceptable screening value of 1.65 mg/L. Historical results have been consistently below the maximum acceptable screening value with concentrations between <0.1 and 1,6 mg/L and a single previous exceedance of 1.7 mg/L in Apr 2014.

In general other analytes were reported at concentrations similar or lower to those recorded in the previous monitoring events. The water quality conditions at one particular well (MW4) that appeared to be different in April 2015 to previously documented levels for some parameters (including salinity, total dissolved solids (TDS), hardness, sulphate, iron, calcium) have returned to historical values, indicating that April 2015 was rather an isolated spike that could be associated with less freshwater contributing to the already hypersaline aquifer at this particular location, in the fall period.

It is noted that at based on the field measurements at well MW05, TDS values have decreased steadily since Oct 2012 (94,705 mg/L) to Nov 2015 (19,949 mg/L), a trend that could be related to additional fresh water inputs. This well is located down gradient from the TAN and therefore could be considered that the source of freshwater that decreases the salinity of the aquifer at this location may be related to construction activities (such as dust suppression water infiltrating into the ground, infiltration from onsite water evaporation ponds, etc.). However, no other parameters that could be of concern (such as heavy metals or nutrients) have increased in concentrations over time and the pH and Eh values at this location have been generally consistent over the monitoring period.

As a general note the dissolved oxygen field measurements at all five wells are as expected, during spring events and deteriorating during fall events, trend confirmed by the November 2015 data.

In conclusion, the GME November 2015 results continue to support the fact that the observed variability in the groundwater chemistry with no clear trends suggests the results depict a combination of natural variability in groundwater chemistry and off site contributions as opposed to increasing concentrations of analytes associated with site activities. Based on the current results, none of the analytes observed exceeding the trigger levels are regarded as directly attributed to current on site activities.

The full GME report is in preparation by ERM and if required by the OEPA this can be provided as further reference to the above stated facts.

Attached to this letter is the summary table showing the November 2015 groundwater monitoring results as well as well as the historical monitoring data, to enable a review of the variability of the discussed parameters over time since 2011.

Yours sincerely,

Rajan Sinha
Technical Services & Business Development Manager

Attachment: Full groundwater monitoring results

Attachment 8C-2

Groundwater monitoring results to accompany Letter Att8C.1.

Table 1. Groundwater Gauging Results and Field Parameters
YPNPL November 2015
0220651

Well ID	Gauging Date	Coord. Easting (MGA94)	Coord. Northing (MGA94)	Depth of Well (mbTOC)	Depth to Water (mbTOC)	Depth to Water (mAHD)*	DO (mg/L)	EC ($mScm^{-1}$)	pH	Eh (mV)	TEMP (ºC)	TDS (mg/L)	Method of sampling	Purge Volume (L)	Comments
Trigger value									**6.0-8.4**			**143000**			
MW1**	11-Oct-12	477747.17	7719628.2	8.72			3.78	2.30	7.09	149.60	29.8	1495	Bailer	19.0	Slightly turbid, pale grey, becoming turbid at 15L, slight light brown. Dry purged sampled upon recovery
	6-Mar-13	477747.17	7719628.2	8.74			1.82	2.66	7.26	78.50	30.7	1729	Bailer	22.5	Slighl cloudy no odour,
	17-Apr-14	477747.17	7719628.2	8.74			0.58	1.56	6.71	2.69	32.4	1016	Low flow peristaltic pump	4.0	
	17-Oct-13	477660.51	7719656.72	17.40	6.440	4.400	0.30	1.74	5.60	81.40	31.2	1131	Low flow peristaltic pump	3.5	Clear, colourless no odour
	9-Apr-14	477660.51	7719656.72	17.56	5.861	4.979	0.64	1.88	7.13	40.20	32.6	1222	Low flow peristaltic pump	2.5	Clear, no odour
	29-Oct-14	477660.51	7719656.72	17.40	6.297	4.543	1.01	2.05	7.44	-6.30	32.1	1333	Low flow peristaltic pump	1.7	Clear, no odour, the drawdown was higher than 10 cm at a flow rate of 150 ml/min
	30-Apr-15	477660.51	7719656.72	17.35	6.260	4.580	0.30	1.96	7.31	-20.40	30.2	1274	Low flow peristaltic pump	3.5	Clear, no odour
	23-Nov-15	477660.51	7719656.72	17.25	6.586	4.254	0.80	1.90	7.22	120.40	33.2	1235	Low flow peristaltic pump	5.0	Clear, no odour.
MW2	11-Oct-12	477982.18	7719632.25	8.20	4.481		2.22	4.29	7.12	142.50	29.2	2789	Bailer	24.0	Turbid, pale brown, no odour, moderate recharge, good yield
	6-Mar-13	477982.18	7719632.25	8.20	4.432		1.65	4.21	7.28	37.90	32.0	2737	Bailer	21.0	Turbid, slightly brown no odour
	17-Apr-14	477982.18	7719632.25	8.21	4.600		3.44	4.69	6.90	101.00	32.2	3049	Bailer	33.0	
	17-Oct-13	477982.18	7719632.25	8.19	5.800		1.17	3.51	5.34	158.60	29.9	2282	Low flow peristaltic pump	3.0	Clear, colourless no odour
	9-Apr-14	477982.18	7719632.25	8.21	3.906		0.49	3.10	6.98	66.90	34.7	2015	Low flow peristaltic pump	3.0	Clear, no odour
	29-Oct-14	477982.18	7719632.25	8.20	4.145		0.90	3.31	7.14	4.80	30.1	2148	Low flow peristaltic pump	1.7	Clear, no odour, good recharge, low drawdown
	30-Apr-15	477982.18	7719632.25	6.80	2.772	2.698	0.45	3.48	7.19	32.10	31.3	2262	Low flow peristaltic pump	4.0	Clear, no odour, good recharge, low drawdown
	23-Nov-15	477982.18	7719632.25	6.70	3.265	2.205	1.77	2.97	7.03	124.70	32.2	1931	Low flow peristaltic pump	7.0	Clear, no odour.
MW3	11-Oct-12	478228.57	7719614.88	8.17	2.867	1.983	2.88	14.05	7.47	75.30	28.0	9133	Bailer	44.0	Slightly turbid, grey becoming pale brown, moderate recharge
	6-Mar-13	478228.57	7719614.88	7.18	2.801	2.049	1.49	20.90	7.32	33.20	31.1	13585	Bailer	24.0	Turbid, Pale brown, no odour
	17-Apr-14	478228.57	7719614.88	8.19	3.010	1.840	1.78	17.95	7.19	27.50	31.9		Bailer	33.0	
	17-Oct-13	478228.57	7719614.88	8.17	2.020	2.830	1.75	14.70	6.17	145.90	29.3	9555	Low flow peristaltic pump	3.5	Clear, colourless no odour
	9-Apr-14	478228.57	7719614.88	8.12	2.446	2.404	1.67	16.08	7.50	73.10	29.3	10452	Low flow peristaltic pump	3.5	Clear, no odour
	29-Oct-14	478228.57	7719614.88	8.12	2.577	2.273	6.16	14.15	7.97	11.90	30.3	9198	Low flow peristaltic pump	2.3	Clear, no odour, good recharge, low drawdown
	29-Apr-15	478228.57	7719614.88	8.18	2.854	1.996	0.33	12.74	7.36	-6.50	31.6	8281	Low flow peristaltic pump	3.0	Clear, no odour, good recharge, low drawdown
	23-Nov-15	478228.57	7719614.88	8.10	3.156	1.694	1.75	13.56	7.31	-29.50	30.9	8814	Low flow peristaltic pump	9.0	Clear, no odour.
MW4**	11-Oct-12	47717.79	7719296.04	4.64	1.519		2.06	126.60	7.66	123.20	28.7	82290	Bailer	24.0	Highly turbid, silty, orange, no odour, fast recharge
	6-Mar-13	47717.79	7719296.04	7.21	3.949		-	-	-	-	-	-	-	-	Unable to be sampled due to curve in PVC Pipe extension
	17-Apr-14	47717.79	7719296.04	7.35	4.070		0.13	67.40	7.17	15.72	33.9	43810	Low flow peristaltic pump	2.5	Turbid, red brown
	17-Oct-13	477794.2	7719237.25	14.40	3.820	2.480	1.99	124.40	4.32	135.00	31.0	80860	Low flow peristaltic pump	4.5	Clear, colourless no odour
	9-Apr-14	477794.2	7719237.25	14.53	3.840	2.460	1.30	118.10	6.99	62.90	33.0	76765	Low flow peristaltic pump	3.0	Clear, no odour
	29-Oct-14	477794.2	7719237.25	13.96	4.265	2.035	3.56	68.90	7.15	41.80	31.5	44785	Low flow peristaltic pump	2.0	clear, no odour, good reacharge, well head partially damaged
	30-Apr-15	477794.2	7719237.25	13.94	4.220	2.080	0.07	168.20	6.81	11.40	30.1	109330	Low flow peristaltic pump	6.0	slghtly cloudy, some supended solids, no odour, good recharge
	23-Nov-15	477794.2	7719237.25	14.90	4.389	1.911	0.43	139.40	6.80	79.30	32.0	90610	Low flow peristaltic pump	7.0	Clear, no odour.
MW5	11-Oct-12	477976.98	7719306.26	5.01	1.054	5.636	1.73	145.70	6.90	193.20	29.3	94705	Bailer	24.0	Slightly turbid, pale brown, no odour, recharge becoming turbid, red-brown
	6-Mar-13	25-Aug-08	7719306.26	5.07	0.905	5.785	0.99	141.20	6.84	135.90	34.3	91780	Bailer	24.0	Turbid, cream to pale colour, no odour
	17-Apr-14	25-Aug-08	7719306.26	5.97	2.020	4.670	2.24	147.30	6.77	210.70	34.4	95745	Bailer	33.0	
	17-Oct-13	25-Aug-08	7719306.26	8.95	4.530	2.160	0.51	104.00	6.21	125.60	30.3	67600	Low flow peristaltic pump	5.5	Clear, no odour
	9-Apr-14	477976.98	7719306.26	9.01	4.415	2.275	1.03	70.80	7.08	69.20	32.0	46020	Low flow peristaltic pump	2.5	Clear, no odour
	28-Oct-14	477976.98	7719306.26	9.00	4.505	2.185	0.78	69.70	7.24	46.00	31.6	45305	Low flow peristaltic pump	1.1	clear, no odour, good recharge
	29-Apr-15	477976.98	7719306.26	9.00	4.470	2.220	0.17	44.78	7.25	-20.30	30.0	29107	Low flow peristaltic pump	3.0	slightly cloudy, some solids in suspension, no doour, good recharge
	23-Nov-15	477976.98	7719306.26	8.96	4.756	1.934	0.90	30.69	7.37	54.00	31.4	19949	Low flow peristaltic pump	7.0	Slightly cloudy, no odour.

Notes:
**MW1 and MW4 Were Replaced in September 2013
* Calculations based on data from April 2015 survey (Handley surveyors)

Table 2 Groundwater Anaytical Results - BTEX, PAH and TRH
YPNPL November 2015
0220651

LocCode	Sampled_Date-Time	BTEX								PAH	TPH										
		Benzene	Ethylbenzene	Toluene	Total BTEX	Xylene (m & p)	Xylene (o)	Xylene Total	C6-C10 less BTEX (F1)	Naphthalene	C10-C16	C16-C34	C34-C40	F2-NAPHTHALENE	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	C6-C10
		µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
EQL		1	2	2	0.001	2	2	2	0.02	5	0.1	0.1	0.1	0.1	20	50	100	50	50	100	0.02
Trigger Values (Max Baseline + 10%)																					
MW1	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	<40	<50	<200	<200	<450	-	-
	17/10/2013	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	9/04/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	30/10/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	30/04/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	23/11/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
MW2	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	<40	<50	<200	<200	<450	-	-
	17/10/2013	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	9/04/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	29/10/2014	<1	<2	<2	<0.002	<2	<2	<2	<0.03	<6	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.03
	30/04/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	23/11/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
MW3	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	<40	<50	<200	<200	<450	-	-
	17/10/2013	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	9/04/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	29/10/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	29/04/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	23/11/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
MW4	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	<40	<50	<200	<200	<450	-	-
	17/10/2013	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	9/04/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	30/10/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	30/04/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	23/11/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
MW5	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	<40	81	<200	<200	281	-	-
	17/10/2013	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	9/04/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	30/10/2014	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	29/04/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02
	23/11/2015	<1	<2	<2	<0.001	<2	<2	<2	<0.02	<5	<0.1	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02

Table 3 Groundwater Anaytical Results - Inorganics and Metals
YPNPL November 2015
0220651

		Inorganics																					
		Alkalinity (Bicarbonate as CaCO3)	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Cations Total	Chloride	Fluoride	Hydrogen sulfide	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrite (as NO2-)	Nitrogen (Total Oxidised)	Nitrogen (Total)	Reactive Phosphorus as P	Sodium (Filtered)	Sulphate as SO4	Sulphide	TDS	Hardness as CaCO3 (Filtered)	TSS
		mg/L	mg/L	µg/L	meq/L	meq/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		1	1	5	0.01	0.01	1	0.1	0.5	-100	0.05	0.002	0.002	0.05	0.002	50	0.001	0.5	1	0.1	10	1	5
Trigger Values (Max Baseline + 10%)**			561	40	-	-	95,700	1.65	N/A	-	2.97	9.67	N/A	-	3.63	5610	0.011	62,700	5720	N/A	143,000	20,900	2090
LocCode	**Sampled_Date-Time**																						
MW1	30/04/2011	-	350	38	-	-	780	-	<0.5	-	-	1.7	<0.005	-	1.7	2500	<0.002	350	170	-	2000	-	-
	20/09/2011	-	320	18	-	-	710	0.4	-	-6	0.28	-	-	-	3.1	3400	0.008	300	150	<0.5	-	-	180
	27/02/2012	-	300	<5	-	-	670	0.5	-	-	0.17	2	<0.005	<0.05	2	2100	<0.002	340	140	<0.5	-	-	220
	11/10/2012	-	300	53	-	-	600	0.4	-	1	0.49	1.1	<0.005	<0.05	1.1	1500	0.003	290	100	<0.5	-	-	520
	6/03/2013	-	300	15	-	-	570	0.5	<0.5	-	0.14	1.9	0.025	0.08	1.9	2000	0.003	280	100	<0.5	-	-	2900
	17/04/2013	-	290	<5	-	-	560	0.4	-	-	0.15	2.2	0.022	0.07	2.2	2400	0.004	270	120	<0.5	-	-	16
	17/10/2013	367	367	32	17.2	17.5	300	0.8	-	0.87	0.15	0.086	<0.002	-	0.086	240	0.007	265	-	<0.1	940	284	25
	9/04/2014	358	358	114	18.1	17.3	345	0.8	-	2.42	0.49	1.6	0.004	-	1.6	2090	0.006	267	59	<0.1	995	270	<5
	30/10/2014	361	361	<5	19.1	17.1	366	0.6	-	5.42	2.46	0.162	<0.002	-	0.162	2620	0.018	226	75	<0.1	981	352	<5
	30/04/2015	272	272	31	18.5	18.8	374	0.6	<0.1	0.79	0.72	2.24	0.079	-	2.32	3040	0.014	258	119	<0.1	1010	366	<5
	23/11/2015	**316**	**316**	**<5**	**19.6**	**17.8**	**394**	**0.8**	**<0.1**	**4.68**	**<0.05**	**0.248**	**0.003**	**-**	**0.251**	**260**	**0.01**	**229**	**103**	**<0.1**	**1110**	**381**	**<5**
MW2	30/04/2011	-	280	200	-	-	930	-	<0.5	-	-	3.3	<0.005	-	3.3	3900	0.004	570	170	-	2000	-	-
	20/09/2011	-	290	<5	-	-	1200	0.6	-	-3	0.2	-	-	-	1.2	1400	0.004	610	210	<0.5	-	-	190
	27/02/2012	-	300	30	-	-	1400	0.7	-	-	0.26	0.62	<0.005	<0.05	0.62	880	<0.002	1000	220	<0.5	-	-	84
	11/10/2012	-	370	<5	-	-	1300	0.5	-	-5	0.51	0.63	<0.005	<0.05	0.63	1100	<0.002	600	180	<0.5	-	-	440
	6/03/2013	-	360	<5	-	-	1000	0.6	<0.5	-	0.1	0.6	<0.005	<0.05	0.6	700	<0.002	580	170	<0.5	-	-	320
	17/10/2013	281	281	<5	31.7	34.4	811	0.6	-	3.95	0.42	2.28	<0.002	-	2.28	2700	0.003	507	-	<0.1	2040	593	10
	17/04/2013	-	340	<5	-	-	1100	0.6	-	-	0.21	0.51	<0.005	<0.05	0.51	720	0.003	610	200	<0.5	-	-	290
	9/04/2014	250	250	<5	28.4	28.8	730	0.8	-	0.7	<0.05	4.94	0.007	-	4.95	4960	0.007	463	135	<0.1	1550	412	<5
	29/10/2014	276	276	<5	30.1	27	771	0.6	-	5.54	0.23	2.49	<0.002	-	2.49	2720	0.01	376	138	<0.1	1650	508	<5
	30/04/2015	304	304	17	30.8	32.2	758	0.6	<0.1	2.16	0.8	3.55	<0.002	-	3.55	4350	0.008	487	163	<0.1	1720	529	<5
	23/11/2015	**292**	**292**	**<5**	**29.1**	**27.4**	**692**	**0.7**	**<0.1**	**2.91**	**1.4**	**5.44**	**<0.002**	**-**	5.44	6840	**0.006**	**405**	**180**	**<0.1**	**1680**	**469**	**<5**
MW3	30/04/2011	-	400	54	-	-	5400	-	<0.5	-	-	1.9	<0.005	-	1.9	2600	0.003	3400	800	-	9800	-	-
	20/09/2011	-	450	57	-	-	3700	1.4	-	2	0.18	-	-	-	0.033	220	0.006	2500	810	<0.5	-	-	280
	27/02/2012	-	460	<5	-	-	4000	1.5	-	-	0.29	0.32	<0.005	<0.05	0.32	610	<0.002	3200	940	<0.5	-	-	230
	11/10/2012	-	540	12	-	-	4200	<0.1	-	3	0.22	0.12	<0.005	<0.05	0.12	330	0.003	2800	710	<0.5	-	-	270
	6/03/2013	-	470	<5	-	-	5900	1.4	<0.5	-	0.16	0.26	<0.005	<0.05	0.26	420	0.003	3500	670	<0.5	-	-	180
	17/04/2013	-	560	770	-	-	28,000	1	-	-	1.5	0.031	<0.005	<0.05	0.031	1500	0.006	8000	1400	<0.5	-	-	470
	17/10/2013	479	479	<5	111	121	3140	1.6	-	4.37	<0.05	0.611	0.002	-	0.613	530	<0.001	2180	-	<0.1	7280	1180	54
	9/04/2014	466	466	<5	164	164	5000	1.7	-	0.14	0.35	0.464	0.029	-	0.493	840	0.009	3050	647	<0.1	9050	1440	6
	29/10/2014	533	533	<5	120	112	3480	1.4	-	3.6	0.22	0.175	<0.002	-	0.175	400	0.021	2060	537	<0.1	6520	977	<5
	29/04/2015	570	570	19	128	124	3780	1.3	<0.1	1.64	0.88	2.37	0.008	-	2.38	3260	0.02	2300	475	<0.1	7020	1040	<5
	23/11/2015	**582**	582	**10**	**135**	**118**	**3980**	1.9	**<0.1**	**6.9**	**1.33**	**2.03**	**0.002**	**-**	**2.03**	**3360**	**0.021**	**2140**	**548**	**<0.1**	**7620**	**1080**	**<5**
MW4	30/04/2011	-	510	740	-	-	3900	-	<0.5	-	-	0.82	<0.005	-	0.82	2100	0.008	2700	350	-	6700	-	-
	21/09/2011	-	370	18	-	-	2500	0.7	-	1	0.31	-	-	-	0.24	540	0.009	1800	280	<0.5	-	-	670
	28/02/2012	-	390	<5	-	-	3200	0.6	-	-	0.59	0.17	<0.005	<0.05	0.17	760	0.007	2700	410	<0.5	-	-	1900
	11/10/2012	-	420	<5	-	-	3700	0.4	-	1	0.72	0.44	<0.005	<0.05	0.44	1200	0.007	2400	380	<0.5	-	-	2900
	17/04/2013	-	390	<5	-	-	4700	0.4	-	-	0.49	0.24	<0.005	<0.05	0.24	730	0.01	2600	440	<0.5	-	-	210
	17/10/2013	109	109	877	2090	2390	69,800	0.3	-	6.66	0.71	2.89	<0.002	-	2.89	3600	<0.001	45,400	3540	<0.1	136,000	18,500	74
	9/04/2014	148	148	14	1460	1620	49,000	0.4	-	5.39	3.8	4.07	<0.002	-	4.07	7870	<0.001	31,800	2290	<0.1	88,300	10,600	43
	29/10/2014	317	317	<5	779	724	25,700	0.4	-	3.65	0.99	2.17	<0.002	-	2.17	3160	0.009	14,200	-	<0.1	41,000	4410	14
	30/04/2015	118	118	<5	2480	2680	83,600	0.2	<0.1	3.7	<0.05	0.441	<0.002	-	0.441	410	0.004	50,400	5960	<0.1	134,000	21700	201
	23/11/2015	**203**	**203**	**<5**	**2120**	**2240**	**72,200**	**0.3**	**<0.1**	**2.71**	**0.22**	**1.21**	**<0.002**	**-**	**1.21**	**1430**	**0.009**	**41,600**	**4070**	**<0.1**	**128,000**	**18,800**	**133**
MW5	29/04/2015	-	370	56	-	-	87,000	-	<0.5	-	-	1.1	<0.005	-	1.1	5100	0.007	48,000	5200	-	130,000	-	-
	21/09/2011	-	210	47	-	-	87,000	0.3	-	0	2.7	-	-	-	0.02	2700	0.01	48,000	4100	<0.5	-	-	1100
	28/02/2012	-	150	<5	-	-	80,000	0.4	-	-	2.2	1.2	<0.005	<0.05	1.2	3400	0.006	57,000	4400	<0.5	-	-	1400
	11/10/2012	-	160	620	-	-	77,000	0.3	-	-4	0.72	1.1	<0.005	<0.05	1.1	1800	0.005	39,000	3500	<0.5	-	-	2600
	6/03/2013	-	170	1000	-	-	64,000	0.4	<0.5	-	2.1	1.3	<0.005	<0.05	1.3	3400	0.007	36,000	3800	<0.5	-	-	660
	17/04/2013	-	170	<5	-	-	58,000	0.4	-	-	1	1.6	<0.005	<0.05	1.6	2600	0.014	33,000	3300	<0.5	-	-	1600
	17/10/2013	207	207	<5	1210	1340	40,500	0.6	-	5.06	0.17	3.29	<0.002	-	3.29	3460	0.005	25,700	-	<0.1	75,400	9860	63
	9/04/2014	275	275	18	774	799	25,700	0.8	-	1.54	2.63	1.54	<0.002	-	1.54	4170	0.002	15,600	2110	<0.1	47,100	5040	78
	30/10/2014	351	351	<5	623	584	20,500	0.6	-	3.22	0.32	1.02	<0.002	-	1.02	1340	0.013	11,600	1800	<0.1	33,200	3220	<5
	29/04/2015	397	397	20	499	531	16,300	0.6	<0.1	3.09	0.88	0.995	<0.002	-	0.995	1870	0.016	10,900	1510	<0.1	25,400	2260	154
	23/11/2015	**99**	**638**	**15**	**337**	**298**	**10,600**	**0.9**	**<0.1**	**6.12**	**3.05**	**1.44**	**0.005**	**-**	**1.44**	**4490**	**0.003**	**6,220**	**1200**	**<0.1**	**19,400**	**956**	119

Legend 🟨 🟦 shaded blue indicated implied exceedance of trigger value

-	Trigger value not established
N/A	Trigger value NA – Not Available. There are a number of metals for which results have shown concentrations below the laboratory detection limits (Arsenic, Cadmium, Copper, Chromium, Lead and Nickel), and so a reliable trigger level has not been able to be determined in the Constrcution Water Quality Management Plan.
**	As listed in the Water Quality Management Plan, - part of the Construction Environmental Management Plan - 2-250-329-PRO-TRE-0111-att02
	The values from the last GME April 2015 are highlighted in bold
*	in the November 2015 dataset, specific concentration values are adopted from the field duplicate of primary sample MW04, if identified to be higher, as a conservative measure for assessment

Table 3 Groundwater Anaytical Results - Inorganics and Metals
YPNPL November 2015
0220651

		Metals																					
		Lead (Filtered)	Aluminium	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (hexavalent)	Chromium IV (Filtered)	Chromium (III+VI) (Filtered)	Chromium III (Filtered)	Copper (Filtered)	Iron	Iron (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury	Nickel (Filtered)	Phosphorus	Potassium (Filtered)	Selenium (Filtered)	Silicon (Filtered)	Zinc (Filtered)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L
EQL		0.0001	0.005	0.001	0.0002	0.00005	0.2	0.002	0.001	0.0002	0.001	0.0005	0.005	0.002	0.1	0.0005	0.00005	0.0005	0.005	0.1	0.0002	20	0.001
Trigger Values (Max Baseline + 10%)		N/A	-	0.0209	N/A	N/A	1210	N/A	N/A	N/A	N/A	N/A	143	0.264	5170	0.242	0.0001	N/A	0.869	2310	-		0.052
LocCode	**Sampled_Date-Tim**																						
MW1	30/04/2011	<0.001	-	0.01	<0.001	<0.0001	200	<0.002	-	<0.001	-	-	-	0.008	63	0.17	<0.00005	-	0.06	10	<0.002	14,000	0.016
	20/09/2011	-	1.8	0.002	<0.001	<0.0001	170	-	-	<0.001	-	-	1.8	<0.005	54	0.046	-	<0.001	0.05	7.9	<0.002	13,000	0.027
	27/02/2012	-	3.6	0.002	<0.001	<0.0001	180	-	-	<0.001	-	-	4.2	<0.005	53	0.088	-	<0.001	0.08	7.7	<0.002	-	0.038
	11/10/2012	-	21	0.005	<0.001	<0.0001	170	-	-	<0.001	-	-	30	0.009	51	0.038	-	<0.001	10	8.6	<0.002	-	0.008
	6/03/2013	-	10	<0.005	<0.001	<0.0001	160	-	-	<0.001	-	-	14	<0.005	49	0.17	-	<0.001	<0.01	8.2	<0.002	15,000	0.01
	17/04/2013	<0.001	0.33	<0.005	<0.001	0.0004	160	-	-	<0.001	-	0.001	0.39	<0.005	49	0.087	-	<0.001	0.02	8.2	<0.002	16,000	0.01
	17/10/2013	<0.0001	0.38	0.006	0.0008	<0.00005	66	-	<0.001	<0.0002	<0.001	<0.0005	1.47	0.437	29	0.425	<0.0001	0.001	0.015	13	0.0005	14,800	0.005
	9/04/2014	<0.0001	0.06	<0.005	0.0008	<0.00005	57	-	<0.001	<0.0002	<0.001	<0.0005	0.57	0.43	31	0.272	<0.0001	<0.0005	0.049	10	0.001	17,500	<0.001
	30/10/2014	<0.0001	0.03	0.018	0.0006	<0.00005	88	-	<0.001	<0.0002	<0.001	<0.0005	0.33	0.052	32	0.204	<0.0001	0.0008	0.034	11	0.0006	17,100	0.009
	30/04/2015	<0.0001	0.09	0.006	0.0004	<0.00005	92	<0.001	<0.001	<0.0002	<0.0001	0.0005	0.32	0.044	33	0.08	<0.0001	0.0007	0.046	9	0.001	18000	0.003
	23/11/2015	**<0.0002**	**1.37**	**0.006**	**0.0008**	**<0.0001**	**98**	**<0.001**	**-**	**<0.0005**	**<0.001**	**<0.001**	**0.42**	**<0.005**	**33**	**0.0087**	**<0.0001**	**0.001**	**0.023**	**10**	**<0.002**	**21,100**	**<0.005**
MW2	30/04/2011	<0.001	-	0.005	<0.001	<0.0001	99	<0.002	-	<0.001	-	-	-	<0.005	66	<0.005 - 0.005	<0.00005	-	0.09	19	0.003	12,000	0.013
	20/09/2011	-	4.2	0.002	<0.001	<0.0001	150	-	-	<0.001	-	-	6	<0.005	98	0.001	-	<0.001	0.06	20	<0.002	11,000	0.021
	27/02/2012	-	3.6	0.005	<0.001	<0.0001	240	-	-	<0.001	-	-	4.6	0.24	140	0.22	-	<0.001	0.03	24	<0.002	-	0.047
	11/10/2012	-	9.2	0.002	<0.001	<0.0001	160	-	-	<0.001	-	-	12	<0.005	94	0.01	-	<0.001	0.17	21	<0.002	-	0.021
	6/03/2013	-	10	0.006	<0.001	<0.0001	150	-	-	<0.001	-	-	15	<0.005	87	0.012	-	<0.001	<0.01	21	<0.002	13,000	0.017
	17/10/2013	<0.0001	0.04	<0.005	<0.0002	<0.00005	112	-	<0.001	<0.0002	<0.001	<0.0005	0.06	<0.002	76	<0.0005	<0.0001	<0.0005	0.008	18	0.0031	10,600	<0.001
	17/04/2013	<0.001	3.5	<0.005	<0.001	0.0003	160	-	-	<0.001	-	<0.001	5.2	<0.005	100	0.012	-	<0.001	0.1	23	<0.002	13,000	0.012
	9/04/2014	<0.0001	0.02	<0.005	<0.0002	<0.00005	71	-	<0.001	<0.0002	<0.001	<0.0005	<0.05	<0.002	57	0.0009	<0.0001	<0.0005	0.032	17	0.0011	11,700	<0.001
	29/10/2014	<0.0001	0.01	0.017	<0.0002	<0.00005	98	-	<0.001	<0.0002	<0.001	<0.0005	<0.05	<0.002	64	0.0024	<0.0001	<0.0005	0.039	18	0.0016	10,800	0.006
	30/04/2015	0.0001	0.1	<0.005	0.0002	<0.00005	103	<0.001	<0.002	<0.0002	<0.0001	0.0015	0.14	0.004	66	0.001	<0.0001	0.0005	0.019	18	0.0025	13,900	0.021
	23/11/2015	**<0.0002**	**0.02**	**<0.005**	**<0.0005**	**<0.0001**	**94**	**<0.001**	**-**	**<0.0005**	**<0.001**	**<0.001**	**<0.05**	**<0.005**	**57**	**<0.0005**	**<0.0001**	**<0.0005**	**0.01**	**18**	**0.004**	**14,400**	**<0.005**
MW3	30/04/2011	<0.005	-	0.013	<0.005	<0.0005	120	<0.002	-	<0.005	-	-	-	<0.025	300	0.02 - 0.022	<0.00005	-	0.16	130	<0.01	16,000	0.02
	20/09/2011	-	5.8	0.019	<0.005	<0.0005	85	-	-	<0.005	-	-	7.4	<0.025	210	0.014	-	<0.005	0.05	90	<0.01	15,000	0.047
	27/02/2012	-	6.5	0.005	<0.005	<0.0005	95	-	-	<0.005	-	-	6.8	<0.025	210	0.026	-	<0.005	0.05	120	<0.01	-	0.032
	11/10/2012	-	5	<0.01	<0.01	<0.001	100	-	-	<0.01	-	-	5.8	<0.05	260	0.027	-	<0.01	0.06	120	<0.02	-	0.031
	6/03/2013	-	5.8	<0.025	<0.005	<0.0005	130	-	-	<0.005	-	-	6.3	<0.025	340	0.018	-	<0.005	1.6	130	<0.01	17,000	<0.025
	17/04/2013	<0.01	14	0.072	<0.01	<0.001	350	-	-	<0.01	-	<0.01	21	0.52	910	1.7	-	<0.01	0.16	340	<0.02	14,000	<0.05
	17/10/2013	<0.0001	<0.01	0.021	0.0008	<0.00005	91	-	<0.001	<0.0002	<0.001	0.0005	<0.05	0.01	232	0.0038	<0.0001	0.0006	<0.005	97	0.0038	17,400	<0.001
	9/04/2014	<0.0001	0.02	<0.005	0.001	<0.00005	104	-	<0.001	<0.0002	<0.001	0.0017	<0.05	<0.002	286	0.0133	<0.0001	<0.0005	0.044	115	0.0035	16,600	<0.001
	29/10/2014	<0.0001	0.03	0.024	0.0014	<0.00005	68	-	<0.001	0.0004	<0.001	0.0014	<0.05	0.005	196	0.002	<0.0001	0.0012	0.038	100	0.0024	17,100	0.025
	29/04/2015	<0.0001	0.03	<0.005	0.0009	<0.00005	75	<0.010	-	0.0003	0.0003	0.0006	<0.05	<0.002	208	0.0131	<0.0001	<0.0005	0.025	114	0.0032	19800	0.003
	23/11/2015	**<0.0002**	**0.04**	**0.013**	**0.0013**	**<0.0001**	**78**	**<0.001**	**-**	**<0.0005**	**<0.001**	**0.002**	**0.08**	**0.055**	**214**	**0.102**	**<0.0001**	**<0.0005**	**0.02**	**129**	**0.003**	**22,000**	**0.012**
MW4	30/04/2011	<0.005	-	<0.005	<0.005	<0.0005	39	<0.002	-	<0.005	-	-	-	<0.025	100	0.013 - 0.014	<0.00005	-	0.79	110	<0.01	8700	0.01
	21/09/2011	-	21	<0.005	<0.005	<0.0005	28	-	-	<0.005	-	-	31	<0.025	68	0.011	-	<0.005	0.14	69	<0.01	7500	0.029
	28/02/2012	-	82	<0.005	<0.005	<0.0005	49	-	-	<0.005	-	-	130	<0.025	96	0.033	-	<0.005	0.48	110	<0.01	-	0.047
	11/10/2012	-	65	<0.01	<0.01	<0.001	69	-	-	<0.01	-	-	130	<0.05	150	0.041	-	<0.01	0.54	110	<0.02	-	0.012
	17/04/2013	<0.005	4.4	0.031	<0.005	<0.0005	94	-	-	<0.005	-	<0.005	7.4	<0.025	190	0.12	-	<0.005	0.05	120	<0.01	11,000	<0.025
	17/10/2013	<0.001	1.33	<0.025	<0.0025	<0.001	972	-	<0.01	<0.0025	<0.02	0.005	1.63	<0.025	3900	0.277	<0.0001	0.0479	0.014	1640	<0.01	7380	<0.025
	9/04/2014	<0.001	0.17	<0.025		<0.001	598	-	<0.001	<0.0025	<0.001	<0.005	<0.5	0.034	2210	0.0029	<0.0001	0.035	<0.005	1200	<0.01	7400	0.042
	29/10/2014	<0.0004	0.66	0.013	0.0022	<0.0004	248	-	0.002	0.0018	<0.001	<0.002	1.02	0.019	921	0.0746	<0.0001	0.021	0.078	724	<0.004	5820	0.042
	30/04/2015	<0.001	4.8	<0.025	<0.0025	<0.001	1120	<0.010	-	0.004	0.004	<0.005	6.76	<0.025	4590	3.29	<0.0001	0.037	<0.005	1970	<0.01	6670	<0.025
	23/11/2015	**0.0002***	**3.4***	**<0.005**	**0.002***	**0.0005**	**1020**	**0.005***	**-**	**0.0051***	**<0.001**	**0.003**	**4.71***	**<0.005**	**3960**	**0.975***	**<0.0001**	**0.034**	**0.047***	**2270**	**0.004**	**6850***	**0.006***
MW5	29/04/2015	<0.05	-	<0.05	<0.05	<0.005	1000	0.01	-	<0.05	-	-	-	<0.25	4100	0.2 - 0.22	0.00011	-	0.11	1900	<0.1	4900	<0.05
	21/09/2011	-	11	<0.1	<0.1	<0.01	1100	-	-	<0.1	-	-	12	<0.5	4300	<0.1	-	<0.1	0.04	1700	<0.2	4600	<0.1
	28/02/2012	-	18	<0.1	<0.1	<0.01	1100	-	-	<0.1	-	-	25	<0.5	4700	<0.1	-	<0.1	0.21	2100	<0.2	-	<0.1
	11/10/2012	-	31	<0.05	<0.05	<0.005	970	-	-	<0.05	-	-	37	<0.25	3700	<0.05	-	<0.05	<0.01	1700	<0.1	-	<0.05
	6/03/2013	-	16	<0.25	<0.05	<0.005	770	-	-	<0.05	-	-	18	<0.25	3000	<0.05	-	<0.05	0.04	1500	<0.1	5900	<0.25
	17/04/2013	<0.05	33	0.3	<0.05	<0.005	740	-	-	<0.05	-	<0.05	44	<0.25	2900	<0.05	-	<0.05	0.16	1400	<0.1	6000	<0.25
	17/10/2013	<0.0004	0.74	<0.01	0.0013	<0.0004	599	-	<0.01	<0.01 - 0.01	<0.01	<0.002	0.8	<0.01	2030	0.0013	<0.0001	0.0073	0.011	988	<0.004	6060	<0.01
	9/04/2014	<0.0004	1.02	0.086	<0.001	<0.0004	303	-	<0.002	0.01 - 0.007	<0.001	<0.002	1.13	0.015	1040	0.0026	<0.0001	0.0032	<0.005	767	<0.004	6940	0.017
	30/10/2014	<0.0002	<0.05	<0.005	0.0017	<0.0002	194	-	0.006	0.0065	<0.001	<0.001	<0.25	0.01	665	0.0016	<0.0001	0.0024	0.082	590	0.003	7040	<0.005
	29/04/2015	<0.0002	3.61	<0.005	0.0008	<0.0002	139	<0.010	-	0.003	0.003	0.002	4.8	0.007	464	0.005	<0.0001	0.0018	0.023	467	<0.002	8290	0.02
	23/11/2015	**<0.0002**	**0.5**	**<0.005**	**0.0006**	**<0.0001**	**20**	**0.003**	**-**	**0.004**	**0.001**	**<0.001**	**0.59**	**<0.005**	**220**	**0.0016**	**<0.0001**	**0.0014**	**0.012**	**328**	**<0.002**	**8020**	**<0.005**

Legend

-	Trigger value not established
N/A	Trigger value NA – Not Available. There are a number of metals for which results have shown concentrations below the laboratory detection limits (Arsenic, Cadmium, Copper, Chromium, Lead and Nickel), and so a reliable trigger level has not been able to be determined in the Constrcution Water Quality Management Plan.
**	As listed in the Water Quality Management Plan, - part of the Construction Environmental Management Plan - 2-250-329-PRO-TRE-0111-att02
*	The values from the last GME April 2015 are highlighted in bold in the November 2015 dataset, specific concentration values are adopted from the field duplicate of primary sample MW04, if identified to be higher, as a conservative measure for assessment

Field Duplicates (WATER)
Filter: SDG in('EP1516256')

			SDG	EP1516256	EP1516256	**RPD**
			Field_ID	MW04	QC01_231115	
			Sampled_Date-Time	23/11/2015	23/11/2015	
			Sample Type	Duplicate		
Chem_Group	**ChemName**	**Units**	**LOR**			
	Silicon as SiO2 (Filtered)	mg/l	0.1	14.5	14.7	1
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/l	1	4070.0	4190.0	3
	Unionized Hydrogen Sulfide	mg/l	0.1	<0.1	<0.1	0
BTEX	Benzene	µg/L	1	<1.0	<1.0	0
	Ethylbenzene	µg/L	2	<2.0	<2.0	0
	Toluene	µg/L	2	<2.0	<2.0	0
	Total BTEX	mg/l	0.001	<0.001	<0.001	0
	Xylene (m & p)	µg/L	2	<2.0	<2.0	0
	Xylene (o)	µg/L	2	<2.0	<2.0	0
	Xylene Total	µg/L	2	<2.0	<2.0	0
	C6-C10 less BTEX (F1)	mg/l	0.02	<0.02	<0.02	0
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/l	1	203.0	179.0	13
	Alkalinity (Carbonate as CaCO3)	mg/l	1	<1.0	<1.0	0
	Alkalinity (Hydroxide) as CaCO3	µg/l	1000	<1000.0	<1000.0	NA
	Alkalinity (total) as CaCO3	mg/l	1	203.0	179.0	13
	Ammonia as N	µg/l	5	<5.0	7.0	**33**
	Anions Total	meq/L	0.01	2120.0	2190.0	3
	Cations Total	meq/L	0.01	2240.0	1970.0	13
	Chloride	mg/l	1	72200.0	74400.0	3
	Fluoride	mg/l	0.1	0.3	0.3	0
	Kjeldahl Nitrogen Total	mg/l	0.05	**0.22**	**0.51**	**79**
	Nitrate (as N)	mg/l	0.002	1.21	0.989	20
	Nitrite (as N)	mg/l	0.002	<0.002	0.002	NA
	Nitrogen (Total Oxidised)	mg/l	0.002	1.21	0.991	20
	Nitrogen (Total)	µg/l	50	1430.0	1500.0	5
	Reactive Phosphorus as P	mg/l	0.001	0.009	0.008	12
	Sodium (Filtered)	mg/l	1	41600.0	36300.0	14
	Sulphide	mg/l	0.1	<0.1	<0.1	NA
	TDS	mg/l	10	128000.0	129000.0	1
	Hardness as CaCO3 (Filtered)	mg/l	1	18800.0	17200.0	9
	TSS	mg/l	5	133.0	143.0	7
Lead	Lead (Filtered)	mg/l	0.0002	<0.0002	0.0002	NA
Metals	Aluminium (Filtered)	mg/l	0.005	<0.005	<0.005	NA
	Aluminium	mg/l	0.01	**1.45**	**3.4**	**80**
	Arsenic (Filtered)	mg/l	0.0005	0.0014	0.0023	**49**
	Cadmium (Filtered)	mg/l	0.0002	0.0005	0.0005	0
	Calcium (Filtered)	mg/l	1	1020.0	920.0	10
	Chromium (hexavalent) (Filtered)	mg/l	0.001	0.004	0.005	22
	Chromium (III+VI) (Filtered)	mg/l	0.0005	0.0048	0.0051	6
	Chromium (Trivalent)	mg/l	0.001	<0.001	<0.001	NA
	Copper (Filtered)	mg/l	0.001	0.003	0.003	0
	Iron (Filtered)	mg/l	0.005	<0.005	0.006	NA
	Iron	mg/l	0.05	**1.82**	**4.71**	**89**
	Magnesium (Filtered)	mg/l	1	3960.0	3630.0	9
	Manganese (Filtered)	mg/l	0.0005	0.903	0.975	8
	Mercury	mg/l	0.0001	<0.0001	<0.0001	0
	Nickel (Filtered)	mg/l	0.0005	**<0.0005**	**0.0342**	NA
	Phosphorus	mg/l	0.005	**0.013**	**0.047**	**113**
	Potassium (Filtered)	mg/l	1	2270.0	2000.0	13
	Selenium (Filtered)	mg/l	0.002	0.004	0.003	29
	Silicon (Filtered)	µg/l	50	6760.0	6850.0	1
	Zinc (Filtered)	mg/l	0.005	<0.005	0.006	18
PAH/Phenols	Naphthalene	µg/L	5	<5.0	<5.0	NA
TPH	C10-C16	mg/l	0.1	<0.1	<0.1	NA
	C16-C34	mg/l	0.1	<0.1	<0.1	NA
	C34-C40	mg/l	0.1	<0.1	<0.1	NA
	F2-NAPHTHALENE	mg/l	0.1	<0.1	<0.1	NA
	C6 - C9	µg/L	20	<20.0	<20.0	NA
	C10 - C14	µg/L	50	<50.0	<50.0	NA
	C15 - C28	µg/L	100	<100.0	<100.0	NA
	C29-C36	µg/L	50	<50.0	<50.0	NA
	+C10 - C36 (Sum of total)	µg/L	50	<50.0	<50.0	NA
	C10 - C40 (Sum of total)	µg/L	100	<100.0	<100.0	NA
	C6-C10	mg/l	0.02	<0.02	<0.02	NA

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 100 (1-5 x EQL); 40 (5-10 x EQL); 40 (> 10 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Field Blanks (WATER)
Filter: SDG in('EP1516256')

SDG	EP1516256
Field_ID	QA01_231115
Sampled_Date-Time	23/11/2015
Sample_Type	Rinsate

Chem_Group	**ChemName**	**Units**	**LOR**	
	Silicon as SiO2 (Filtered)	mg/l	0.1	-
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/l	1	<1
	Unionized Hydrogen Sulfide	mg/l	0.1	-
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/l	1	<1
	Alkalinity (Carbonate as CaCO3)	mg/l	1	<1
	Alkalinity (Hydroxide) as CaCO3	µg/l	1000	<1000
	Alkalinity (total) as CaCO3	mg/l	1	<1
	Ammonia as N	µg/l	5	-
	Anions Total	meq/L	0.01	<0.01
	Cations Total	meq/L	0.01	<0.01
	Chloride	mg/l	1	<1
	Fluoride	mg/l	0.1	<0.1
	Ionic Balance	%	0.01	-
	Kjeldahl Nitrogen Total	mg/l	0.05	-
	Nitrate (as N)	mg/l	0.002	-
	Nitrite (as N)	mg/l	0.002	-
	Nitrogen (Total Oxidised)	mg/l	0.002	-
	Nitrogen (Total)	µg/l	50	-
	Reactive Phosphorus as P	mg/l	0.001	-
	Sodium (Filtered)	mg/l	1	<1
	Sulphide	mg/l	0.1	-
	TDS	mg/l	10	-
	Hardness as CaCO3 (Filtered)	mg/l	1	<1
	TSS	mg/l	5	-
Lead	Lead (Filtered)	mg/l	0.0002	<0.0002
Metals	Aluminium	mg/l	0.01	-
	Aluminium (Filtered)	mg/l	0.005	<0.005
	Arsenic (Filtered)	mg/l	0.0005	<0.0005
	Cadmium (Filtered)	mg/l	0.0002	<0.0001
	Calcium (Filtered)	mg/l	1	<1
	Chromium (hexavalent) (Filtered)	mg/l	0.001	-
	Chromium (III+VI) (Filtered)	mg/l	0.0005	<0.0005
	Chromium (Trivalent)	mg/l	0.001	-
	Copper (Filtered)	mg/l	0.001	<0.001
	Iron	mg/l	0.05	-
	Iron (Filtered)	mg/l	0.005	<0.005
	Magnesium (Filtered)	mg/l	1	<1
	Manganese (Filtered)	mg/l	0.0005	<0.0005
	Mercury	mg/l	0.0001	<0.0001
	Nickel (Filtered)	mg/l	0.0005	<0.0005
	Phosphorus	mg/l	0.005	-
	Potassium (Filtered)	mg/l	1	<1
	Selenium (Filtered)	mg/l	0.002	<0.002
	Silicon (Filtered)	µg/l	50	-
	Zinc (Filtered)	mg/l	0.005	<0.005
PAH/Phenols	Naphthalene	µg/L	5	-
TPH	C10-C16	mg/l	0.1	-
	C16-C34	mg/l	0.1	-
	C34-C40	mg/l	0.1	-
	F2-NAPHTHALENE	mg/l	0.1	-
	C6 - C9	µg/L	20	-
	C10 - C14	µg/L	50	-
	C15 - C28	µg/L	100	-
	C29-C36	µg/L	50	-
	+C10 - C36 (Sum of total)	µg/L	50	-
	C10 - C40 (Sum of total)	µg/L	100	-
	C6-C10	mg/l	0.02	-

Attachment 8D

Letter from OEPA, dated 1 September 2015, notifying results of June 2016 Groundwater Monitoring Results.

1st September 2016

Our Reference: 200-200-LET-EPA-0009

Your Reference: 2013-0000239827:ST02-2013-004

Mark Rust
Senior Environmental Officer
Office of the Environmental Protection Authority
Locked Bag 10
East Perth WA 6892

Email: mark.rust@epa.wa.gov.au

Dear Mark,

Subject: Report to OEPA for Groundwater Monitoring Results as per Condition 8 of Ministerial Statement No. 870

This letter to inform the OEPA on the outcomes of the latest groundwater monitoring undertaken by Yara Pilbara Nitrates Pty Ltd (YPNPL) at the Technical Ammonium Nitrate Production Facility (TANPF) as required by Conditions 8-4 and 8-5 of Ministerial Statement 870.

Condition 8-4	*The proponent shall sample/monitor all groundwater bores required by Condition 8-3 every six months and shall set groundwater monitoring trigger values at a value of 10% above the baseline contaminant concentrations obtained from the hydrogeological studies required by condition 8-1.*
Condition 8-5	*In the event that monitoring required by condition 8-4 indicates an exceedance of trigger levels: 1. The proponent shall report such findings to the CEO within 7 days of the exceedance being identified; 2. The proponent shall provide evidence which allows determination of the cause of the exceedance; 3. If determined by the CEO to be project attributable, the proponent shall submit actions to be taken to address the exceedance within 7 days of the determination being made to the CEO; 4. The proponent shall implement actions to address the exceedance and shall continue until such time as the CEO determines that the remedial actions may cease; and 5. The proponent shall submit bi-annually, or at a frequency defined to the satisfaction of the CEO, the results of monitoring required by condition 8-4 to the CEO, until such time as the CEO determines that reporting may cease.*

YPNPL has reported results to OEPA of previous monitoring regularly (most recently in December 2015), as ongoing monitoring continues to show substantial variation that are considered to be reflective of a natural variability rather than a result of site related potential contamination sources as a result of ongoing construction activities. Since the last report to OEPA in December 2015 progress in commissioning of the TANPF has been significantly slower than anticipated and the plant is yet to be fully commissioned.

Groundwater sampling was undertaken in June 2016, with resampling undertaken in August 2016 to check the representativeness of some results from the June sampling event. Due to limitations in sampling equipment, site MW04 was unable to be sampled. This is being addressed through the acquisition of new sampling equipment that will enable sampling of this bore. MW04 will be sampled at the next monitoring event.

In June 2016 a number of analytes were detected at concentrations slightly above trigger values. When these were retested in August 2016 one (1) analyte at one (1) well, MW02, was found to exceed the trigger value of Total Nitrogen.

The Total Nitrogen value at MW2 of 13,000 µg/L has exceeded the trigger value of 5,610µg/L. As previously reported, this was also exceeded in November 2015 (6,840µg/L). YPNPL has initiated an investigation to understand the cause of this elevated Nitrogen value. Results from this investigation will be submitted to the OEPA once it is complete.

Attached to this letter is a summary table showing the 2016 groundwater monitoring results as well as the historical monitoring data, to enable a review of the variability of the parameters over time since 2011.

If you have any queries please do not hesitate to contact Susan Giles, Environmental Superintendent on 9183 4167 or susan.giles@yara.com.

Yours sincerely

Brian HOWARTH

HESQ Manager

Yara Pilbara Nitrates

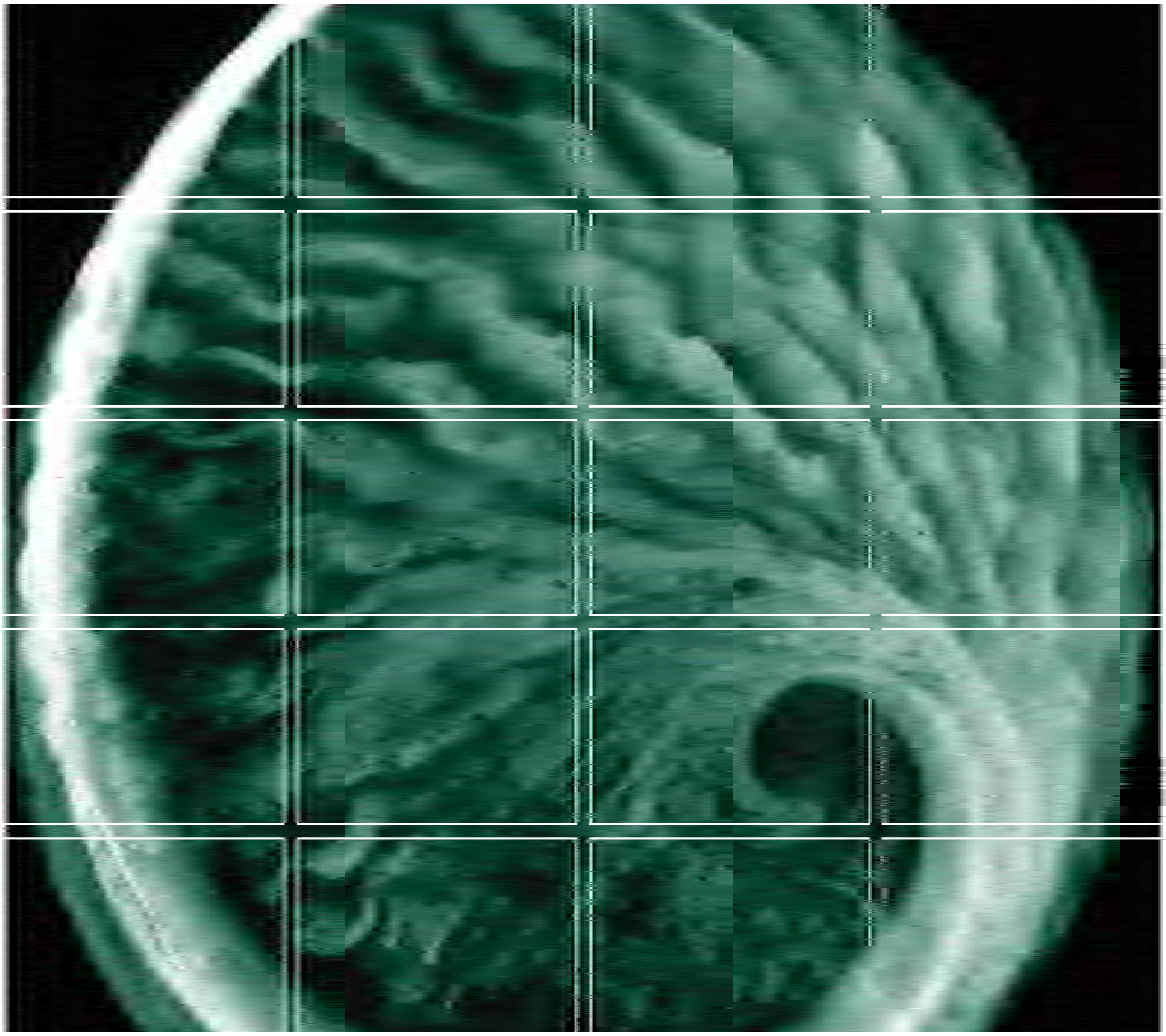
<u>Attachments</u>

1. TANP Groundwater monitoring results

						Inorganics									Metals																TRHs**				
Parameter		pH	TDS	TSS	Alkalinity (total) as CaCO3	Ammonia	Ammonia as N	Chloride	Nitrate (as N)	Nitrate (as NO3-)	Nitrogen (Total)	Reactive Phosphorus as P	Sulphide	Sulphate	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (III+VI) (Filtered)	Chromium (hexavalent)	Chromium (Trivalent)	Copper (Filtered)	Iron (Total)	Iron (Filtered)	Lead (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury	Nickel (Filtered)	Zinc (Filtered)	C6 - C9	C10 - C14	C15 - C28	C29-C36	C10-36 (sum of total)
Units		pH units	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L				
Current Trigger Level		**6-8.4**	**143,000**	**2,090**	**561**	**0.04**	**40**	**95,700**	**NA**	**9.67**	**5,600**	**NA**	**NA**	**5,720**	**0.021**	**NA**	**NA**	**1210**	**NA**	**NA**	**NA**	**NA**	**143**	**0.26**	**NA**	**5170**	**0.242**	**0.0001**	**NA**	**0.052**	**NA**	**NA**	**NA**	**NA**	**NA**
MW1	30/04/2011	6.95	2,000		350		38	780	1.70		2,500	<0.002		170	0.010	<0.001	<0.0001	200	<0.001	<0.002	<0.005			0.008	<0.001	63	0.170	<0.00005		0.016	<40	<50	<200	<200	<450
	20/09/2011	6.86		180	320		18	710			3,400	0.008	<0.5	150	0.002	<0.001	<0.0001	170	<0.001				1.80	<0.005		54	0.046		<0.001	0.027					
	27/02/2012	6.90		220	300	<0.005	5	670	2.00	8.70	2,100	<0.002	<0.5	140	0.002	<0.001	<0.0001	180	<0.001				4.20	<0.005		53	0.088		<0.001	0.038					
	11/10/2012	7.09		520	300	0.064	53	600	1.10	4.70	1,500	0.003	<0.5	100	0.005	<0.001	<0.0001	170	<0.001				30.00	0.009		51	0.038		<0.001	0.008					
	6/03/2013	7.26		2,900	300	0.018	15	570	1.90	<0.05	2,000	0.003	<0.5	100	<0.005	<0.001	<0.0001	160	<0.001				14.00	<0.005		49	0.170		<0.001	0.010					
	17/04/2013	6.71		16	290		5	560	2.20		2,400	0.004	<0.5	120	<0.005	<0.001	0.0004	160	<0.001			0.0010	0.39	<0.005	<0.001	49	0.087		<0.001	0.010					
	17/10/2013	5.60	940	25	367		32	300	0.09		240	0.007	<0.1		0.006	0.001	<0.00005	66	<0.0002		<0.001	<0.0005	1.47	0.437	<0.0001	29	0.425	<0.0001	0.001	0.005	<20	<50	<100	<50	<100
	9/04/2014	7.13	995	<5	358		114	345	1.60		2,090	0.006	<0.1	59	<0.005	0.001	<0.00005	57	<0.0002		<0.001	<0.0005	0.57	0.430	<0.0001	31	0.272	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	30/10/2014	7.44	981	<5	361		5	366	0.16		2,620	0.018	<0.1	75	0.018	0.001	<0.00005	88	<0.0002		<0.001	<0.0005	0.33	0.052	<0.0001	32	0.204	<0.0001	0.001	0.009	<20	<50	<100	<50	<100
	30/04/2015	7.31	1,010	<5	272		31	374	2.24		3,040	0.014	<0.1	119	0.006	0.000	<0.00005	92	<0.0002	<0.001	<0.0001	0.0050	0.32	0.044	<0.0001	33	0.080	<0.0001	0.001	0.003	<20	<50	<100	<50	<100
	23/11/2015	7.22	1,110	<5	316		5	394	0.25		260	0.010	<0.1	103	0.006	0.001	<0.0001	98	<0.0005	<0.001	<0.001	<0.001	0.42	<0.005	<0.0002	33	0.009	<0.0001	0.001	<0.005	<20	<50	<100	<50	<100
	1/06/2016	7.90	1,100	440	288		<10	428		2.50	3,100				0.610	0.001	<0.0001	102	<0.005	0.002		<0.002		1.000	0.006	33	0.240	<0.0001	0.005	0.052					
	9/08/2016														<0.005								<0.005												
MW2	30/04/2011	7.16	2,000		250		200	930	3.30		3,900	0.004		170	0.005	<0.001	<0.0001	99	<0.001	<0.002	<0.005			<0.005	<0.001	66	0.005	<0.00005		0.013	<40	<50	<200	<200	<450
	20/09/2011	6.78		190	290		5	1,200			1,400	0.004	<0.5	210	0.002	<0.001	<0.0001	150	<0.001				6.00	<0.005		98	0.001		<0.001	0.021					
	27/02/2012	6.83		84	300	0.036	30	1,400	0.62	2.70	880	<0.002	<0.5	220	0.005	<0.001	<0.0001	240	<0.001				4.60	0.240		140	0.220		<0.001	0.047					
	11/10/2012	7.12		440	370	<0.005	5	1,300	0.63	2.80	1,100	<0.002	<0.5	180	0.002	<0.001	<0.0001	160	<0.001				12.00	<0.005		94	0.010		<0.001	0.021					
	6/03/2013	7.28		320	360	<0.005	5	1,000	0.60	2.70	700	<0.002	<0.5	170	0.006	<0.001	<0.0001	150	<0.001				15.00	<0.005		87	0.012		<0.001	0.017					
	17/04/2013	5.34		290	340		5	811	2.28		720	0.003	<0.5	200	<0.005	<0.001	<0.00005	112	<0.001			<0.001	5.20	<0.005	<0.001	100	0.012		<0.001	0.012					
	17/10/2013	6.90	2,040	10	281		5	1,100	0.51		2,700	0.003	<0.1		<0.005	<0.0002	0.0003	160	<0.0002		<0.001	<0.0005	0.06	<0.002	<0.0001	76	<0.0005	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	9/04/2014	6.98	1,550	<5	250		5	730	4.94		4,960	0.007	<0.1	135	<0.005	<0.0002	<0.00005	71	<0.0002		<0.001	<0.0005	<0.05	<0.002	<0.0001	57	0.001	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	30/10/2014	7.14	1,650	<5	276		5	771	2.49		2,720	0.010	<0.1	138	0.017	<0.0002	<0.00005	98	<0.0002		<0.001	<0.0005	<0.05	<0.002	<0.0001	64	0.002	<0.0001	<0.0005	0.006	<20	<50	<100	<50	<100
	30/04/2015	7.19	1,720	<5	304		17	758	3.55		4,350	0.008	<0.1	163	<0.005	0.000	<0.00005	103	<0.0002	<0.001	<0.0001	0.0015	0.14	0.004	0.000	66	0.001	<0.0001	0.001	0.021	<20	<50	<100	<50	<100
	23/11/2015	7.03	1,680	<5	292		5	692	5.44		6,840	0.006	<0.1	180	<0.005	<0.0005	<0.0001	94	<0.0005	<0.001	<0.001	<0.001	<0.05	<0.005	<0.0002	57	<0.0005	<0.0001	<0.0005	<0.005	<20	<50	<100	<50	<100
	14/06/2016	7.90	1,700	240	281		10	750		5.50	5,900				<0.005	<0.001	<0.0001	93	<0.005	<0.001		0.0004		<0.005	<0.0001	60	0.010	<0.0001	<0.001	0.006					
	9/08/2016										13,000																								
MW3	30/04/2011	7.30	9,800		400		54	5,400	1.90		2,600	0.003		800	0.013	<0.005	<0.0005	120	<0.005	<0.002	<0.005			<0.025	<0.005	300	0.022	<0.00005		0.020	<40	<50	<200	<200	<450
	20/09/2011	7.22		280	450		57	3,700			220	0.006	<0.5	810	0.019	<0.005	<0.0005	85	<0.005				7.40	<0.025		210	0.014		<0.005	0.047					
	27/02/2012	7.18		230	460	<0.005	5	4,000	0.32	1.40	610	<0.002	<0.5	940	0.005	<0.005	<0.0005	95	<0.005				6.80	<0.025		210	0.026		<0.005	0.032					
	11/10/2012	7.47		270	540	0.015	12	4,200	0.12	0.51	330	0.003	<0.5	710	<0.01	<0.01	<0.001	100	<0.01				5.80	<0.05		260	0.027		<0.01	0.031					
	6/03/2013	7.32		180	470	<0.005	5	5,900	0.26	1.10	420	0.003	<0.5	670	<0.025	<0.005	<0.0005	130	<0.005				6.30	<0.025		340	0.018		<0.005	<0.025					
	17/04/2013	6.17		470			770	28,000	0.03		1,500	0.006	<0.5	1,400	0.072	<0.01	<0.001	350	<0.01			<0.01	21.00	0.520	<0.001	910	1.700		<0.01	<0.05					
	17/10/2013	7.19	7,280	54	479		5	3,140	0.61		530	<0.001	<0.1		0.021	0.001	<0.00005	91	<0.0002	<0.001	<0.001	0.0005	<0.05	0.010	<0.0001	232	0.004	<0.0001	0.001	<0.001	<20	<50	<100	<50	<100
	9/04/2014	7.50	9,050	6	466		5	5,000	0.46		840	0.009	<0.1	647	<0.005	0.001	<0.00005	104	<0.0002	<0.001	<0.001	0.0017	<0.05	<0.002	<0.0001	286	0.013	<0.0001	<0.0005	<0.001	<20	<50	<100	<50	<100
	30/10/2014	7.97	6,520	<5	533		5	3,480	0.18		400	0.021	<0.1	537	0.024	0.001	<0.00005	68	0.0004	<0.001	<0.001	0.0014	<0.05	0.005	<0.0001	196	0.002	<0.0001	0.001	0.025	<20	<50	<100	<50	<100
	30/04/2015	7.36	7,020	<5	570		19	3,780	2.37		3,260	0.020	<0.1	475	<0.005	0.001	<0.00005	75	0.0003	<0.01	0.0003	0.0006	<0.05	<0.002	<0.0001	208	0.013	<0.0001	<0.0005	0.003	<20	<50	<100	<50	<100
	23/11/2015	7.31	7,620	<5	582		10	3,980	2.03		3,360	0.021	<0.1	548	0.013	0.001	<0.0001	78	<0.0005	<0.001	<0.001	0.0020	0.08	0.055	<0.0002	214	0.102	<0.0001	<0.0005	0.012	<20	<50	<100	<50	<100
	1/06/2016	7.80	8,300	300	593		<10	4,640		1.90	2,100				0.067	<0.005	<0.0005	90	<0.005	<0.001		<0.002		0.079	0.001	250	0.150	<0.0001	<0.005	0.010					
	9/08/2016				553										<0.005																				
MW4	30/04/2011	7.64	6,700		510		740	3,900	0.82		2,100	0.008		350	<0.005	<0.005	<0.0005	39	<0.005	<0.002	<0.005			<0.025	<0.005	100	0.014	<0.00005		0.010	<40	<50	<200	<200	<450
	20/09/2011	7.58		670	370		18	2,500			540	0.009	<0.5	280	<0.005	<0.005	<0.0005	28	<0.005				31.00	<0.025		68	0.011		<0.005	0.029					
	27/02/2012	7.50		1,900	390	<0.005	5	3,200	0.17	0.74	760	0.007	<0.5	410	<0.005	<0.005	<0.0005	49	<0.005				130.00	<0.025		96	0.033		<0.005	0.047					
	11/10/2012	7.66		2,900	420	<0.005	5	3,700	0.44	1.90	1,200	0.007	<0.5	380	<0.01	<0.01	<0.001	69	<0.01				130.00	<0.05		150	0.041		<0.01	0.012					
	6/03/2013			210	390		5	4,700	0.24		730	0.010	<0.5	440	0.031	<0.005	<0.0005	94	<0.005			<0.005	7.40	<0.025	<0.005	190	0.120		<0.005	<0.025					
	17/04/2013	4.32	136,000	74	109		877	69,800	2.89		3,600	<0.001	<0.1	3,540	<0.025	<0.0025	<0.001	972	<0.0025		<0.02	0.0050	1.63	<0.025	<0.001	3,900	0.277	<0.0001	0.048	<0.025	<20	<50	<100	<50	<100
	17/10/2013	6.99	88,300	43	148		14	49,000	4.07		7,870	<0.001	<0.1	2,290	<0.025		<0.001	598	<0.0025		<0.001	<0.005	<0.5	0.034	<0.001	2,210	0.003	<0.0001	0.035	0.042	<20	<50	<100	<50	<100
	9/04/2014	7.15	41,000	14	317		5	25,700	2.17		3,160	0.009	<0.1		0.013	0.002	<0.0004	248	0.0018		<0.001	<0.002	1.02	0.019	<0.0004	921	0.075	<0.0001	0.021	0.042	<20	<50	<100	<50	<100
	30/10/2014	6.81	134,000	201	118		5	38,600	0.44		410	0.004	<0.1	5,960	<0.025	<0.0025	<0.001	1,120	0.0040	<0.01	0.0040	<0.005	6.76	<0.025	<0.001	4,590	3.290	<0.0001	0.037	<0.025	<20	<50	<100	<50	<100
	30/04/2015	6.80	128,000	133	203		5	72,200	1.21		1,430	0.009	<0.1	4,070	<0.005	0.002	0.0005	1,020	0.0051	0.0050	<0.001	0.0030	4.71	<0.005	0.000	3,960	0.098	<0.0001	0.034	0.006	<20	<50	<100	<50	<100
	23/11/2015																																		
	1/06/2016																																		
	9/08/2016																																		
MW5	30/04/2011	6.73	130,000		370		56	87,000	1.10		5,100	0.007		5,200	<0.05	<0.05	<0.005	1,000	<0.05	0.0100	<0.005			<0.25	<0.05	4,100	0.220	0.0001		<0.05	<40	<50	<200	<200	<450
	20/09/2011	6.55		1,100	210		47	87,000			2,700	0.010	<0.5	4,100	<0.1	<0.1	<0.01	1,100	<0.1				12.00	<0.5		4,300	<0.1		<0.1	<0.1					
	27/02/2012	6.62		1,400	150	<0.005	5	80,000	1.20	5.50	3,400	0.006	<0.5	4,400	<0.1	<0.1	<0.01	1,100	<0.1				25.00	<0.5		4,700	<0.1		<0.1	<0.1					
	11/10/2012	6.90		2,600	160	0.750	620	77,000	1.10	4.70	1,800	0.005	<0.5	3,500	<0.05	<0.05	<0.005	970	<0.05				37.00	<0.25		3,700	<0.05		<0.05	<0.05					
	6/03/2013	6.84		660	170	1.200	1,000	64,000	1.30	6.00	3,400	0.007	<0.5	3,800	<0.25	<0.05	<0.005	770	<0.05				18.00	<0.25		3,000	<0.05		<0.05	<0.25					
	17/04/2013	6.21		1,600	170		5	58,000	1.60		2,600	0.014	<0.5	3,300	0.300	<0.05	<0.005	740	<0.05			<0.05	44.00	<0.25	<0.05	2,900	<0.05		<0.05	<0.25					
	17/10/2013	6.77	75,400	63	207		5	40,500	3.29		3,460	0.005	<0.1		<0.01	0.001	<0.0004	599	0.0120		<0.01	<0.002	0.80	<0.01	<0.0004	2,030	0.001	<0.0001	0.007	<0.01	<20	<50	<100	<50	<100
	9/04/2014	7.08	47,100	78	275		18	25,700	1.54		4,170	0.002	<0.1	2,110	0.086	<0.001	<0.0004	303	0.0070		<0.001	<0.002	1.13	0.015	<0.0004	1,040	0.003	<0.0001	0.003	0.017	<20	<50	<100	<50	<100
	30/10/2014	7.24	33,200	<5	351		5	20,500	1.02		1,340	0.013	<0.1	1,800	<0.005	0.002	<0.0002	194	0.0065		<0.001	<0.001	<0.25	0.010	<0.0002	665	0.002	<0.0001	0.002	<0.005	<20	<50	<100	<50	<100
	30/04/2015	7.25	25,400	154	397		20	16,300	1.00		1,870	0.016	<0.1	1,510	<0.005	0.001	<0.0002	139	0.0030	<0.01	0.0030	0.0020	4.80	0.007	<0.0002	464	0.005	<0.0001	0.002	0.020	<20	<50	<100	<50	<100
	23/11/2015	7.37	19,400	119	638		15	10,600	1.44		4,490	0.003	<0.1	1,200	<0.005	0.001	<0.0001	20	0.0040	0.0030	0.0010	<0.001	0.59	<0.005	<0.0002	220	0.002	<0.0001	0.001	<0.005	<20	<50	<100	<50	<100
	1/06/2016	7.90	17,000	49	485		<10	9,300		5.10	5,400				0.031	<0.010	<0.0010	54	<0.005	0.0040		<0.002		0.02	<0.0010	172	0.013	<0.0001	<0.010	<0.005					
	9/08/2016														<0.005																				

Attachment 9A

Preliminary Acid Sulfate Soil Investigation Report, dated August 2011.



Technical Ammonium Nitrate Production Facility

Preliminary Acid Sulfate Soil Investigation

DRAFT

Burrup Nitrates Pty Ltd
August 2011
0086269

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DRAFT REPORT

Burrup Nitrates Pty Ltd

Technical Ammonium Nitrate Production Facility

Preliminary Acid Sulfate Soil Investigation

August 2011

Reference: 0086269

Environmental Resources Management Australia
6th Floor, 172 St Georges Terrace
Perth   WA   6000
Telephone +61 8 9321 5200
Facsimile +61 8 9321 5262
www.erm.com

Technical Ammonium Nitrate Production Facility

Preliminary Acid Sulfate Soil Investigation

DRAFT

Burrup Nitrates Pty Ltd

August 2011

Approved by: *Toby Whincup*
Position: Project Manager
Signed:
Date: *17 August, 2011*

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This report has been prepared in accordance with the scope of services described in the contract or agreement between Environmental Resources Management Australia Pty Ltd ABN 12 002 773 248 (ERM) and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and ERM accepts no responsibility for its use by other parties.

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1 INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Burrup Nitrates Pty Ltd (BNPL) in 2008 to undertake a preliminary acid sulfate soil (ASS) investigation of the proposed Technical Ammonia Nitrate Production Facility (TANPF), located at "Site D" within the Burrup Industrial Estate (BIE) on the Burrup Peninsula, Western Australia (WA) *(Figure 1, Annex A)*.

The ASS investigation undertaken focused on the 35 ha northern portion of Site D (hereafter referred to as 'the site') which is the designated area of disturbance (both permanent and temporary) for the TANPF *(Figure 1, Annex A)*.

The preliminary ASS investigation is one of several baseline studies required in support of the environmental approvals process for the project.

1.1 PROJECT APPRECIATION

Site D occupies an area of approximately 79 ha and extends from Village Road in the north to Hearson Cove Road in the south. The existing Burrup Fertiliser Pty Ltd (BFPL) ammonia plant is situated adjacent the western boundary of Site D, with vacant land present between the site and Hearson Cove to the east.

The site (including temporary laydown areas) occupies approximately 35 ha in the northern section of Site D, albeit bulk earthworks disturbance associated with construction of permanent works for the TANPF will be constrained to approximately 16 ha (*Figure 2, Annex A)* within the north-west quadrant of Site D.

The TANPF comprises construction of three major processing units, including a nitric acid plant, ammonium nitrate solutions plant and the technical ammonium nitrate (TAN) plant.

The proposed site preparation works for the TANPF are anticipated to include the following activities, which have the potential to directly or indirectly disturb ASS, should they exist within the site:

- Bulk earthworks, including excavations undertaken for building and plant foundations, utilities and other civil works;
- Dewatering and trenching (subject to detailed design requirements); and
- Installation of site drainage.

It is understood that proposed finished design levels will be attained via cut to fill earthworks. Existing site levels will be reduced in the northern section of the site (refer *Figure 2, Annex A*), which corresponds to the 'Negligible ASS Risk' mapped zone. Fill from the northern section of the site will be imported to the low-lying southern section of the site to make up site levels. By implication, soil and groundwater disturbance within the 'Moderate to High Risk' ASS mapped zone of the site will be minimised in accordance with WA Department of Environment and Conservation (DEC) recommendations for best practice management of ASS. It is understood that the site will be filled to achieve a typical formation level of 5.5 m AHD (Golder, 2011). The inter-relationship of the indicative earthworks cut and fill areas and ASS risk mapping zones are shown on *Figure 2, Annex A*.

1.2 *OBJECTIVES*

The principal objectives of the investigation were to establish, in a manner consistent with relevant DEC ASS guidance, an understanding of the acid sulfate soil status of the site, and associated potential environmental risk implications or constraints to the proposed development.

1.3 *SCOPE OF WORK*

To meet the project objective, the following scope of works was completed in accordance with the approved proposal:

- A desktop assessment and site walkover inspection completed and reported as part of the approved Public Environmental Review (PER) (ERM, 2010);

- A soil and groundwater sampling and analysis program (SAP) was designed cognisant of the desktop assessment findings and relevant DEC guidance. The intrusive works comprised drilling of 10 soil bores across the site to a nominal target depth of 3m. At 5 locations, boreholes were extended at least 2m beyond the groundwater table to facilitate monitoring well installation and groundwater sampling and analysis;

- Soil samples were collected at regular depth intervals, field tested and submitted to SGS, a National Association of Testing Authorities (NATA) accredited laboratory for pH_{field} and pH_{fox}.

- Selected soil samples were analysed for the Chromium Reducible Sulphur (CRS) suite, guided by the outcomes of the afore-mentioned field pH testing;

- A single groundwater monitoring event was completed in April 2011, including recovery of representative groundwater samples from the 5 monitoring wells, field analysis of indicator parameters, and laboratory analysis of water quality parameters (including ASS indicator species); and
- Comparison of field and laboratory soil and groundwater data with relevant DEC ASS assessment criteria, to confirm the presence or absence of Actual Acid Sulfate Soils (AASS) and Potential Acid Sulfate Soils (PASS) and associated management implications (where applicable).

1.4 REGULATORY CONTEXT

Requirements for the assessment and management of ASS at the site were formally conditioned in Ministerial Statement No. 870 published on 7 July 2011. Condition 9 of the ministerial approval articulates the following requirements, which must be implemented pursuant to the provisions of the WA *Environmental Protection Act 1986* in support of the construction of the TANPF:

> *9 Acid Sulfate Soils*
>
> *9-1 The proponent shall undertake intrusive acid sulfate soils investigations prior to the commencement of construction; and*
>
> *9-2 In the event that acid sulfate soils are disturbed during construction of the TANPF, the proponent shall treat and manage acid sulfate soils in accordance with the requirements of the DEC's draft guideline on the treatment and management of acid sulfate soils and water in acid sulfate soil landscapes (May, 2009) and any subsequent revisions.*

The findings of the ASS investigation conducted by ERM, as reported herein, may be used in support of the discharge of Ministerial condition 9-1 in due course. Informal consultation with the DEC in August 2011 (pers. comms Steve Appleyard) suggests that potential requirements for further intrusive investigation of the site may not be required on the basis of ERM's assessment results, which suggest a low-risk implication to future construction of the TANPF.

1.5 LIMITATIONS

The findings of this report are based on the scope of work outlined above. ERM performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties, express or implied, are made. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials on the subject Site should not be interpreted as a guarantee that such materials do not exist on the site.

This assessment is based on a site inspection conducted by ERM personnel, sampling and analyses described in the report, and information provided by people with knowledge of site conditions. All conclusions and recommendations made in the preliminary report are the professional opinions of the ERM personnel involved with the project and, while normal checking of the accuracy of data has been conducted, ERM assumes no responsibility or liability for errors in data obtained from regulatory agencies or any other external sources, nor from occurrences outside the scope of this project.

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This report has been prepared solely for use by the client and ERM accepts no responsibility for its use by other parties.

2 METHODOLOGY

2.1 DESKTOP INVESTIGATION

DEC guidelines were followed to assess the presence of AASS and/or PASS at the site prior to undertaking the preliminary soil and groundwater investigations. The initial desktop assessment (ERM, 2010) included a review of:

- Western Australian Planning Commission (WAPC) ASS risk maps;
- Geological and hydrogeological mapping data;
- Topographical data;
- Geomorphological information;
- Available historical exploratory logs to assess soil stratigraphic units across the site; and
- Available field survey data to assess the presence of potential visual indicators of AASS/PASS, such as acid scalded areas, stunted or dead vegetation, acid tolerant vegetation, (black) iron monosulfides or (yellow) jarosite minerals.

The findings of the desktop assessment are presented in the published PER (ERM, 2010), including relevant baseline data pertaining to the site's history, surrounding land-uses, environmental setting, geological and hydrogeological conditions.

On the basis of the desk-based review findings, as reported in the PER (ERM, 2010), a site investigation was recommended to assess the presence and distribution of AASS and/or PASS.

2.2 *FIELD INVESTIGATION*

2.2.1 *Soil Investigation Design Rationale*

DEC guidance (DEC, May 2009) generally recommends a minimum of 2 sampling locations per hectare for non-linear disturbances over 4ha in size, which equates to nominally 32 sampling locations for the proposed TANPF development area.

However, upon review of available geological information, desktop data and walkover findings, a reduced density sampling program was considered satisfactory to characterise the distribution and magnitude of ASS at the site. The sampling design comprised 10 soil bores spatially distributed to investigate the inferred ASS risk zones associated with the principal geological/geomorphological units in the locality of the site, and cognisant of the proposed cut and fill design for the construction area.

2.2.2 *Soil Investigation Rationale*

The main soil investigation was undertaken in January 2011 by ERM and BNPL's nominated drilling subcontractor, Golder. All soil bores were drilled to at least 3 m below ground level (mbgl), which is inferred to be at least 0.5 m below the maximum intended depth of excavations within granular soils beneath the proposed TANPF footprint. Five of the bores were drilled beyond the permanent watertable to a maximum recorded depth of 9 mbgl to accommodate groundwater monitoring well installations. Investigation locations (SB1 – SB5 and MW1 – MW5) are illustrated on *Figure 2, Annex A.*

During drilling, soil lithology was logged by experienced ERM field personnel using the Unified Soil Classification System (USCS). Potential visual and olfactory indicators associated with acid sulfate soils were recorded where apparent (e.g. soil colour, mottling, hydrogen sulphide odours).

Soil samples were collected at 0.25 m intervals by the field investigator using a fresh pair of nitrile gloves for each sample. Samples were placed in laboratory supplied plastic bags and frozen prior to transport to SGS (a National Association of Testing Authorities (NATA) accredited laboratory) under strict chain of custody protocols.

Field screening (pH_f and pH_{fox}) was undertaken by SGS consistent with guidance provided in the DEC's *Identification and Investigation of Acid Sulfate Soils and Groundwater* (May, 2009). Twenty-four soil samples were selectively analysed by SGS for the chromium reducible sulphur suite to assist with the confirmation of PASS and/or AASS at the site. These were selected according to field screening observations and to ensure representative lateral and vertical characterisation over the site.

2.2.3 *Groundwater Investigation*

A groundwater sampling program was conducted in April 2011 by trained ERM staff.

Standing water levels were gauged and representative samples recovered for field testing of indicator parameters (including temperature, pH, oxygen reduction potential, electrical conductivity and dissolved oxygen).

Representative groundwater samples were collected from the five groundwater monitoring wells (illustrated in *Figure 2, Annex A*) and submitted to SGS for analysis of ASS indicator species such as dissolved iron, aluminium and manganese, as well as baseline characterisation of major cations and anions, total dissolved solids, total hardness, total alkalinity and other dissolved metals.

3 RESULTS

3.1 DESKTOP INVESTIGATION

The desktop ASS assessment for the site is presented in full in the Public Environmental Review (ERM, 2010), which concluded that further investigation should be conducted to characterise the presence, distribution and magnitude of ASS at the site.

Western Australian 1:50,000 Urban Geology Series mapping for the site and surrounding area is indicated on *Figure 3, Annex A*. Mapping indicates that the on-site superficial geology comprises the following lithologies:

- Pleistocene red-brown silty sands (Qps) in the north-west section of the site, inferred to extend up to a maximum thickness of 10m;
- Holocene beach and dune shelly sands (Qhy) in the central section of the site, inferred to extend up to a maximum thickness of 10m; and
- Holocene mud and silt deposits (Qhm) in the southern section of the site (inferred to extend up to a maximum thickness of 5m).

The Holocene deposits are associated with the 'Moderate to High' ASS risk categorised section of the site (refer *Figure 2, Annex A*), which will undergo minimal direct and indirect disturbance according to the current earthworks design proposals. The Pleistocene soils in the northern section of the site, corresponding to the 'Low' ASS risk zone, will form the bulk of material disturbed during the construction works. The bedrock geology beneath the site comprises Granophyre, which does not present a potential ASS risk.

Several indicators suggestive of the presence of ASS were identified during the walkover inspection of the site, including waterlogged soils, iron staining in near-surface soil horizons, the presence of acid and water tolerant vegetation, and low lying bare/scalded areas. Shell fragments and other aquatic artefacts were also observed in the southern section of the site. There was also evidence of surface salt crusting on the ground in the southern portion of the site, and in historical surface water channels.

3.2 FIELD INVESTIGATION

3.2.1 *Geological Findings*

Exploratory logs from the investigation are presented in *Annex B* and summarised lithological details and ASS screening results are detailed in *Annex C, Table 1*.

The superficial soils at the site variably comprise brown to red-brown clayey sands, silty sands, clayey gravels and clayey gravelly sands, extending from ground level to between 0.5 and 5 m bgl. Shell grit inclusions were identified at some locations, consistent with the mapped geology.

Superficial soil thickness typically increases towards the southern margins of the site, consistent with geological and topographical expectations. Exploratory hole data did not reveal a distinct difference in soil type association between the 'Moderate to High' and 'Negligible' risk ASS mapped areas of the site.

Horizons of well to very well cemented ferricrete or calcrete were identified within the superficial soils at several locations, between 0.1 and 1.5 m bgl (Golder, 2011). Golder (2011) also recorded dolerite at one borehole location, which was assessed for geotechnical purposes only (BH04).

The superficial soils are generally underlain by Granophyre bedrock, which consists of pale grey and dark grey, fine to medium sized crystals, which is distinctly weathered and generally becomes fresher with depth (Golder, 2011). The bedrock is reported as locally fractured along thin iron-stained quartz seams, generally of high to extremely high strength.

A generalised geological cross-section for the site area is presented in *Figure 4, Annex A*.

3.2.2 *ASS Investigation Findings*

Consistent with interpretative guidelines detailed in the DEC's *Acid Sulfate Soils Guideline Series – Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes* (May, 2009), samples were considered to potentially represent actual acid sulfate soils when pH_f was less than four.

Samples may be considered to potentially represent PASS when:

1) pH_{fox} is less than 4; and/or

2) the change in pH is greater than 2 (where the resultant pH_{fox} is less than 4); and/or

3) there is a strong reaction following addition of hydrogen peroxide.

Field screening of fifty-nine soil samples revealed that soil pH_f values ranged between 5.8 and 9.8 and were not indicative of AASS.

pH_{fox} values ranged between 5.6 and 10.7 and the average difference between pH_f and pH_{fox} was generally less than 1. Five samples, SB5_0.0, SB5_0.5, MW2_0.0, MW3_0.0, MW5_1.0, had a difference between pH_f and pH_{fox} slightly greater than 2. Given the absolute pH_f and pH_{fox} values for these samples, it is considered unlikely that the results are indicative of PASS.

Observed reactions between soil and hydrogen peroxide ranged from slight to extreme intensity. It was noted that reaction intensity did not always correlate to the difference between pH_f and pH_{fox}. The observed extreme reactions (in the absence of sulphidic oxidation processes) may, however, be attributable to elevated manganese content in on-site soils (DEC, May 2009). Based on the overall field observations, the presence of AASS and PASS was considered unlikely.

Confirmatory laboratory analysis via the CRS suite, revealed that no samples contained reduced inorganic sulphur concentrations above the applicable DEC threshold criterion of 0.03%S for coarse textured sands and loamy sands (DEC, May 2009). Additionally, the pH KCl and actual acidity tests (TAA) were not suggestive of the presence of AASS in any of the samples (i.e. all pH KCl results were above 4.5).

Laboratory analysis results for the soil investigation are presented in *Annex C, Table 1*. Chain of custody (CoC) documentation and laboratory data are presented in *Annex D*.

3.2.3 Groundwater Investigation Findings

Full details of the site-specific hydrogeological and hydrological investigation findings for the site are presented in the report *Technical Ammonium Nitrate Production Facility Hydrogeological and Hydrological Investigation* (ERM, 2011).

Groundwater well sampling data forms are presented in *Annex B*.

Groundwater Elevation and Inferred Flow Direction

Groundwater elevations recorded in April 2011 are presented in *Annex C, Table 5*.

The recorded depth to groundwater at the site ranged between 0.566 to 2.926 m bgl. Groundwater elevations ranged between 2.166 m AHD at MW5 (in the southern section of the site) to 6.462 m AHD at MW1 (in the northern section of the site).

Groundwater data results indicate the presence of a continuous unconfined aquifer at the site, which is present at shallow depth in the Granophyre bedrock geology in the north of the site, and extends into the marine muds and silts in the low-lying southern section of the site. There is no evidence of secondary perched ground water at the site. Groundwater elevations are generally observed to follow surface topography at the site.

The interpolated groundwater flow direction is in a south easterly direction across the proposed development area, with an estimated hydraulic gradient of 0.011. The estimated groundwater contours for the site are shown in *Figure 5, Annex A*.

Groundwater Analytical Results

Annex C, Tables 2-5 provide a summary of field and laboratory groundwater analysis results.

Groundwater field pH measurements at the site ranged between 6.73 at MW5 and 7.65 at MW4, indicating circum-neutral groundwater conditions.

Redox results for those wells located in the northern section of the site (MW1-MW3) indicated slight to moderate reducing conditions (-100 to +57 mV), with the southernmost well results suggestive of oxidising groundwater conditions (+125 to 237 mV).

Recorded groundwater salinity increased from north (3,100-3,540 us/cm) to south (10-16,000 us/cm), which is consistent with the geological and geomorphological setting.

Dissolved iron (filtered) was identified at a concentration exceeding the laboratory limit of reporting (LOR) at MW1 only (0.008 mg/L). Dissolved aluminium (filtered) was recorded marginally above the laboratory LOR at monitoring wells MW1 and MW3 with concentrations of 0.01 and 0.013 mg/L recorded respectively. The observed concentrations of these ASS indicator species are not suggestive of associated impacts to the aquifer due to groundwater acidification.

Overall field and laboratory analysis results are not indicative of ASS impacts to groundwater in the locality of the site.

Chain of custody (CoC) documentation and laboratory data are presented in *Annex D*.

3.3 *ANALYTICAL DATA QUALITY*

Laboratory QA/QC procedures and results are detailed in the certified laboratory results contained in *Annex D*.

Analytical data quality checks were made to assess data in terms of completeness, representativeness, comparability, accuracy and precision.

All samples were collected, stored and transported to the laboratory in accordance with standard ERM protocols which are consistent with guidelines provided in the DEC's publication *Development of Sampling and Analysis Programs - Contaminated Sites Management Series* (DEC, 2001).

Laboratory analysis was undertaken within specified holding times in accordance with Schedule B(3) of the NEPM and using NATA accepted analytical procedures.

The overall field and laboratory QA/QC results indicate that the data is of sufficient quality to serve as a basis for interpretation in the assessment of ASS impacts to soil and groundwater at the site.

4 *CONCLUSIONS*

The ASS investigation results for the site do not indicate the presence of AASS/PASS within or adjacent to the proposed construction area.

Laboratory CRS results were all below the DEC threshold criterion of 0.03%S for coarse textured sands and loamy sands, which indicates that an Acid Sulfate Soils Management Plan (ASSMP) should not be required in support of construction of the facility, particularly in relation to earthworks and dewatering management requirements.

It is recommended that the findings of this investigation be formally reported in accordance with the latest DEC checklist requirements for a detailed ASS investigation and submitted for review and approval to discharge the ministerial conditions for the site.

5 *REFERENCES*

DEC, 2001. *Development of Sampling and Analysis Programs - Contaminated Sites Management Series.* Department of Environment and Conservation Contaminated Sites Management Series. December, 2001.

DEC, 2009. *Draft Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes*. Department of Environment and Conservation Acid Sulfate Soils Guideline Series. May 2009.

ERM, 2010 *Technical Ammonium Nitrate Production Facility Public Environmental Review*. Prepared by ERM on behalf of BNPL.

ERM, 2011. *Technical Ammonium Nitrate Production Facility Hydrogeological and Hydrological Investigation*. Internal report for BNPL, not published.

Golder Associates, 2011. *Geotechnical Investigation*. Proposed Technical Ammonium Nitrate Production Facility, Burrup Peninsula.

Steve Appleyard, 2011. Advice to ERM from the DEC regarding DEC approval of ASS results, 16 August 2011. pers. comms.

Annex A

Figures

Legend

🟥 Site D Boundary
▭ Area of Disturbance 'The Site'

Figure 1
Site Location

Client:	Burrup Nitrates Pty Ltd
Project:	Acid Sulfate Soil Report
Drawing	0086269p_ASS_G002_R0.mxd
Date:	15/08/2011 Drawing Size: A4
Drawn By:	DN Reviewed By: SS
Projection:	GDA 1994 MGA Zone 50
Scale:	Refer to scale bar

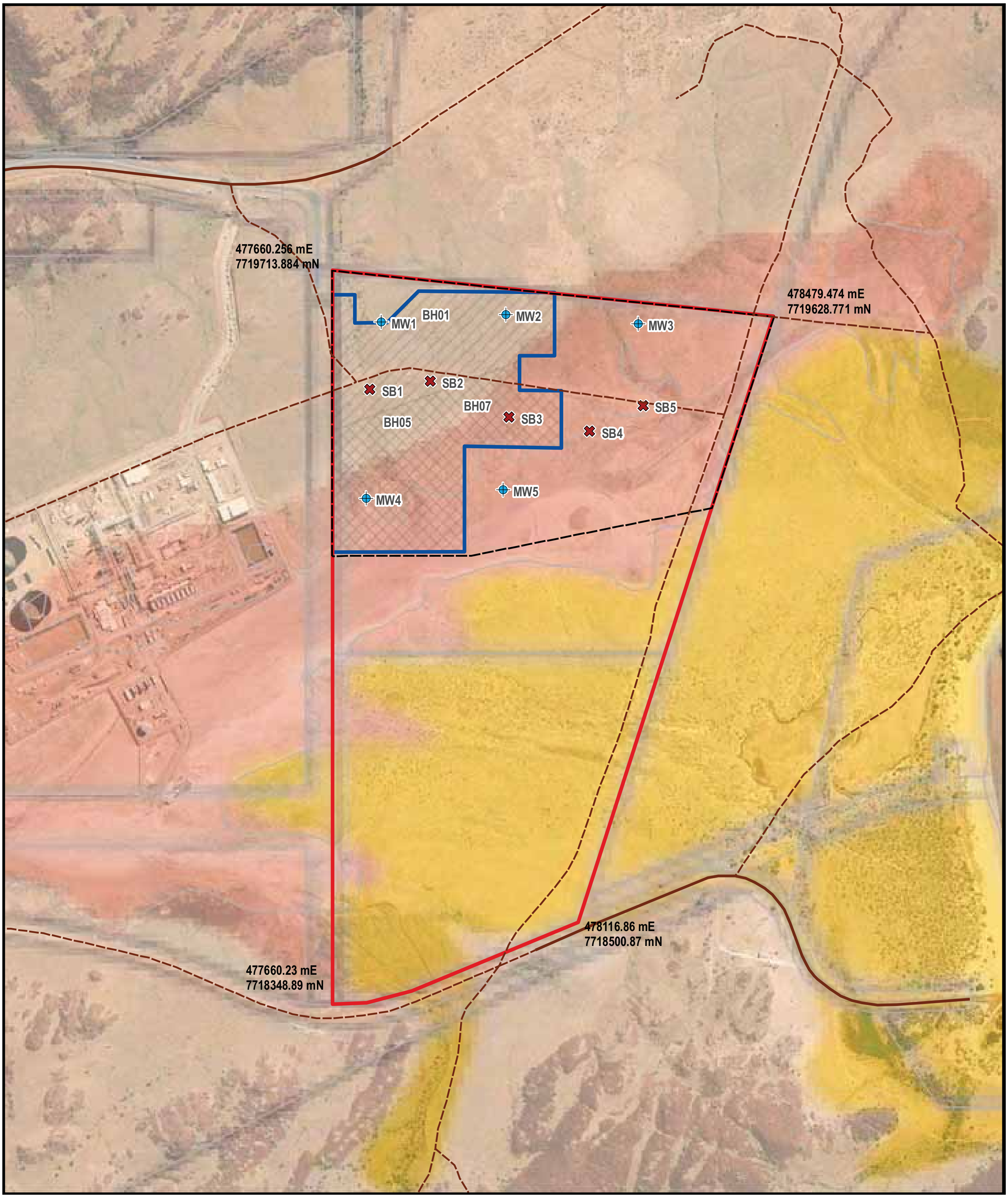
N
0 250 500 750Km

Maps and figures contained within this document may be based on third party data, may not be to scale and is intended for use as a guide only. ERM does not warrant the accuracy of any such maps or figures.

Environmental Resources Management Australia Pty Ltd

Adelaide, Brisbane, Canberra, Hunter Valley, Melbourne, Perth,Port Macquarie, Sydney

ERM



Legend

🟥 Site D Boundary

⬚ Area of Disturbance 'The Site'

🟦 Proposed Permanent Plant Area

Sampling Locations

⊕ Monitoring Well

✖ Soil Bore

Acid Sulfate Soils

🟧 high to moderate risk of ASS occurring within 3 m of natural soil surface

🟨 moderate to low risk of ASS occurring within 3 m of natural soil surface

▭ no known risk of ASS occurring within 3 m of natural soil surface (or deeper)

Plant Levels

▨ Cut

▩ Structural Fill

Client:	Burrup Nitrates Pty Ltd		
Project:	Acid Sulfate Soil Report		
Drawing No:	0086269p_ASS_G003_R0.mxd		
Date:	15/08/2011	Drawing size:	A4
Drawn by:	DN	Reviewed by:	SS
Source:	Aerial supplied by Landgate		
Scale:	1:10 000		

N

0 100 200 300m

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Figure 2

Preliminary Investigation Locations, ASS Risk Zoning and Earthworks

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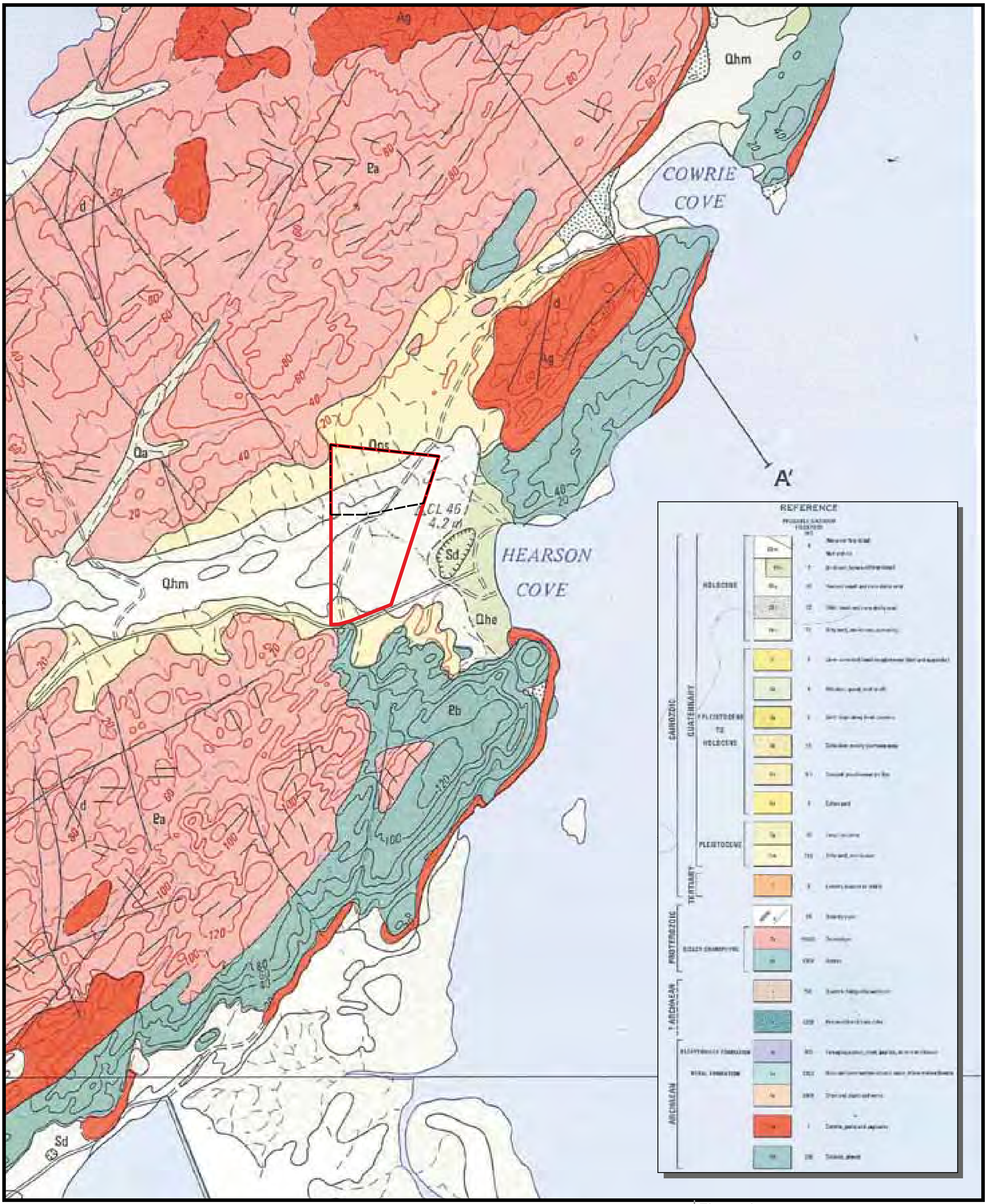
ERM



Legend

▭ Site D Boundary

⬚ Area of Disturbance 'The Site'

Client:	Burrup Nitrates Pty Ltd		
Project:	Acid Sulfate Soil Report		
Drawing	0086269p_ASS_G004_R0.mxd		
Date:	15/08/2011	Drawing Size:	A4
Drawn By:	DN	Reviewed By:	SS
Projection:	GDA 1994 MGA Zone 50		
Scale:	Refer to scale bar		

N

0 400 800 1,200m

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Figure 3

Geological Mapping

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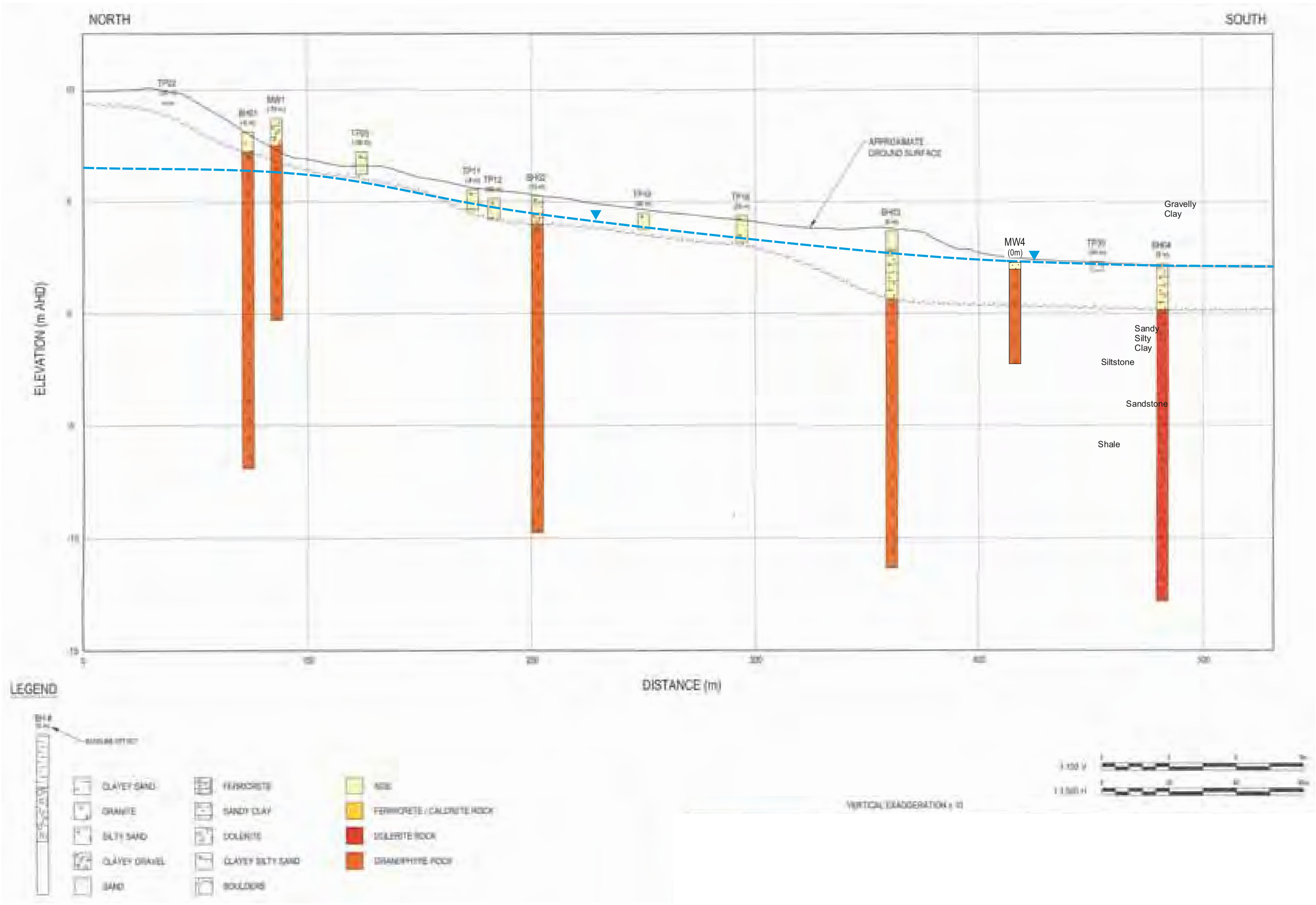
ERM



Legend

- - - - Inferred Groundwater Elevation
(April 2011)

Figure 4
Geological Cross-section

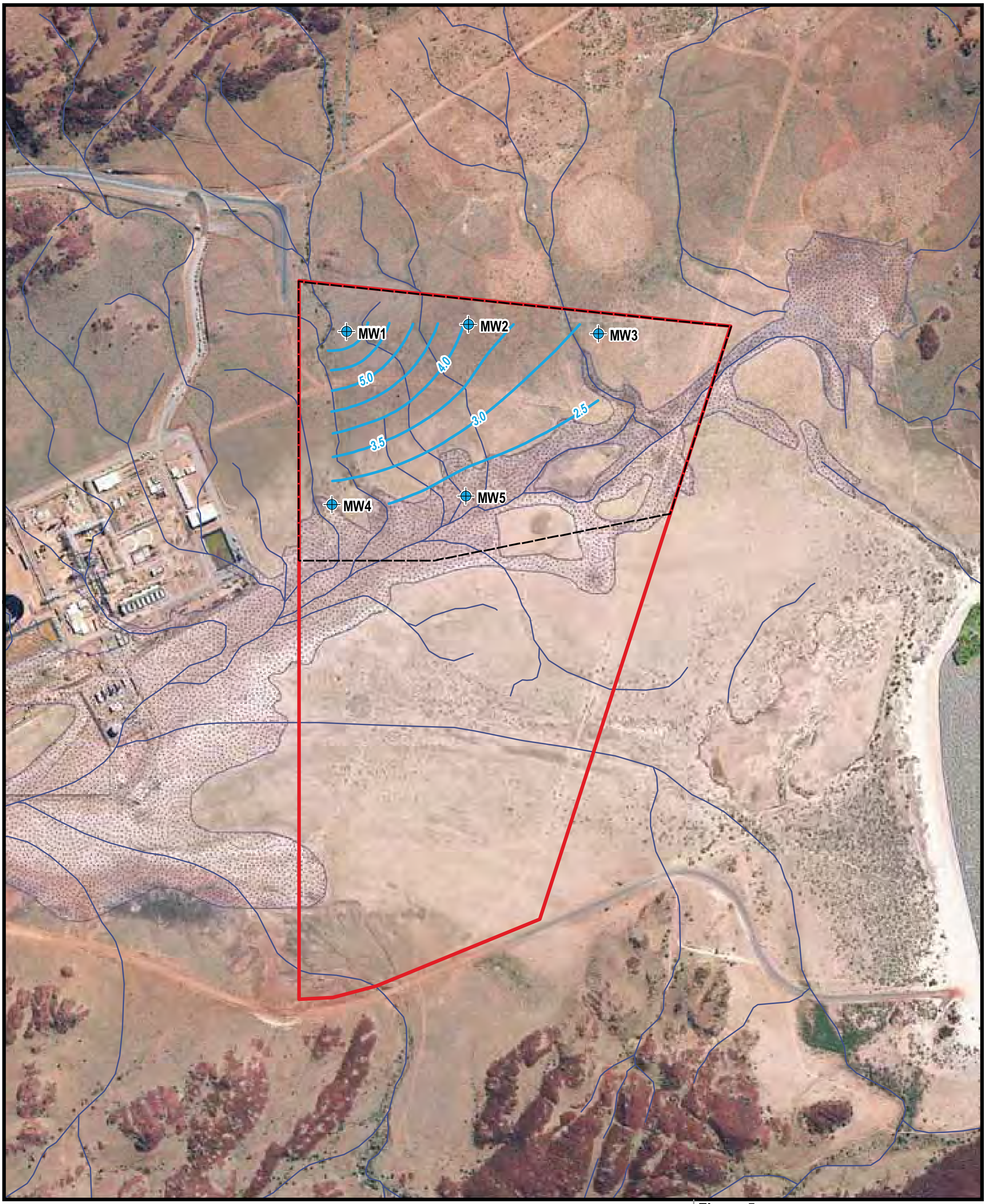
Client: Burrup Nitrates Pty Ltd
Project: Acid Sulfate Soil Report

Drawing No: 0082692p_ASS_C001.cdr
Date: 17/08/2011 Drawing size: A4
Drawn by: DN Reviewed by: BC
Source: -
Scale: Not to Scale

Environmental Resources Management Australia Pty Ltd

Brisbane, Canberra, Hunter Valley, Melbourne, Perth,
Port Macquarie, Sydney

ERM



Legend

- 🟥 Site D Boundary
- ▭ Area of Disturbance 'The Site'
- ⊕ Monitoring Well Locations
- — Groundwater Contour (mAHD)
- 3.5 Groundwater Elevation (mAHD)
- — Water Course
- ▨ Saline Coastal Flat

Client:	Burrup Nitrates Pty Ltd
Project:	Acid Sulfate Soil Report
Drawing	0086269p_ASS_G005_R0.mxd
Date:	17/08/2011 Drawing Size: A4
Drawn By:	DN Reviewed By: SS
Projection:	GDA 1994 MGA Zone 50
Scale:	Refer to scale bar

N

0 90 180 270m

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Figure 5

Inferred Groundwater Contours - April 2011

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Adelaide, Brisbane, Canberra, Hunter Valley, Melbourne, Perth,Port Macquarie, Sydney

ERM

Annex B

Borehole Logs And Groundwater Monitoring Forms

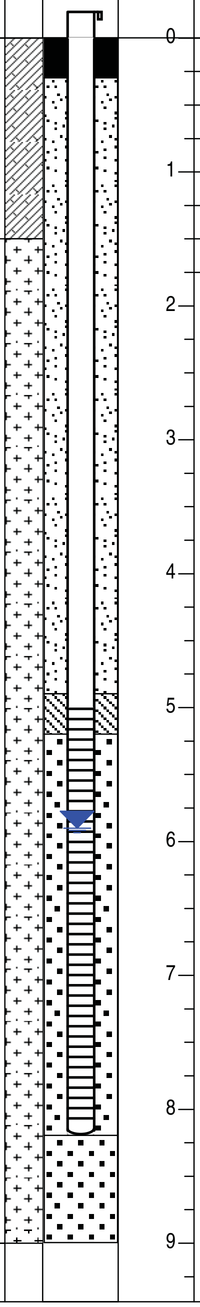
Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW1

ERM

ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**	Total Depth (m): **9.0**	Water Level (Final): **5.8**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **PVC Type 16**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **52**	East MGA: **477750.267**
Drill Method: **SSA, AR**	Surface Completion: **Standpipe**	North MGA: **7719618.897**
Hole Type: **Monitoring Well**	Water Strike:	



Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Orange brown, slightly damp, loose, fine to medium grain size, poorly sorted, sub-angular. Some gravel. Gravel content increasing from 0.25m depth. Some cobbles from 1.0m depth.					DS			MW1_0.0	
					DS			MW1_0.25	
					DS			MW1_0.5	
					DS			MW1_0.75	
					DS			MW1_1.0	
Granophyre Grey, fractured, bedrock Soft weathered material at 4.5 to 4.8m					DS			MW1_1.5	Air rotary from 0.5m due to SSA rejection on rocks. Slow Recharge. Slightly turbid brown water. Purged dry 3 times during development.
End of Log									

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

ID: MW2

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **EnviroTech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Monitoring Well**

Total Depth (m): **7.8**
Hole Diam. / Width (mm): **200**
Casing Type: **PVC Type 16**
Casing Diam. (mm): **52**
Surface Completion: **Standpipe**
Water Strike: **5.8**

Water Level (Final): **5.6**
RL Ground:
RL Case:
East MGA: **477982.134**
North MGA: **7719632.321**

ERM

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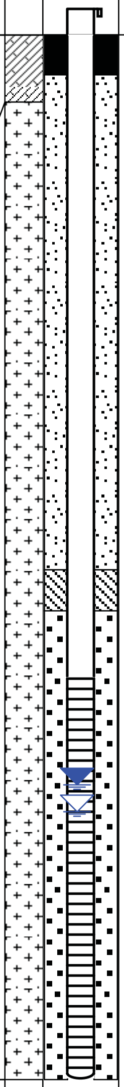

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sandy Gravel Brown, dry, loose, fine to medium grain size, poorly sorted, sub-angular.			0		DS			MW2_0.0	
					DS			MW2_0.25	
					DS			MW2_0.5	
Granophyre Grey, hard, bedrock. Soft weathered material at 2.5 - 2.8m			1						Air rotary from 0.5m due to SSA rejection on rock.
			2						
					DS			MW2_2.5	
			3						
			4						
			5						
			6						Moderate Recharge. Very turbid, becoming slightly turbid brown water. Purged dry 3 times during development.
			7						
End of Log			8						
			9						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates** Project No: **0086269** Project Name: **Burrup Nitrates TAN Plant** Site Name: **Burrup Nitrates TAN Plant** Site Address: **Village Road, Burrup Peninsula**		**ID: MW3**
Drill Start Date: **18/1/2011** Drill Finish Date: **18/1/2011** Drill Co: **EnviroTech Drilling** Driller: **Mark Italiano** Drill Method: **SSA, AR** Hole Type: **Monitoring Well**	Total Depth (m): **7.6** Hole Diam. / Width (mm): **200** Casing Type: **PVC Type 16** Casing Diam. (mm): **52** Surface Completion: **Standpipe** Water Strike: **5.5**	Water Level (Final): **3.6** RL Ground: RL Case: East MGA: **478228.561** North MGA: **7719614.980**

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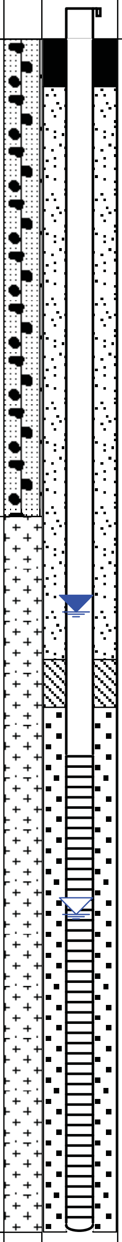

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Brown, dry, loose, fine grain size, poorly sorted, sub-angular. Some Boulders between 0.5 and 0.9m depth. Gravel content increasing from 0.25m depth.			0		DS			MW3_0.0	(DUP03)
					DS			MW3_0.25	(DUP04)
					DS			MW3_0.9	
			1						
					DS			MW3_1.5	Air rotary from 0.5 m due to SSA rejection on rock.
			2		DS			MW3_2.0	
					DS			MW3_2.5	
Granophyre Grey, hard.			3		DS			MW3_3.0	
			4						
			5						
			6						Moderate Recharge. Slightly turbid, becoming very turbid brown water. Purged dry 2 times during development.
			7						
End of Log									

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**

Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW4

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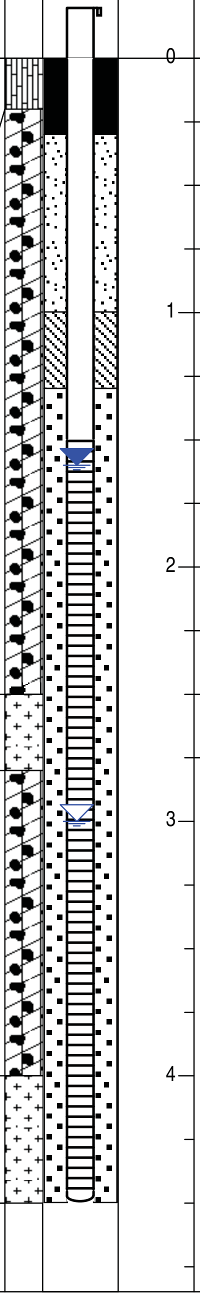
Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **Envirotech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Monitoring Well**

Total Depth (m): **4.5**
Hole Diam. / Width (mm): **200**
Casing Type: **PVC Type 16**
Casing Diam. (mm): **52**
Surface Completion: **Standpipe**
Water Strike: **3.0**

Water Level (Final): **1.6**
RL Ground:
RL Case:
East MGA: **477721.886**
North MGA: **7719306.205**



Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Silty Sand Brown, dry, loose, fine to medium grain size, poorly sorted, sub-angular to angular. With some cobbles. Fine shell fragments in upper 100mm of profile.			0		DS			MW4_0.0	
Clayey Gravel Brown, moist, loose, poorly sorted, sub-angular gravels. With cobbles and boulders.					DS			MW4_0.5	
			1		DS			MW4_1.0	
					DS			MW4_1.5	Unable to penetrate beyond 0.1m with SSA. Air rotary from surface.
			2		DS			MW4_2.0	
Rock Grey. Probable boulder.					DS			MW4_2.5	
Clayey Gravel Brown, moist, loose, moderately plastic, poorly sorted, sub-angular gravels. Some cobbles and boulders.			3						
Granophyre			4						Fast - moderate Recharge. Very turbid red brown water.
End of Log									

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

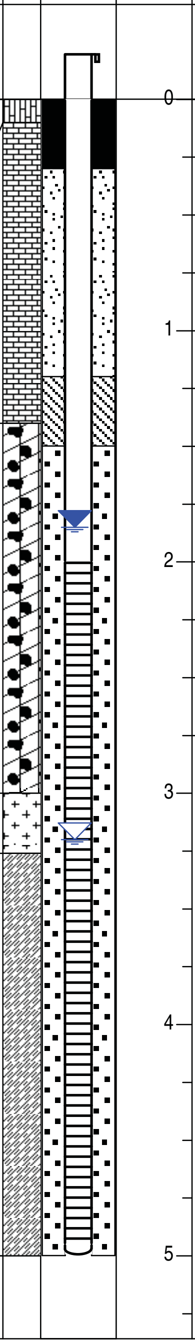
Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: MW5

ERM
ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**	Total Depth (m): **5.0**	Water Level (Final): **1.85**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **PVC Type 16**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **52**	East MGA: **477976.901**
Drill Method: **SSA, AR**	Surface Completion: **Standpipe**	North MGA: **7719306.205**
Hole Type: **Monitoring Well**	Water Strike: **3.2**	



Lithology	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface						
Clayey Sand Brown, damp, loose, fine to course grain size, poorly sorted, sub-angular to angular. Some cobbles.		DS			MW5_0.0	(DUP06) Salt crusting at surface.
Rock Hard brown, ferricrete/silcrete cemented.		DS			MW5_0.5	
		DS			MW5_1.0	
Clayey Gravel Red brown, damp, loose, fine to medium grain size, poorly sorted, sub-angular to angular gravels.		DS			MW5_1.5	Unable to penetrate beyond 0.1 with SSA. Air rotary from surface.
		DS			MW5_2.0	
		DS			MW5_2.5	
Rock Grey, hard. Probable boulder.						
Silty Clay Brown, moist, firm, plastic, traces of gravel.						Fast - moderate Recharge. Very turbid red brown water, becoming clear.
End of Log						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Page **1 of 1**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB1

ERM

ERM Australia Pty Ltd

Drill Start Date: **17/1/2011**
Drill Finish Date: **17/1/2011**
Drill Co: **EnviroTech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Soil Bore**

Total Depth (m): **3.0**
Hole Diam. / Width (mm): **200**
Casing Type: **NA**
Casing Diam. (mm): **NA**
Surface Completion: **NA**
Water Strike: **NA**

Water Level (Final): **NA**
RL Ground:
RL Case:
East MGA:
North MGA:

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Brown, dry, loose, fine to medium grain size, sub-angular. Some grains <120mm. Increasing grains <120mm content at 0.5m.			0		DS			SB1_0.0	Air Rotary from 0.5m due to rejection of SSA on unconsolidated rock.
					DS			SB1_0.25	
					DS			SB1_0.50	
					DS			SB1_0.75	
Rock Fractured bedrock.			1		DS			SB1_1.0	
			2						
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB2

ERM

ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **Envirotech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Soil Bore**

Total Depth (m): **3.0**
Hole Diam. / Width (mm): **200**
Casing Type: **NA**
Casing Diam. (mm): **NA**
Surface Completion: **NA**
Water Strike: **NA**

Water Level (Final): **NA**
RL Ground:
RL Case:
East MGA:
North MGA:

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Brown, dry, loose, low plasticity, fine-medium grain size, poorly sorted, sub-angular. Some grains <120mm. Increasing rocks <180mm content at 0.5m			0		DS			SB2_0.0	(Dup 02)
					DS			SB2_0.25	
					DS			SB2_0.5	Air Rotary from 0.5 due to SSA rejection on unconsolidated rock.
					DS			SB2_0.75	
			1		DS			SB2_1.0	
Rock Grey, hard, fractured.					DS			SB2_1.2	
			2						
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB3

ERM Australia Pty Ltd

Drill Start Date: **18/1/2011**
Drill Finish Date: **18/1/2011**
Drill Co: **EnviroTech Drilling**
Driller: **Mark Italiano**
Drill Method: **SSA, AR**
Hole Type: **Soil Bore**

Total Depth (m): **3.0**
Hole Diam. / Width (mm): **200**
Casing Type: **NA**
Casing Diam. (mm): **NA**
Surface Completion: **NA**
Water Strike: **NA**

Water Level (Final): **NA**
RL Ground:
RL Case:
East MGA:
North MGA:

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Sand Orange brown, slightly damp, loose, fine to medium grain size, poorly sorted, sub-angular. Some gravel.			0		DS			SB3_0.0	(DUP01) Salt crusting at surface.
Gravelly Clayey Sand Orange brown, slightly damp, loose, low plasticity, fine to medium grain size, poorly sorted. Some grains <150mm.					DS			SB3_0.25	
					DS			SB3_0.5	Air rotary from 0.5 m due to SSA rejection on rocks.
			1		DS			SB3_1.0	
Granophyre Grey, hard, bedrock.					DS			SB3_1.25	
			2						
End of Log			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB4

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Drill Start Date: **18/1/2011**	Total Depth (m): **3.0**	Water Level (Final): **NA**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **NA**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **NA**	East MGA:
Drill Method: **SSA, AR**	Surface Completion: **NA**	North MGA:
Hole Type: **Soil Bore**	Water Strike: **NA**	

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Clayey Gravely Red brown, fine to coarse grain size, sub-angular to angular. Some sand. Trace cobbles at the surface.			0		DS			SB4_0.0	Surficial rocky outcrops in surrounding areas (Black and Green). Air Rotary from 0.3 due to SSA rejection on unconsolidated rock.
Rock Red brown, hard ferricrete/silcrete cemented layer. Well cemented.					DS			SB4_0.25	
			1						
Clayey Sand Red brown, fine to coarse grain size, poorly sorted, sub-angular.									
					DS			SB4_1.5	
			2		DS			SB4_2.0	
					DS			SB4_2.5	
Granophyre Grey, bedrock.									
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Client: **Burrup Nitrates**
Project No: **0086269**
Project Name: **Burrup Nitrates TAN Plant**
Site Name: **Burrup Nitrates TAN Plant**
Site Address: **Village Road, Burrup Peninsula**

ID: SB5

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Drill Start Date: **18/1/2011**	Total Depth (m): **3.0**	Water Level (Final): **NA**
Drill Finish Date: **18/1/2011**	Hole Diam. / Width (mm): **200**	RL Ground:
Drill Co: **EnviroTech Drilling**	Casing Type: **NA**	RL Case:
Driller: **Mark Italiano**	Casing Diam. (mm): **NA**	East MGA:
Drill Method: **SSA, AR**	Surface Completion: **NA**	North MGA:
Hole Type: **Soil Bore**	Water Strike: **NA**	

Lithology	Symbol	Well	Depth (m)	Recovery	Sample Type	PPT (kPa)	PID (ppm)	Sample Details	Remarks
Ground Surface									
Silty Sand Brown, dry, loose, fine to medium grain size, moderately sorted, sub-angular. Shell fragments to 0.65m depth. Damp at 1.0m depth.			0		DS			SB5_0.0	Shell fragments to 0.65m. No evidence of corrosion.
					DS			SB5_0.25	
					DS			SB5_0.5	
Rock Red brown, hard ferrocrete/silcrete cemented layer.									
Clayey Sand Red brown, low plasticity, fine - coarse grains, poorly sorted, sub-angular.			1		DS			SB5_1.0	(DUP05)
					DS			SB5_1.5	Air Rotary from 1.0m due to SSA rejection on unconsolidated rock.
			2		DS			SB5_2.0	
					DS			SB5_2.5	
					DS			SB5_3.0	
			3						

NOTE: This bore log is for environmental purposes only and is not intended to provide geotechnical information.

Log By: **JG**
Checked By: **JT**

Groundwater - Well Sampling Data Form

Job Information

Date: 29.4.11	Time: arrive 1040 depart
Project Name: BURRUP ~~NT~~ TANPF	Project Number: 0086269
Site Location: BURRUP	Sampler: EO / JG
Well ID: MW1	Weather: cloudy (rain previous day)

Equipment

Water quality equipment description: HLQ5

Interface probe number: H1M1002

Purging equipment: (please cirlce)

Bailer type: [✓ Plastic] Teflon

Pump type: Peristaltic Submersible Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	[✓ 50mm]	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.49	[✓ 1.96]	7.85	12.3	17.7	31.4	49.1	70.7

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth 8735 m (-) Water level 2774 m (=) Water Column ~6 m

Water Column 6 m (x) Conversion Factor 1.96 (=) Litres per 1 Well Volume ~12 L

Depth to product: / m Product Thickness: / m Verified with Bailer: Y N NA

Water Quality Parameters

Beginning purge time:

Ending purge time:

Pump Intake Depth (mbtoc):

Litres	Time	PH	Temp °C	Cond mS/cm	DO mg/L	Redox mV	Drawdown <10cm	Comments
12	1045	6.98	31.83	2.83	2.01	77	–	~~slight~~ slow to
24	1047	6.96	31.43	3.03	2.46	-67	–	moderate recharge
36	1050	6.95	31.51	3.10	2.43	-74	-	
								slightly turbid
								no discernable odour
								v-pale brown

pH, temp, cond readings not necessary if well is purged dry

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour / drawdown depth

36 **Total Well Volume** Actual amount of water prior to sampling

– **Flow rate** mL/minute

Sample time 1055

Containers used 4p 3g

Did field parameters stabilise? [✓ Y] N NA

Was the well dry purged? Y N

Field QC Checks

Was pre-cleaned sampling equipment used for these samples?	[✓ Y]	N	
Was pre-cleaning sampling equipment properly protected from contamination?	[✓ Y]	N	
Was documentation of equipment conducted?	[✓ Y]	N	NA
Were air bubbles present in vials at time of collection?	Y	[✓ N]	NA
Was sample for metals field filtered prior to preservations?	[✓ Y]	N	NA
Duplicate sample collected?	[✓ Y]	N	Duplicate sample ID DUP01/TRIP01
Rinsate blank collected?	Y	[✓ N]	Rinsate blank ID –

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Groundwater - Well Sampling Data Form

Job Information

Date: 29 4 11
Time: arrive 12:50 depart 13:20
Project Name: BURRUP TANPF
Project Number: 0086265
Site Location: VILLAGE RD, BURRUP PENINSULA
Sampler: EO / JG.
Well ID: MW2
Weather: Overcast

Equipment

Water quality equipment description: HLQE
Interface probe number: HIM 1002.

Purging equipment: (please circle)
Bailer type: [✓ Plastic] Teflon
Pump type: Peristaltic Submersible Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	[✓ 50mm]	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.49	[✓ 1.96]	7.85	12.3	17.7	31.4	49.1	70.7

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth (-) Water level (=) Water Column
8.210 m (-) 2.926 m (=) 5 m

Water Column (x) Conversion Factor (=) Litres per 1 Well Volume
5 m (x) 1.96 (=) 10 L

Depth to product: - m
Product Thickness: - m
Verified with Bailer: [✓ Y] N

Water Quality Parameters

Beginning purge time:
Ending purge time:
Pump Intake Depth (mbtoc):

Litres	Time	PH	Temp °C	Cond mS/cm	DO mg/L	Redox mV	Drawdown <10cm	Comments
10	12:55	7.16	31.89	3.39	2.10	56	-	TURBID, PALE BROWN
20	12:59	7.15	32.00	3.47	2.72	56	-	NO ODOUR
30	13:09	7.16	31.98	3.54	2.74	57		MODERATE RECHARGE
								GOOD YIELD.

**pH, temp, cond readings not necessary if well is purged dry*

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour / drawdown depth

30 **Total Well Volume** Actual amount of water prior to sampling
N/A **Flow rate** mL/minute

Sample time 1310
Containers used 3G 4P
Did field parameters stabilise? [✓ Y] N NA
Was the well dry purged? Y [✓ N]

Field QC Checks

Was pre-cleaned sampling equipment used for these samples?	[✓ Y]	N	
Was pre-cleaning sampling equipment properly protected from contamination?	[✓ Y]	N	
Was documentation of equipment conducted?	[✓ Y]	N	NA
Were air bubbles present in vials at time of collection?	Y	[✓ N]	NA
Was sample for metals field filtered prior to preservations?	[✓ Y]	N	NA
Duplicate sample collected?	Y	[✓ N]	Duplicate sample ID
Rinsate blank collected?	[✓ Y]	N	Rinsate blank ID RIN01

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Groundwater - Well Sampling Data Form

Job Information

Date: 29.4.11	Time: arrive 1231 depart
Project Name: BURRUP TANPF	Project Number: 0086269
Site Location: BURRUP	Sampler: EO/JG
Well ID: MW3	Weather: RAIN

Equipment

Water quality equipment description: HLQ5

Interface probe number: HIM1002

Purging equipment: (please circle)

Bailer type: [✓ Plastic] Teflon

Pump type: Peristaltic Submersible Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	[✓ 50mm]	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.49	[✓ 1.96]	7.85	12.3	17.7	31.4	49.1	70.7

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth 8.200 m (-) Water level 2.007 m (=) Water Column ~6.2 m

Water Column 6 m (x) Conversion Factor 1.96 (=) Litres per 1 Well Volume ~12 L

Depth to product: / m

Product Thickness: / m

Verified with Bailer: Y N N/A

Water Quality Parameters

Beginning purge time: 1232

Ending purge time:

Pump Intake Depth (mbtoc): —

Litres	Time	PH	Temp °C	Cond mS/cm	DO mg/L	Redox mV	Drawdown <10cm	Comments
12	12.32	7.56	30.45	38.9	1.95	-218	—	PUNGENT ODOUR (H2S?)
24	12.35	7.34	30.49	18.0	1.93	-163	—	
36	12.37	7.28	30.52	15.8	2.60	-120	—	slightly turbid
48	12.41	7.30	30.60	16.0	2.80	-100	—	grey becoming pale brown
								moderate recharge /
								good yield.

*pH, temp, cond readings not necessary if well is purged dry

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour / drawdown depth

	Total Well Volume Actual amount of water prior to sampling	Sample time 1245	Containers used 4p3g
—	**Flow rate** mL/minute	Did field parameters stabilise? [✓ Y] N NA	Was the well dry purged? Y [✓ N]

Field QC Checks

Was pre-cleaned sampling equipment used for these samples?	[✓ Y]	N		
Was pre-cleaning sampling equipment properly protected from contamination?	[✓ Y]	N		
Was documentation of equipment conducted?	[✓ Y]	N	NA	
Were air bubbles present in vials at time of collection?	Y	[✓ N]	NA	
Was sample for metals field filtered prior to preservations?	[✓ Y]	N	NA	
Duplicate sample collected?	Y	[✓ N]		Duplicate sample ID /
Rinsate blank collected?	Y	[✓ N]		Rinsate blank ID /

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Groundwater - Well Sampling Data Form

Job Information

Date: 29-4-11

Time: arrive 1150 depart 1205

Project Name: BURRUP TANPF

Project Number: 0086269

Site Location: BURRUP

Sampler: EO/JG

Well ID: MW4

Weather: RAIN / CLOUDY

Equipment

Water quality equipment description: HLQ5

Interface probe number: HIM1002

Purging equipment: (please cirlce)

Bailer type: [✓ Plastic] Teflon

Pump type: Peristaltic Submersible Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	[✓ 50mm]	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.49	[✓ 1.96]	7.85	12.3	17.7	31.4	49.1	70.7

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth 4.780 m (-) Water level 0.898 m (=) Water Column ~4 m

Water Column ~4 m (x) Conversion Factor 1.96 (=) Litres per 1 Well Volume 8. L

Depth to product: / m Product Thickness: / m Verified with Bailer: Y N NA

Water Quality Parameters

Beginning purge time:

Ending purge time:

Pump Intake Depth (mbtoc):

Litres	Time	PH	Temp °C	Cond mS/cm	DO mg/L	Redox mV	Drawdown <10cm	Comments
8	1152	7.65	30.10	12.20	2.68	125	—	HIGHLY TURBID
16	1154	7.65	30.60	12.26	2.20	124	—	SILTY
24	1157	7.64	30.59	12.16	2.23	125	—	ORANGE
								NO ODOUR
								GOOD RECHARGE / YIELD

*pH, temp, cond readings not necessary if well is purged dry

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour / drawdown depth

24 **Total Well Volume** Actual amount of water prior to sampling

— **Flow rate** mL/minute

Sample time 1158

Containers used 4, 3g

Did field parameters stabilise? [✓ Y] N NA

Was the well dry purged? Y [✓ N]

Field QC Checks

Was pre-cleaned sampling equipment used for these samples?	[✓ Y]	N	
Was pre-cleaning sampling equipment properly protected from contamination?	[✓ Y]	N	
Was documentation of equipment conducted?	[✓ Y]	N	NA
Were air bubbles present in vials at time of collection?	Y	[✓ N]	NA
Was sample for metals field filtered prior to preservations?	[✓ Y]	N	NA
Duplicate sample collected?	Y	[✓ N]	Duplicate sample ID /
Rinsate blank collected?	Y	[✓ N]	Rinsate blank ID /

Groundwater - Well Sampling Data Form

Job Information

Date: 29-4-11	Time: arrive 1130 depart 1145
Project Name: BURRUP TANPF	Project Number: 0086269
Site Location: BURRUP	Sampler: EO/JG
Well ID: MW5	Weather: cloudy, some rain

Equipment

Water quality equipment description: HLQ5

Interface probe number: HIM1002

Purging equipment: (please cirlce)

Bailer type: [✓ Plastic] Teflon

Pump type: Peristaltic Submersible Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	[✓ 50mm]	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor (volume in factor L/m)	0.49	[✓ 1.96]	7.85	12.3	17.7	31.4	49.1	70.7

Volume of water in well / V = Pr x r x h
V = volume in litres
P = 3.14159
r = radius in cm
h = height of water column in cm

Total Well Depth 5.100 m (-) Water level 0.566 m (=) Water Column 4.5 m

Water Column 4.5 m (x) Conversion Factor 1.96 (=) Litres per 1 Well Volume ~9 L

Depth to product: / m Product Thickness: / m Verified with Bailer: ☐ Y ☐ N NA

Water Quality Parameters

Beginning purge time:	Ending purge time:	Pump Intake Depth (mbtoc):

Litres	Time	PH	Temp °C	Cond mS/cm	DO mg/L	Redox mV	Drawdown <10cm	Comments
9	1132	7.12	31.16	m18 10.00	2.13	166	–	orange turbid
18	1135	6.76	31.50	"	2.25	221	–	no odour
27	1137	6.73	31.62	"	2.12	237		
								moderate recharge

pH, temp, cond readings not necessary if well is purged dry

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour / drawdown depth

27	**Total Well Volume** Actual amount of water prior to sampling	Sample time 1140 Containers used 4p39
–	**Flow rate** mL/minute	Did field parameters stabilise? [✓ Y] N NA Was the well dry purged? Y [✓ N]

Field QC Checks

Was pre-cleaned sampling equipment used for these samples?	[✓ Y]	N	
Was pre-cleaning sampling equipment properly protected from contamination?	[✓ Y]	N	
Was documentation of equipment conducted?	[✓ Y]	N	NA
Were air bubbles present in vials at time of collection?	Y	[✓ N]	NA
Was sample for metals field filtered prior to preservations?	[✓ Y]	N	NA
Duplicate sample collected?	Y	[✓ N]	
Rinsate blank collected?	Y	[✓ N]	

Duplicate sample ID /

Rinsate blank ID /

WELL MONITORING FORM

PROJECT : 0086269
JOB No: BURRUP NITRATES
LOCATION : BURRUP
DATE : 29.4.11
TIME:
OPERATOR : EO/JG
METHOD : IP

WELL ID	TIME	WELL DEPTH	T.O.C. ELEV. (m)	DEPTH WATER (m)	DEPTH PETRO (m)	PRODUCT IN WELL	PETRO THICK (m)	TOP OF LIQUIDS (m)
MW1	1040	8.735	—	2.774	—	—	—	—
MW5	1130	5.100	—	0.566	—	—	—	—
MW4	1150	4.720	—	0.898	—	—	—	—
MW3	1230	8.200	—	~~8~~2.007	—	—	—	—
MW2	1255	8.210	—	2.926	—	—	—	—

NOTES: Type text in this box.

Site sheets.xls Well Gauge Form

Completed by: EO
Checked by:

Annex C

Tables

Table 1
ASS Field Screening and Analytical Results (Soil)
Burrup Nitrates TAN Production Facility

	Lithology Summary		Field Screening Results					Analytical Results			
Sample ID	Depth	Description	pHf	pHfox	∆ pH	Reaction	Analysis	pH KCl	TAA	SCr	Net Acidity
SB1	0.00	Clayey gravelly sand: brown, dry, loose, fine-medium grained	5.8	5.8	0.0	extreme	NR	NR	NR	NR	NR
	0.25	Clayey gravelly sand: brown, dry, loose, fine-medium grained	5.9	6.1	<0.0	moderate	NR	NR	NR	NR	NR
	0.50	Clayey gravelly sand: brown, dry, loose, fine-medium grained	5.9	6.2	<0.0	extreme	**CRS**	**9.4**	<0.01	<0.005	<0.01
	0.75	Clayey gravelly sand: brown, dry, loose, fine-medium grained	6.3	7.3	<0.0	extreme	**CRS**	**8.4**	<0.01	<0.005	<0.01
	1.00	Clayey gravelly sand: brown, dry, loose, fine-medium grained	7.7	8.0	<0.0	extreme	**CRS**	**8.9**	<0.01	<0.005	<0.01
SB2	0.00	Clayey sand with ~10% cobbles: brown, dry, loose, low plasticity, fine-medium grained	9.3	7.9	1.5	moderate	NR	NR	NR	NR	NR
	0.25	Clayey sand with ~10% cobbles: brown, dry, loose, low plasticity, fine-medium grained	9.2	7.2	2.0	moderate	NR	NR	NR	NR	NR
	0.50	Clayey sand with ~10% cobbles: brown, dry, loose, low plasticity, fine-medium grained	8.7	7.0	1.7	extreme	NR	NR	NR	NR	NR
	0.75	Clayey sand with ~30% cobbles: brown, dry, loose, low plasticity, fine-medium grained	8.5	8.3	0.2	extreme	NR	NR	NR	NR	NR
	1.00	Clayey sand with ~30% cobbles: brown, dry, loose, low plasticity, fine-medium grained	8.9	8.7	0.2	extreme	NR	NR	NR	NR	NR
	1.25	Clayey sand with ~30% cobbles: brown, dry, loose, low plasticity, fine-medium grained	8.1	8.9	<0.0	extreme	NR	NR	NR	NR	NR
SB3	0.00	Clayey gravelly sand: orange brown, slightly damp, loose, low plasticity, fine-medium grained	7.2	6.9	0.3	moderate	NR	NR	NR	NR	NR
	0.25	Clayey gravelly sand: orange brown, slightly damp, loose, low plasticity, fine-medium grained, ~20% cobbles	8.1	8.3	<0.0	moderate	NR	NR	NR	NR	NR
	0.50	Clayey gravelly sand: orange brown, slightly damp, loose, low plasticity, fine-medium grained, ~20% cobbles	8.2	7.2	1.0	slight	NR	NR	NR	NR	NR
	1.00	Clayey gravelly sand: orange brown, slightly damp, loose, low plasticity, fine-medium grained, ~20% cobbles	8.6	9.3	<0.0	slight	NR	NR	NR	NR	NR
	1.25	Clayey gravelly sand: orange brown, slightly damp, loose, low plasticity, fine-medium grained, ~20% cobbles	9.3	9.9	<0.0	slight	NR	NR	NR	NR	NR
SB4	0.00	Clayey sandy gravel: red-brown, damp, plastic, fine-coarse, approx.y 20% clay	8.4	7.8	0.7	slight	NR	NR	NR	NR	NR
	0.25	Clayey sandy gravel: red-brown, damp, plastic, fine-coarse, approx.y 20% clay	8.8	9.1	<0.0	extreme	NR	NR	NR	NR	NR
	1.50	Clayey sand: red-brown, damp, low plasticity, fine-coarse grained	9.8	10.7	<0.0	extreme	NR	NR	NR	NR	NR
	2.00	Clayey sand: red-brown, damp, low plasticity, fine-coarse grained	9.2	9.7	<0.0	extreme	NR	NR	NR	NR	NR
	2.50	Clayey sand: red-brown, damp, low plasticity, fine-coarse grained	9.5	10.6	<0.0	extreme	NR	NR	NR	NR	NR
SB5	0.00	Silty sand: brown, dry, loose, fine-medium grained, small shell fragments within soil	9.3	6.9	2.4	slight	**CRS**	**9.9**	<0.01	<0.005	<0.01
	0.25	Silty sand: brown, dry, loose, fine-medium grained, small shell fragments within soil	9.1	7.4	1.7	slight	**CRS**	**10.1**	<0.01	<0.005	<0.01
	0.50	Silty sand: brown, slightly damp, loose, fine-medium grained	9.1	7.0	2.1	slight	**CRS**	**10.1**	<0.01	<0.005	<0.01
	1.00	Silty sand: brown, slightly damp, loose, fine-medium grained	9.5	7.7	1.8	moderate	**CRS**	**10.0**	<0.01	<0.005	<0.01
	1.50	Silty sand: brown, slightly damp, loose, fine-medium grained	9.3	8.0	1.3	slight	**CRS**	**10.0**	<0.01	<0.005	<0.01
	2.00	Silty sand: brown, slightly damp, loose, fine-medium grained	9.4	9.5	<0.0	slight	NR	NR	NR	NR	NR
	2.50	Silty sand: brown, slightly damp, loose, fine-medium grained	9.5	10.1	<0.0	moderate	NR	NR	NR	NR	NR
	3.00	Silty sand: brown, slightly damp, loose, fine-medium grained	9.2	9.7	<0.0	slight	NR	NR	NR	NR	NR
MW1	0.00	Clayey sand: brown, slightly damp, loose, low plasticity, fine grained, approx.y 15% gravels	9.2	7.5	1.8	extreme	**CRS**	**8.8**	<0.01	<0.005	<0.01
	0.25	Clayey gravelly sand: brown, slightly damp, loose, low plasticity, fine grained, approx. 20% gravels	9.2	8.5	0.7	extreme	**CRS**	**9.4**	<0.01	<0.005	<0.01
	0.50	Clayey gravelly sand: brown, slightly damp, loose, low plasticity, fine grained, approx. 20% gravels	9.1	8.5	0.6	extreme	NR	NR	NR	NR	NR
	0.75	Clayey gravelly sand: brown, slightly damp, loose, low plasticity, fine grained, approx. 20% gravels	9.1	7.6	1.5	moderate	NR	NR	NR	NR	NR
	1.00	Clayey gravelly sand: brown, slightly damp, loose, low plasticity, fine grained, approx. 50% gravels	9.2	8.6	0.6	moderate	NR	NR	NR	NR	NR
	1.50	Clayey gravelly sand: brown, slightly damp, loose, low plasticity, fine grained, approx. 50% gravels	9.4	9.1	0.3	extreme	NR	NR	NR	NR	NR
MW2	0.00	Clayey gravelly sand: brown, dry, loose, low plasticity, 50-70% cobbles <200 mm	8.2	5.6	2.6	moderate	**CRS**	**8.0**	<0.01	<0.005	<0.01
	0.25	Clayey gravelly sand: brown, dry, loose, low plasticity, 50-70% cobbles <200 mm	7.9	7.0	1.0	moderate	NR	NR	NR	NR	NR
	0.50	Clayey gravelly sand: brown, dry, loose, low plasticity, 50-70% cobbles <200 mm	8.1	6.5	1.6	moderate	**CRS**	**7.9**	<0.01	<0.005	<0.01
	2.50	Weathered rock: grey, damp, fine grained	9.2	9.0	0.2	extreme	NR	NR	NR	NR	NR
MW3	0.00	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 10% gravel	9.7	7.3	2.4	moderate	**CRS**	**9.6**	<0.01	<0.005	<0.01
	0.25	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.3	7.9	1.4	moderate	**CRS**	**9.7**	<0.01	<0.005	<0.01
	0.50	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.0	8.3	0.7	moderate	NR	NR	NR	NR	NR
	0.90	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.6	9.3	0.3	extreme	NR	NR	NR	NR	NR
	1.50	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.7	10.0	<0.0	extreme	NR	NR	NR	NR	NR
	2.00	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.6	9.9	<0.0	moderate	NR	NR	NR	NR	NR
	2.50	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.8	9.4	0.4	extreme	NR	NR	NR	NR	NR
	3.00	Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.8	9.7	0.1	extreme	NR	NR	NR	NR	NR
MW4	0.00	Silty Sand: brown, dry, loose, non-plastic, fine to medium grained, approx.y 50% cobbles, fine shell fragments	8.8	8.1	0.7	moderate	NR	NR	NR	NR	NR
	0.50	Clayey gravel with cobbles and boulders: brown, damp, loose, low to medium plasticity	9.2	8.5	0.7	extreme	NR	NR	NR	NR	NR
	1.00	Clayey gravel with cobbles and boulders: brown, damp, loose, low to medium plasticity	9.4	7.3	2.0	slight	**CRS**	**9.5**	<0.01	<0.005	<0.01
	1.50	Clayey gravel with cobbles and boulders: brown, damp, loose, low to medium plasticity	9.4	9.6	<0.0	extreme	NR	NR	NR	NR	NR
	2.00	Clayey gravel with cobbles and boulders: brown, damp, loose, low to medium plasticity	9.5	9.7	<0.0	extreme	NR	NR	NR	NR	NR
	2.50	Clayey gravel with cobbles and boulders: brown, damp, loose, low to medium plasticity	9.1	9.2	<0.0	extreme	NR	NR	NR	NR	NR
MW5	0.00	Clayey sand: brown, damp, loose, fine-coarse grained, salt crusting at surface	8.4	7.3	1.2	moderate	**CRS**	**9.8**	<0.01	<0.005	<0.01
	1.00	Clayey gravel: red-brown, damp, loose, medium plasticity, fine-medium grained	9.1	7.1	2.1	slight	**CRS**	**9.8**	<0.01	<0.005	<0.01
	1.50	Clayey gravel: red-brown, damp, loose, medium plasticity, fine-medium grained	9.0	7.4	1.6	slight	**CRS**	**9.9**	<0.01	<0.005	<0.01
	2.00	Clayey gravel: red-brown, damp, loose, medium plasticity, fine-medium grained	8.9	8.6	0.3	slight	NR	NR	NR	NR	NR
	2.50	Clayey gravel: red-brown, damp, loose, medium plasticity, fine-medium grained	8.9	7.8	1.1	slight	**CRS**	**9.9**	<0.01	<0.005	<0.01
	3.00	Clayey gravel: red-brown, damp, loose, medium plasticity, fine-medium grained	9.1	9.2	<0.0	slight	NR	NR	NR	NR	NR
DUP01	0.00	(SB3) Clayey gravelly sand: orange brown, slightly damp, loose, low plasticity, fine-medium grained	7.6	6.8	0.8	moderate	NR	NR	NR	NR	NR
DUP02	0.00	(SB2) Clayey sand with ~10% cobbles: brown, dry, loose, low plasticity, fine-medium grained	9.1	6.6	2.5	slight	**CRS**	**9.3**	<0.01	<0.005	<0.01
DUP03	0.00	(MW3) Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 10% gravel	9.5	6.8	2.6	slight	**CRS**	**9.7**	<0.01	<0.005	<0.01
DUP04	0.25	(MW3) Clayey sand: brown, dry, loose, low plasticity, fine grained, approx.y 30% gravel <180 mm	9.3	7.7	1.6	slight	**CRS**	**9.7**	<0.01	<0.005	<0.01
DUP05	1.50	(SB5) Silty sand: brown, slightly damp, loose, fine-medium grained	9.3	7.2	2.0	moderate	**CRS**	**10.1**	<0.01	<0.005	<0.01
DUP06	0.00	(MW5) Clayey sand: brown, damp, loose, fine-coarse grained, salt crusting at surface	8.3	6.9	1.4	moderate	**CRS**	**9.8**	<0.01	<0.005	<0.01

Regulatory Assessment		
Potential plus actual acidity (%S)	**0.03**	
Net acidity (%S)		**0.03**

All analytical results in %S, except pH (pH units)

Bold font indicates result above the laboratory limit of reporting (LOR)

🟨 yellow shading indicates result equal to or above the DEC potential plus actual acidity guideline for coarse textured soils

🟧 orange shading indicates result equal to or above the DEC net acidity guideline for coarse textured soils (discounting acid neutralising capacity)

CRS - Chromium Reducible Suite
SCr - Chromium Reducible Sulphur
TAA - Titratable Actual Acidity
NR- Analysis not requested

ASS Field Screening and Analytical Results (Water)
Burrup Nitrates TAN Production Facility
Table 2 - Inorganics

Sample ID	Date	Alkalinity (Bicarbonate)	Alkalinity (Carbonate)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Cations Total	Chloride	Hydrogen sulfide	Ionic Balance	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised)	Nitrogen (Total)	Reactive Phosphorus as P	Silica	Silica (Filtered)	Sodium (Filtered)	Sulphate	TDS	Hardness as CaCO3	Hardness by Calculation (Filtered)	Sum of Ions
		mg/L	mg/L	µg/L	mg/L	µg/L	meq/L	meq/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		1	1	1000	1	5	0.01	0.01	1	0.5	-100	0.005	0.005	0.005	50	0.002	100	50	0.5	1	5	1	5	0
MW1	30/04/2011	420	<1	-	350	38	-	-	780	<0.5	-3	1.7	<0.005	1.7	2500	<0.002	-	30,000	350	170	2000	-	760	1920
MW2	30/04/2011	340	<1	-	280	200	-	-	930	<0.5	1	3.3	<0.005	3.3	3900	0.004	-	26,000	570	170	2000	-	520	2120
MW3	30/04/2011	490	<1	-	400	54	-	-	5400	<0.5	1	1.9	<0.005	1.9	2600	0.003	-	34,000	3400	800	9800	-	1500	10,600
MW4	30/04/2011	630	<1	-	510	740	-	-	3900	<0.5	0	0.82	<0.005	0.82	2100	0.008	-	19,000	2700	350	6700	-	520	7710
MW5	30/04/2011	450	<1	-	370	56	-	-	87,000	<0.5	-1	1.1	<0.005	1.1	5100	0.007	-	10,000	48,000	5200	130,000	-	19,000	148,000
DUP01	30/04/2011	380	<1	-	310	47	-	-	800	<0.5	-1	1.4	<0.005	1.4	2000	<0.002	-	31,000	390	170	2000	-	730	1930
RIN1	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	30/04/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP01	30/04/2011	330	<1	<1000	330	-	32.2	30	781	-	3.52	1.22	<0.01	1.22	-	<0.01	27,100	-	352	174	1950	721	-	-

Notes:

DUP01 and TRIP01 derived from parent sample MW1

RIN1 derived from parent sample MW2

ASS Field Screening and Analytical Results (Water)
Burrup NItrates TAN Production Facility
Table 3 - Metals

Sample ID	Date	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (hexavalent)	Chromium (hexavalent) (Filtered)	Chromium (III+VI) (Filtered)	Chromium (Trivalent)	Chromium (Trivalent) (Filtered)	Iron (Filtered)	Lead (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury	Mercury (Filtered)	Phosphorus	Potassium (Filtered)	Selenium (Filtered)	Silicon (Filtered)	Zinc (Filtered)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L
		0.001	0.001	0.0001	0.2	0.002	0.01	0.001	0.005	0.01	0.005	0.001	0.1	0.001	0.00005	0.0001	0.01	0.1	0.002	20	0.001
MW1	30/04/2011	0.01	<0.001	<0.0001	200	<0.002	-	<0.001	<0.005	-	0.008	<0.001	63	0.17	<0.00005	-	0.06	10	<0.002	14,000	0.016
MW2	30/04/2011	0.005	<0.001	<0.0001	99	<0.002	-	<0.001	<0.005	-	<0.005	<0.001	66	<0.005 - 0.005	<0.00005	-	0.09	19	0.003	12,000	0.013
MW3	30/04/2011	0.013	<0.005	<0.0005	120	<0.002	-	<0.005	<0.005	-	<0.025	<0.005	300	0.02 - 0.022	<0.00005	-	0.16	130	<0.01	16,000	0.02
MW4	30/04/2011	<0.005	<0.005	<0.0005	39	<0.002	-	<0.005	<0.005	-	<0.025	<0.005	100	0.013 - 0.014	<0.00005	-	0.79	110	<0.01	8700	0.01
MW5	30/04/2011	<0.05	<0.05	<0.005	1000	0.01	-	<0.05	<0.005	-	<0.25	<0.05	4100	0.2 - 0.22	0.00011	-	0.11	1900	<0.1	4900	<0.05
DUP01	30/04/2011	0.009	<0.001	<0.0001	190	<0.002	-	<0.001	<0.005	-	0.008	<0.001	62	0.18 - 0.19	<0.00005	-	0.05	10	<0.002	14,000	0.02
RIN1	30/04/2011	0.002	<0.001	<0.0001	-	-	-	<0.001	-	-	<0.005	<0.001	-	<0.001	<0.00005	-	-	-	<0.002	-	0.009
Trip Blank	30/04/2011	<0.001	<0.001	<0.0001	-	-	-	<0.001	-	-	<0.005	<0.001	-	<0.001	<0.00005	-	-	-	<0.002	-	0.012
TRIP01	30/04/2011	0.01	<0.001	<0.0001	188	-	<0.01	<0.001	-	<0.01	<0.05	<0.001	61	0.139	-	<0.0001	-	12	<0.01	-	<0.005

Notes:

DUP01 and TRIP01 derived from parent sample MW1

RIN1 derived from parent sample MW2

ASS Field Screening and Analytical Results (Water)
Burrup Nitrates TAN Production Facility
Table 4 - TPH

Sample ID	Date	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH+C10 - C36 (Sum of total)	TPH C10 - C40 (Sum of total)	TPH C6-C10
		mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
		0.1	0.1	0.1	20	50	100	50	50	100	0.02
MW1	30/04/2011	-	-	-	<40	<50	<200	<200	<450	-	-
MW2	30/04/2011	-	-	-	<40	<50	<200	<200	<450	-	-
MW3	30/04/2011	-	-	-	<40	<50	<200	<200	<450	-	-
MW4	30/04/2011	-	-	-	<40	<50	<200	<200	<450	-	-
MW5	30/04/2011	-	-	-	<40	81	<200	<200	281	-	-
DUP01	30/04/2011	-	-	-	<40	<50	<200	<200	<450	-	-
RIN1	30/04/2011	-	-	-	<40	-	-	-	-	-	-
Trip Blank	30/04/2011	-	-	-	<40	-	-	-	-	-	-
TRIP01	30/04/2011	<0.1	<0.1	<0.1	<20	<50	<100	<50	<50	<100	<0.02

Notes:

DUP01 and TRIP01 derived from parent sample MW1

RIN1 derived from parent sample MW2

ASS Field Screening and Analytical Results (Water)
Burrup Nitrates TAN Production Facility
Table 5 - Groundwater Levels and Field Indicator Results

Sample ID	Date	Standing Water Level	pH	Temp	EC	DO	Redox	Other Comments
		m AHD	Units	Deg. C	us/cm	mg/L	mV	
MW1	29/04/2011	6.47	6.95	31.5	3100	2.43	-74	
MW2	29/04/2011	3.92	7.16	32.0	3540	2.74	57	
MW3	29/04/2011	2.83	7.30	30.6	16000	2.80	-100	Strong Odour
MW4	29/04/2011	2.55	7.64	30.6	12160	2.23	125	
MW5	29/04/2011	2.16	6.73	31.6	>10000	2.12	237	

Annex D

Chain Of Custody And Laboratory Reports

ANALYTICAL REPORT

CLIENT DETAILS

Contact	Brent Carter
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	brent.carter@erm.com
Project	**0086269 Burrup TAN**
Order Number	(Not specified)
Samples	65

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE055190 R0
Report Number	0000013524
Date Reported	27 Jan 2011
Date Received	21 Jan 2011

COMMENTS

The document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898).

SIGNATORIES

S. Hirad

Kurt Blackman
Inorganic Team Leader - Soils

Said Hirad
Laboratory Manager

		Sample Number	PE055190.001	PE055190.002	PE055190.003	PE055190.004	PE055190.005
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.0	0.25	0.50	0.75	1.00
		Sample Date	17 Jan 2011	17 Jan 2011	17 Jan 2011	17 Jan 2011	17 Jan 2011
		Sample Name	SB1_0.0	SB1_0.25	SB1_0.50	SB1_0.75	SB1_1.00
Parameter	**Units**	**LOR**					

Field pH for Acid Sulphate Soil Method: AN104

PHf	pH Units	-	5.8	5.9	5.9	6.3	7.7
PHfox	pH Units	-	5.8	6.1	6.2	7.3	8.0
Reaction*	No unit	-	extreme	moderate	extreme	extreme	extreme
pH Difference*	pH Units	-	0.0	<0.0	<0.0	<0.0	<0.0

		Sample Number	PE055190.006	PE055190.007	PE055190.008	PE055190.009	PE055190.010
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.0	0.25	0.50	0.0	1.0
		Sample Date	17 Jan 2011	17 Jan 2011	17 Jan 2011	17 Jan 2011	18 Jan 2011
		Sample Name	SB3_0.0	SB3_0.25	SB3_0.50	DUP_01	SB3_1.0
Parameter	**Units**	**LOR**					

Field pH for Acid Sulphate Soil Method: AN104

PHf	pH Units	-	7.2	8.1	8.2	7.6	8.6
PHfox	pH Units	-	6.9	8.3	7.2	6.8	9.3
Reaction*	No unit	-	moderate	moderate	slight	moderate	slight
pH Difference*	pH Units	-	0.3	<0.0	1.0	0.8	<0.0

		Sample Number	PE055190.011	PE055190.012	PE055190.013	PE055190.014	PE055190.015
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	1.25	0.0	0.25	0.50	0.75
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB3_1.25	MW1_0.0	MW1_0.25	MW1_0.50	MW1_0.75
Parameter	**Units**	**LOR**					

Field pH for Acid Sulphate Soil Method: AN104

PHf	pH Units	-	9.3	9.2	9.2	9.1	9.1
PHfox	pH Units	-	9.9	7.5	8.5	8.5	7.6
Reaction*	No unit	-	slight	extreme	extreme	extreme	moderate
pH Difference*	pH Units	-	<0.0	1.8	0.7	0.6	1.5

		Sample Number	PE055190.016	PE055190.017	PE055190.018	PE055190.019	PE055190.020
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	1.0	1.5	0.0	0.25	0.5
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW1_1.0	MW1_1.5	SB2_0.0	SB2_0.25	SB2_0.5
Parameter	**Units**	**LOR**					

Field pH for Acid Sulphate Soil Method: AN104

PHf	pH Units	-	9.2	9.4	9.3	9.2	8.7
PHfox	pH Units	-	8.6	9.1	7.9	7.2	7.0
Reaction*	No unit	-	moderate	extreme	moderate	moderate	extreme
pH Difference*	pH Units	-	0.6	0.3	1.5	2.0	1.7

		Sample Number	PE055190.021	PE055190.022	PE055190.023	PE055190.024	PE055190.025
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.75	1.0	1.25	0.0	0.25
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB2_0.75	SB2_1.0	SB2_1.25	MW2_0.0	MW2_0.25
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	8.5	8.9	8.1	8.2	7.9
PHfox	pH Units	-	8.3	8.7	8.9	5.6	7.0
Reaction*	No unit	-	extreme	extreme	extreme	moderate	moderate
pH Difference*	pH Units	-	0.2	0.2	<0.0	2.6	1.0

		Sample Number	PE055190.026	PE055190.027	PE055190.028	PE055190.029	PE055190.030
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.50	2.50	0.0	0.25	0.50
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW2_0.50	MW2_2.5	MW3_0.0	MW3_0.25	MW3_0.5
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	8.1	9.2	9.7	9.3	9.0
PHfox	pH Units	-	6.5	9.0	7.3	7.9	8.3
Reaction*	No unit	-	moderate	extreme	moderate	moderate	moderate
pH Difference*	pH Units	-	1.6	0.2	2.4	1.4	0.7

		Sample Number	PE055190.031	PE055190.032	PE055190.033	PE055190.034	PE055190.035
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.90	1.50	2.0	2.50	3.0
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW3_0.9	MW3_1.5	MW3_2.0	MW3_2.5	MW3_3.0
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	9.6	9.7	9.6	9.8	9.8
PHfox	pH Units	-	9.3	10.0	9.9	9.4	9.7
Reaction*	No unit	-	extreme	extreme	moderate	extreme	extreme
pH Difference*	pH Units	-	0.3	<0.0	<0.0	0.4	0.1

		Sample Number	PE055190.036	PE055190.037	PE055190.038	PE055190.039	PE055190.040
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.0	0.25	0.50	1.0	1.50
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB5_0.0	SB5_0.25	SB5_0.5	SB5_1.0	SB5_1.5
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	9.3	9.1	9.1	9.5	9.3
PHfox	pH Units	-	6.9	7.4	7.0	7.7	8.0
Reaction*	No unit	-	slight	slight	slight	moderate	slight
pH Difference*	pH Units	-	2.4	1.7	2.1	1.8	1.3

		Sample Number	PE055190.041	PE055190.042	PE055190.043	PE055190.044	PE055190.045
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	2.0	2.50	3.0	0.0	0.25
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB5_2.0	SB5_2.5	SB5_3.0	SB4_0.0	SB4_0.25
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	9.4	9.5	9.2	8.4	8.8
PHfox	pH Units	-	9.5	10.1	9.7	7.8	9.1
Reaction*	No unit	-	slight	moderate	slight	slight	extreme
pH Difference*	pH Units	-	<0.0	<0.0	<0.0	0.7	<0.0

		Sample Number	PE055190.046	PE055190.047	PE055190.048	PE055190.049	PE055190.050
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	1.50	2.0	2.50	0.0	1.0
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB4_1.5	SB4_2.0	SB4_2.5	MW5_0.0	MW5_1.0
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	9.8	9.2	9.5	8.4	9.1
PHfox	pH Units	-	10.7	9.7	10.6	7.3	7.1
Reaction*	No unit	-	extreme	extreme	extreme	moderate	slight
pH Difference*	pH Units	-	<0.0	<0.0	<0.0	1.2	2.1

		Sample Number	PE055190.051	PE055190.052	PE055190.053	PE055190.054	PE055190.055
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	1.50	2.5	2.0	3.0	0.0
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW5_1.5	MW5_2.5	MW5_2.0	MW5_3.0	MW4_0.0
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	9.0	8.9	8.9	9.1	8.8
PHfox	pH Units	-	7.4	7.8	8.6	9.2	8.1
Reaction*	No unit	-	slight	slight	slight	slight	moderate
pH Difference*	pH Units	-	1.6	1.1	0.3	<0.0	0.7

		Sample Number	PE055190.056	PE055190.057	PE055190.058	PE055190.059	PE055190.060
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Depth	0.50	1.0	1.50	2.0	2.5
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW4_0.5	MW4_1.0	MW4_1.5	MW4_2.0	MW4_2.5
Parameter	**Units**	**LOR**					
Field pH for Acid Sulphate Soil Method: AN104							
PHf	pH Units	-	9.2	9.4	9.4	9.5	9.1
PHfox	pH Units	-	8.5	7.3	9.6	9.7	9.2
Reaction*	No unit	-	extreme	slight	extreme	extreme	extreme
pH Difference*	pH Units	-	0.7	2.0	<0.0	<0.0	<0.0

Parameter	Units	LOR	Sample Number Sample Matrix Sample Depth Sample Date Sample Name	PE055190.061 Soil 0.0 18 Jan 2011 DUP02	PE055190.062 Soil 0.0 18 Jan 2011 DUP03	PE055190.063 Soil 0.25 18 Jan 2011 DUP04	PE055190.064 Soil 1.5 18 Jan 2011 DUP05	PE055190.065 Soil 0.0 18 Jan 2011 DUP06

Field pH for Acid Sulphate Soil Method: AN104

PHf	pH Units	-	9.1	9.5	9.3	9.3	8.3
PHfox	pH Units	-	6.6	6.8	7.7	7.2	6.9
Reaction*	No unit	-	slight	slight	slight	moderate	moderate
pH Difference*	pH Units	-	2.5	2.6	1.6	2.0	1.4

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
PHf	LB013150	pH Units	-	5.2 - 9.2	0 - 2%
PHfox	LB013150	pH Units	-	5.7 - 5.9	0 - 2%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN104	pHF is determined on an extract of approximately 2g of as received sample in approximately 10 mL of deionised water with pH determined after standing 30 minutes.
AN104	pHFox is determined on an extract of approximately 2g of as received sample with a few mLs of 30% hydrogen peroxide (adjusted to pH 4.5 to 5.5) with the extract reaction being rated from slight to extreme, with pH determined after reaction is complete and extract has cooled. Referenced to ASS Laboratory Methods Guidelines, method 23Af-Bf, 2004.

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	This analysis is not covered by the scope of accreditation.
^	Performed by outside laboratory.
LOR	Limit of Reporting
↑↓	Raised or Lowered Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
-	The sample was not analysed for this analyte

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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STATEMENT OF QA/QC PERFORMANCE AGAINST DATA QUALITY OBJECTIVES

PE055190 R0

CLIENT DETAILS

Contact	Brent Carter
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	brent.carter@erm.com
Project	**0086269 Burrup TAN**
Order Number	(Not specified)
Samples	65

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE055190 R0
Report Number	0000013525
Date Reported	27 Jan 2011

COMMENTS

All the laboratory data for each environmental matrix was compared to the SGS Environmental Services' stated data quality objectives (DQO).
Comments arising from the comparison were made and are reported below.
The data relating to sampling was taken from the chain of custody document and was supplied by the client.
This QA/QC statement must be read in conjunction with the referenced analytical report.
The statement and the analytical report must not be reproduced except in full.

All Data Quality Objectives were met.

SAMPLE SUMMARY

Sample counts by matrix	65 soils	Type of documentation received	COC
Date documentation received	21/1/2011	Samples received in good order	Yes
Samples received without headspace	NA	Sample temperature upon receipt	0
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	5

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
SB1_0.0	PE055190.001	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB1_0.25	PE055190.002	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB1_0.50	PE055190.003	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB1_0.75	PE055190.004	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB1_1.00	PE055190.005	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB3_0.0	PE055190.006	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB3_0.25	PE055190.007	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB3_0.50	PE055190.008	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
DUP_01	PE055190.009	LB013150	17 Jan 2011	21 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011	24 Jan 2011
SB3_1.0	PE055190.010	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB3_1.25	PE055190.011	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW1_0.0	PE055190.012	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW1_0.25	PE055190.013	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW1_0.50	PE055190.014	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW1_0.75	PE055190.015	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW1_1.0	PE055190.016	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW1_1.5	PE055190.017	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB2_0.0	PE055190.018	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB2_0.25	PE055190.019	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB2_0.5	PE055190.020	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB2_0.75	PE055190.021	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB2_1.0	PE055190.022	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB2_1.25	PE055190.023	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW2_0.0	PE055190.024	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW2_0.25	PE055190.025	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW2_0.50	PE055190.026	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW2_2.5	PE055190.027	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_0.0	PE055190.028	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_0.25	PE055190.029	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_0.5	PE055190.030	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_0.9	PE055190.031	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_1.5	PE055190.032	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_2.0	PE055190.033	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_2.5	PE055190.034	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW3_3.0	PE055190.035	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_0.0	PE055190.036	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_0.25	PE055190.037	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_0.5	PE055190.038	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_1.0	PE055190.039	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_1.5	PE055190.040	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_2.0	PE055190.041	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_2.5	PE055190.042	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB5_3.0	PE055190.043	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB4_0.0	PE055190.044	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB4_0.25	PE055190.045	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB4_1.5	PE055190.046	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB4_2.0	PE055190.047	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
SB4_2.5	PE055190.048	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW5_0.0	PE055190.049	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW5_1.0	PE055190.050	LB013150	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011

HOLDING TIME SUMMARY

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW5_1.5	**PE055190.051**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW5_2.5	**PE055190.052**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW5_2.0	**PE055190.053**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW5_3.0	**PE055190.054**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW4_0.0	**PE055190.055**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW4_0.5	**PE055190.056**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW4_1.0	**PE055190.057**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW4_1.5	**PE055190.058**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW4_2.0	**PE055190.059**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
MW4_2.5	**PE055190.060**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
DUP02	**PE055190.061**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
DUP03	**PE055190.062**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
DUP04	**PE055190.063**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
DUP05	**PE055190.064**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011
DUP06	**PE055190.065**	**LB013150**	18 Jan 2011	21 Jan 2011	25 Jan 2011	24 Jan 2011	25 Jan 2011	24 Jan 2011

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in Green when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR	BLK MB
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104			
LB013150.001			
PHf	pH Units	-	5.2
PHfox	pH Units	-	5.7
LB013150.024			
PHf	pH Units	-	8.7
PHfox	pH Units	-	5.7
LB013150.047			
PHf	pH Units	-	9.2
PHfox	pH Units	-	5.7
LB013150.070			
PHf	pH Units	-	9.0
PHfox	pH Units	-	5.9

DUPLICATES

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE055190.010-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104 LB013150.012						
PHf	pH Units	-	8.6	8.5	30	1
PHfox	pH Units	-	9.3	9.3	30	0

		Sample Name		PE055190.020-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104 LB013150.023						
PHf	pH Units	-	8.7	8.6	30	2
PHfox	pH Units	-	7.0	7.1	30	2

		Sample Name		PE055190.030-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104 LB013150.035						
PHf	pH Units	-	9.0	9.2	30	1
PHfox	pH Units	-	8.3	8.2	30	1

		Sample Name		PE055190.040-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104 LB013150.046						
PHf	pH Units	-	9.3	9.4	30	0
PHfox	pH Units	-	8.0	8.1	30	1

		Sample Name		PE055190.050-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104 LB013150.058						
PHf	pH Units	-	9.1	9.0	30	2
PHfox	pH Units	-	7.1	7.1	30	1

		Sample Name		PE055190.060-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104 LB013150.069						
PHf	pH Units	-	9.1	9.2	30	1
PHfox	pH Units	-	9.2	9.0	30	2

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE055190.065-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Field pH for Acid Sulphate Soil Method: ME-(AU)-[ENV]AN104						
LB013150.076						
PHf	pH Units	-	8.3	8.4	30	1
PHfox	pH Units	-	6.9	6.9	30	1

LABORATORY CONTROL STANDARDS

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No LCS were required for this job.

QUALITY CONTROL - MATRIX SPIKES

Matrix spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of the report. Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spikes were required for this job.

Matrix spike duplicates are calculated as relative percent difference using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The original result is the analyte concentration of the matrix spike and the replicate result is the analyte concentration of the matrix spike duplicate.
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spike Duplicates were required for this job.

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	NATA Accreditation does not cover this analysis.
^	Performed by outside laboratory.
LOR	Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
NA	The sample was not analysed for this analyte

Samples analysed as received.
Solid samples expressed on a dry weight basis.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

CLIENT DETAILS / LABORATORY DETAILS

Contact	Brent Carter	Manager	Said Hirad
Client	ERM Australia Pty Ltd	Laboratory	SGS Newburn Environmental
Address	PO Box 7338 Cloisters Square PERTH WA 6850	Address	10 Reid Rd Newburn WA 6105
Telephone	08 9321 5200	Telephone	(08) 9373 3500
Facsimile	08 9321 5262	Facsimile	(08) 9373 3556
Email	brent.carter@erm.com	Email	au.environmental.perth@sgs.com
Project	**0086269 Burrup TAN**	SGS Reference	PE055190A R0
Order Number	(Not specified)	Report Number	0000014088
Samples	24	Date Reported	08 Feb 2011
		Date Received	31 Jan 2011

COMMENTS

The document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Liming rate calculated using a Fineness factor of 1.5 (which is equivalent to finely divided Ag Lime <0.5mm) and Neutralising Value (NV) of 100%.

If using Liming Material <100% NV, then Liming Rate can be adusted as follows:
Actual Liming Rate equals Calculated Liming Rate times 100 divided by NV of
actual Liming Material Bulk Density of Material of 1g/cm3 assumed.

If Bulk Density differs from 1g/cm3 then Liming rate can be adjusted as follows:
Actual Liming Rate equals Calculated Liming Rate times Actual Bulk Density

SIGNATORIES

S. Hirad

Kurt Blackman
Inorganic Team Leader - Soils

Said Hirad
Laboratory Manager

		Sample Number	PE055190A.012	PE055190A.015
		Sample Matrix	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011
		Sample Name	MW1_0.0	MW1_0.75
Parameter	Units	LOR		

TAA SPOCAS Method: AN219

Parameter	Units	LOR	PE055190A.012	PE055190A.015
pH KCl*	pH Units	-	**8.8**	**9.4**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-
Calcium (CaKCl)	%w/w	0.005	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	PE055190A.012	PE055190A.015
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	<0.005

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE055190A.012	PE055190A.015
s-Net Acidity	%w/w S	0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	PE055190A.012	PE055190A.015
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**2.1**	**34**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**20**	**330**
ANC as % $CaCO_3$	% CaCO3	0.1	**2.1**	**34**
Lime Equivalence	% CaCO3	0.1	**2.1**	**34**

		Sample Number	PE055190A.018	PE055190A.019	PE055190A.020
		Sample Matrix	Soil	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB2_0.0	SB2_0.25	SB2_0.5
Parameter	Units	LOR			

TAA SPOCAS Method: AN219

Parameter	Units	LOR	PE055190A.018	PE055190A.019	PE055190A.020
pH KCl*	pH Units	-	**9.4**	**8.4**	**8.9**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-
Calcium (CaKCl)	%w/w	0.005	-	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-	-

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	PE055190A.018	PE055190A.019	PE055190A.020
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	<0.005	<0.005

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE055190A.018	PE055190A.019	PE055190A.020
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-	-

		Sample Number	PE055190A.018	PE055190A.019	PE055190A.020
		Sample Matrix	Soil	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB2_0.0	SB2_0.25	SB2_0.5
Parameter	Units	LOR			

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	SB2_0.0	SB2_0.25	SB2_0.5
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**4.4**	**0.8**	**4.4**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**43**	**7.5**	**43**
ANC as % $CaCO_3$	% CaCO3	0.1	**4.4**	**0.8**	**4.4**
Lime Equivalence	% CaCO3	0.1	**4.4**	**0.8**	**4.4**

		Sample Number	PE055190A.024
		Sample Matrix	Soil
		Sample Date	18 Jan 2011
		Sample Name	MW2_0.0
Parameter	Units	LOR	

TAA SPOCAS Method: AN219

Parameter	Units	LOR	MW2_0.0
pH KCl*	pH Units	-	**8.0**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-
Calcium (CaKCl)	%w/w	0.005	-
Magnesium (MgKCl)	%w/w	0.005	-

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	MW2_0.0
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	**0.006**

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	MW2_0.0
s-Net Acidity	%w/w S	0.01	<0.01
a-Net Acidity	moles H+/T	5	<5
Liming Rate*	kg CaCO3/T	0.1	-
Verification s-Net Acidity*	%w/w S	0.01	-
a-Net Acidity without ANCE*	moles H+/T	5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	MW2_0.0
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**0.9**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**8.6**
ANC as % $CaCO_3$	% CaCO3	0.1	**0.9**
Lime Equivalence	% CaCO3	0.1	**0.9**

		Sample Number	PE055190A.026	PE055190A.028	PE055190A.029
		Sample Matrix	Soil	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW2_0.50	MW3_0.0	MW3_0.25
Parameter	Units	LOR			

TAA SPOCAS Method: AN219

Parameter	Units	LOR	MW2_0.50	MW3_0.0	MW3_0.25
pH KCl*	pH Units	-	**7.9**	**9.6**	**9.7**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-
Calcium (CaKCl)	%w/w	0.005	-	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-	-

		Sample Number	PE055190A.026	PE055190A.028	PE055190A.029
		Sample Matrix	Soil	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	MW2_0.50	MW3_0.0	MW3_0.25
Parameter	Units	LOR			

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	PE055190A.026	PE055190A.028	PE055190A.029
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	**0.006**	<0.005

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE055190A.026	PE055190A.028	PE055190A.029
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-	-

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	PE055190A.026	PE055190A.028	PE055190A.029
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**0.8**	**6.5**	**8.0**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**7.5**	**64**	**79**
ANC as % $CaCO_3$	% CaCO3	0.1	**0.8**	**6.5**	**8.0**
Lime Equivalence	% CaCO3	0.1	**0.8**	**6.5**	**8.0**

		Sample Number	PE055190A.036	PE055190A.037	PE055190A.038	PE055190A.039	PE055190A.040
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	SB5_0.0	SB5_0.25	SB5_0.5	SB5_1.0	SB5_1.5
Parameter	Units	LOR					

TAA SPOCAS Method: AN219

Parameter	Units	LOR	PE055190A.036	PE055190A.037	PE055190A.038	PE055190A.039	PE055190A.040
pH KCl*	pH Units	-	**9.9**	**10.1**	**10.1**	**10.0**	**10.0**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-	-
Calcium (CaKCl)	%w/w	0.005	-	-	-	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-	-	-	-

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	PE055190A.036	PE055190A.037	PE055190A.038	PE055190A.039	PE055190A.040
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE055190A.036	PE055190A.037	PE055190A.038	PE055190A.039	PE055190A.040
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-	-	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	<5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-	-	-	-

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	PE055190A.036	PE055190A.037	PE055190A.038	PE055190A.039	PE055190A.040
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**30**	**33**	**33**	**35**	**33**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**290**	**320**	**320**	**340**	**320**
ANC as % $CaCO_3$	% CaCO3	0.1	**30**	**33**	**33**	**35**	**33**
Lime Equivalence	% CaCO3	0.1	**30**	**33**	**33**	**35**	**33**

		Sample Number	PE055190A.049	PE055190A.050
		Sample Matrix	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011
		Sample Name	MW5_0.0	MW5_1.0
Parameter	Units	LOR		

TAA SPOCAS Method: AN219

pH KCl*	pH Units	-	9.8	9.8
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-
Calcium (CaKCl)	%w/w	0.005	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-

Chromium Reducible Sulphur (CRS) Method: AN217

Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	<0.005

Net Acidity Calculations Method: AN220

s-Net Acidity	%w/w S	0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-

Acid Neutralising Capacity (ANC) Method: AN214

Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	35	60
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	340	590
ANC as % $CaCO_3$	% CaCO3	0.1	35	60
Lime Equivalence	% CaCO3	0.1	35	60

		Sample Number	PE055190A.051	PE055190A.052
		Sample Matrix	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011
		Sample Name	MW5_1.5	MW5_2.5
Parameter	Units	LOR		

TAA SPOCAS Method: AN219

pH KCl*	pH Units	-	9.9	9.9
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-
Calcium (CaKCl)	%w/w	0.005	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-

Chromium Reducible Sulphur (CRS) Method: AN217

Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	<0.005

Net Acidity Calculations Method: AN220

s-Net Acidity	%w/w S	0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-

Parameter	Units	LOR	PE055190A.051	PE055190A.052
Sample Number			PE055190A.051	PE055190A.052
Sample Matrix			Soil	Soil
Sample Date			18 Jan 2011	18 Jan 2011
Sample Name			MW5_1.5	MW5_2.5

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	PE055190A.051	PE055190A.052
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**57**	**34**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**560**	**340**
ANC as % $CaCO_3$	% CaCO3	0.1	**57**	**34**
Lime Equivalence	% CaCO3	0.1	**57**	**34**

Parameter	Units	LOR	PE055190A.057
Sample Number			PE055190A.057
Sample Matrix			Soil
Sample Date			18 Jan 2011
Sample Name			MW4_1.0

TAA SPOCAS Method: AN219

Parameter	Units	LOR	PE055190A.057
pH KCl*	pH Units	-	**9.5**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-
Calcium (CaKCl)	%w/w	0.005	-
Magnesium (MgKCl)	%w/w	0.005	-

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	PE055190A.057
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE055190A.057
s-Net Acidity	%w/w S	0.01	<0.01
a-Net Acidity	moles H+/T	5	<5
Liming Rate*	kg CaCO3/T	0.1	-
Verification s-Net Acidity*	%w/w S	0.01	-
a-Net Acidity without ANCE*	moles H+/T	5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	PE055190A.057
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**26**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**260**
ANC as % $CaCO_3$	% CaCO3	0.1	**26**
Lime Equivalence	% CaCO3	0.1	**26**

Parameter	Units	LOR	PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
Sample Number			PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
Sample Matrix			Soil	Soil	Soil	Soil	Soil
Sample Date			18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
Sample Name			DUP02	DUP03	DUP04	DUP05	DUP06

TAA SPOCAS Method: AN219

Parameter	Units	LOR	PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
pH KCl*	pH Units	-	**9.3**	**9.7**	**9.7**	**10.1**	**9.8**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	-	-	-	-	-
Calcium (CaKCl)	%w/w	0.005	-	-	-	-	-
Magnesium (MgKCl)	%w/w	0.005	-	-	-	-	-

		Sample Number	PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
		Sample Matrix	Soil	Soil	Soil	Soil	Soil
		Sample Date	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011	18 Jan 2011
		Sample Name	DUP02	DUP03	DUP04	DUP05	DUP06
Parameter	Units	LOR					

Chromium Reducible Sulphur (CRS) Method: AN217

Parameter	Units	LOR	PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5	<5
Chromium Reducible Sulphur (Scr)	kg H2SO4/T	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Net Acidity Calculations Method: AN220

Parameter	Units	LOR	PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5	<5	<5
Liming Rate*	kg CaCO3/T	0.1	-	-	-	-	-
Verification s-Net Acidity*	%w/w S	0.01	-	-	-	-	-
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	<5	<5	<5
Liming Rate without ANCE*	kg CaCO3/T	0.1	-	-	-	-	-

Acid Neutralising Capacity (ANC) Method: AN214

Parameter	Units	LOR	PE055190A.061	PE055190A.062	PE055190A.063	PE055190A.064	PE055190A.065
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	% CaCO3	0.1	**4.6**	**7.0**	**9.2**	**34**	**31**
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	kg H2SO4/T	0.1	**46**	**69**	**91**	**330**	**300**
ANC as % $CaCO_3$	% CaCO3	0.1	**4.6**	**7.0**	**9.2**	**34**	**31**
Lime Equivalence	% CaCO3	0.1	**4.6**	**7.0**	**9.2**	**34**	**31**

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Acid Neutralising Capacity (ANC) **Method: ME-(AU)-[ENV]AN214**

Parameter	QC Reference	Units	LOR	MB
Acid Neutralisation Capacity (ANCBT) as % $CaCO_3$	LB013771	% CaCO3	0.1	<0.1
Acid Neutralisation Capacity (ANCBT) as kg H_2SO_4/t	LB013771	kg	0.1	<0.1 - 0.6
ANC as % $CaCO_3$	LB013771	% CaCO3	0.1	<0.1
Lime Equivalence	LB013771	% CaCO3	0.1	<0.1

Chromium Reducible Sulphur (CRS) **Method: ME-(AU)-[ENV]AN217**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chromium Reducible Sulphur (Scr)	LB013595	%	0.005	<0.005	0%	87%
	LB013596	%	0.005	<0.005	0%	86%
Chromium Reducible Sulphur (Scr)	LB013595	moles	5	<5		
	LB013596	moles	5	<5		
Chromium Reducible Sulphur (Scr)	LB013595	kg	0.005	<0.005		
	LB013596	kg	0.005	<0.005		

Net Acidity Calculations **Method: ME-(AU)-[ENV]AN220**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
s-Net Acidity	LB013778	%w/w S	0.01	<0.01	NA
a-Net Acidity	LB013778	moles	5	<5	NA
a-Net Acidity without ANCE*	LB013778	moles	5	<5	NA

TAA SPOCAS **Method: ME-(AU)-[ENV]AN219**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl*	LB013655	pH Units	-	5.5 - 6.7	0%	97%
Titratable Actual Acidity	LB013655	kg	0.25	<0.25	0%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB013655	moles	5	<5	0%	112%
Titratable Actual Acidity (TAA) S%w/w	LB013655	%w/w S	0.01	<0.01	0%	112%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN004	Soils, sediments and sludges are pulverised using an LM2 ringmill. The dry sample is pulverised to a particle size of >90% passing through a -75µm sieve.
AN214	Acid Neutralising Capacity (ANC): The crushed or as received sample is reacted with excess normal acid (HCl) and then back titrated with standard sodium hydroxide to determine the acid consumed. The result is expressed as kg H_2SO_4/tonne

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	This analysis is not covered by the scope of accreditation.
^	Performed by outside laboratory.
LOR	Limit of Reporting
↑↓	Raised or Lowered Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
-	The sample was not analysed for this analyte

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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STATEMENT OF QA/QC PERFORMANCE AGAINST DATA QUALITY OBJECTIVES

PE055190A R0

CLIENT DETAILS

Contact	Brent Carter
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	brent.carter@erm.com
Project	**0086269 Burrup TAN**
Order Number	(Not specified)
Samples	24

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE055190A R0
Report Number	0000014091
Date Reported	08 Feb 2011

COMMENTS

All the laboratory data for each environmental matrix was compared to the SGS Environmental Services' stated data quality objectives (DQO).
Comments arising from the comparison were made and are reported below.
The data relating to sampling was taken from the chain of custody document and was supplied by the client.
This QA/QC statement must be read in conjunction with the referenced analytical report.
The statement and the analytical report must not be reproduced except in full.

All Data Quality Objectives were met.

SAMPLE SUMMARY

Sample counts by matrix	24 soil	Type of documentation received	COC
Date documentation received	1/2/2011	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	0
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	3

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Acid Neutralising Capacity (ANC) Method: ME-(AU)-[ENV]AN214

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1_0.0	PE055190A.012	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW1_0.75	PE055190A.015	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB2_0.0	PE055190A.018	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB2_0.25	PE055190A.019	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB2_0.5	PE055190A.020	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW2_0.0	PE055190A.024	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW2_0.50	PE055190A.026	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW3_0.0	PE055190A.028	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW3_0.25	PE055190A.029	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB5_0.0	PE055190A.036	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB5_0.25	PE055190A.037	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB5_0.5	PE055190A.038	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB5_1.0	PE055190A.039	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
SB5_1.5	PE055190A.040	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW5_0.0	PE055190A.049	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW5_1.0	PE055190A.050	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW5_1.5	PE055190A.051	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW5_2.5	PE055190A.052	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
MW4_1.0	PE055190A.057	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
DUP02	PE055190A.061	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
DUP03	PE055190A.062	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
DUP04	PE055190A.063	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
DUP05	PE055190A.064	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011
DUP06	PE055190A.065	LB013771	18 Jan 2011	31 Jan 2011	18 Apr 2011	07 Feb 2011	18 Apr 2011	07 Feb 2011

Chromium Reducible Sulphur (CRS) Method: ME-(AU)-[ENV]AN217

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1_0.0	PE055190A.012	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW1_0.75	PE055190A.015	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB2_0.0	PE055190A.018	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB2_0.25	PE055190A.019	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB2_0.5	PE055190A.020	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW2_0.0	PE055190A.024	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW2_0.50	PE055190A.026	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW3_0.0	PE055190A.028	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW3_0.25	PE055190A.029	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB5_0.0	PE055190A.036	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB5_0.25	PE055190A.037	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB5_0.5	PE055190A.038	LB013595	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB5_1.0	PE055190A.039	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
SB5_1.5	PE055190A.040	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW5_0.0	PE055190A.049	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW5_1.0	PE055190A.050	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW5_1.5	PE055190A.051	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW5_2.5	PE055190A.052	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
MW4_1.0	PE055190A.057	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
DUP02	PE055190A.061	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
DUP03	PE055190A.062	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
DUP04	PE055190A.063	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
DUP05	PE055190A.064	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011
DUP06	PE055190A.065	LB013596	18 Jan 2011	31 Jan 2011	18 Apr 2011	02 Feb 2011	18 Apr 2011	02 Feb 2011

HOLDING TIME SUMMARY

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed

Net Acidity Calculations   Method: ME-(AU)-[ENV]AN220

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1_0.0	PE055190A.012	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW1_0.75	PE055190A.015	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB2_0.0	PE055190A.018	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB2_0.25	PE055190A.019	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB2_0.5	PE055190A.020	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW2_0.0	PE055190A.024	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW2_0.50	PE055190A.026	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW3_0.0	PE055190A.028	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW3_0.25	PE055190A.029	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB5_0.0	PE055190A.036	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB5_0.25	PE055190A.037	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB5_0.5	PE055190A.038	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB5_1.0	PE055190A.039	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
SB5_1.5	PE055190A.040	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW5_0.0	PE055190A.049	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW5_1.0	PE055190A.050	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW5_1.5	PE055190A.051	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW5_2.5	PE055190A.052	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
MW4_1.0	PE055190A.057	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
DUP02	PE055190A.061	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
DUP03	PE055190A.062	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
DUP04	PE055190A.063	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
DUP05	PE055190A.064	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011
DUP06	PE055190A.065	LB013778	18 Jan 2011	31 Jan 2011	19 Mar 2011	07 Feb 2011	19 Mar 2011	04 Feb 2011

TAA SPOCAS   Method: ME-(AU)-[ENV]AN219

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1_0.0	PE055190A.012	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW1_0.75	PE055190A.015	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB2_0.0	PE055190A.018	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB2_0.25	PE055190A.019	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB2_0.5	PE055190A.020	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW2_0.0	PE055190A.024	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW2_0.50	PE055190A.026	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW3_0.0	PE055190A.028	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW3_0.25	PE055190A.029	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB5_0.0	PE055190A.036	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB5_0.25	PE055190A.037	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB5_0.5	PE055190A.038	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB5_1.0	PE055190A.039	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
SB5_1.5	PE055190A.040	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW5_0.0	PE055190A.049	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW5_1.0	PE055190A.050	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW5_1.5	PE055190A.051	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW5_2.5	PE055190A.052	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
MW4_1.0	PE055190A.057	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
DUP02	PE055190A.061	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
DUP03	PE055190A.062	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
DUP04	PE055190A.063	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
DUP05	PE055190A.064	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011
DUP06	PE055190A.065	LB013655	18 Jan 2011	31 Jan 2011	18 Apr 2011	04 Feb 2011	18 Apr 2011	04 Feb 2011

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

			Sample Name	PE055190A.036-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chromium Reducible Sulphur (CRS) Method: ME-(AU)-[ENV]AN217 LB013595.014						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	200	0
Net Acidity Calculations Method: ME-(AU)-[ENV]AN220 LB013778.013						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	200	
a-Net Acidity	moles H+/T	5	<5	<5	200	
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	200	
TAA SPOCAS Method: ME-(AU)-[ENV]AN219 LB013655.013						
pH KCl*	pH Units	-	9.9	10.0	30	0
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	200	0
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	200	0
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	200	0

			Sample Name	PE055190A.038-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chromium Reducible Sulphur (CRS) Method: ME-(AU)-[ENV]AN217 LB013595.017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	200	0
Net Acidity Calculations Method: ME-(AU)-[ENV]AN220 LB013778.016						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	200	
a-Net Acidity	moles H+/T	5	<5	<5	200	
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	200	
TAA SPOCAS Method: ME-(AU)-[ENV]AN219 LB013655.016						
pH KCl*	pH Units	-	10.1	10.1	30	0
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	200	0
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	200	0
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	200	0

			Sample Name	PE055190A.063-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chromium Reducible Sulphur (CRS) Method: ME-(AU)-[ENV]AN217 LB013596.014						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	200	0
Net Acidity Calculations Method: ME-(AU)-[ENV]AN220 LB013778.029						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	200	
a-Net Acidity	moles H+/T	5	<5	<5	200	
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	200	

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE055190A.063-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**

TAA SPOCAS Method: ME-(AU)-[ENV]AN219
LB013655.030

pH KCl*	pH Units	-	9.7	9.7	30	0
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	200	0
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	200	0
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	200	0

		Sample Name		PE055190A.065-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**

Chromium Reducible Sulphur (CRS) Method: ME-(AU)-[ENV]AN217
LB013596.017

Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	200	0

Net Acidity Calculations Method: ME-(AU)-[ENV]AN220
LB013778.032

s-Net Acidity	%w/w S	0.01	<0.01	<0.01	200	
a-Net Acidity	moles H+/T	5	<5	<5	200	
a-Net Acidity without ANCE*	moles H+/T	5	<5	<5	200	

TAA SPOCAS Method: ME-(AU)-[ENV]AN219
LB013655.033

pH KCl*	pH Units	-	9.8	9.8	30	0
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	200	0
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	200	0
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Control Units	Control LOR	LCS STD Result	LCS STD Expected Result	LCS STD Criteria %	LCS STD Recovery %
Chromium Reducible Sulphur (CRS) Method: ME-(AU)-[ENV]AN217						
LB013595.003						
Chromium Reducible Sulphur (Scr)	%	0.005	0.55	0.583	85 - 115	87
LB013596.003						
Chromium Reducible Sulphur (Scr)	%	0.005	0.55	0.583	85 - 115	86
TAA SPOCAS Method: ME-(AU)-[ENV]AN219						
LB013655.002						
pH KCl*	pH Units	-	3.6	3.68	95 - 105	97
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	61	54.42	85 - 115	112
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.10	0.087	85 - 115	112
LB013655.018						
pH KCl*	pH Units	-	3.6	3.68	95 - 105	97
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	61	54.42	85 - 115	112
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.10	0.087	85 - 115	112

Matrix spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of the report. Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spikes were required for this job.

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as relative percent difference using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The original result is the analyte concentration of the matrix spike and the replicate result is the analyte concentration of the matrix spike duplicate.
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spike Duplicates were required for this job.

FOOTNOTES

IS	Insufficient sample for analysis.	QFH	QC result is above the upper tolerance
LNR	Sample listed, but not received.	QFL	QC result is below the lower tolerance
*	NATA Accreditation does not cover this analysis.	NA	The sample was not analysed for this analyte
^	Performed by outside laboratory.		
LOR	Limit of Reporting		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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ANALYTICAL REPORT

CLIENT DETAILS

Contact	Brent Carter
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	brent.carter@erm.com
Project	**0086269 Burrup TANPF Dampier**
Order Number	**A06631**
Samples	8

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE057307 R0
Report Number	0000019717
Date Reported	17 May 2011
Date Received	02 May 2011

COMMENTS

The document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

Samples `MW3`, `MW4` and `MW5` were diluted due to high conductivity for metals. Hence the LORs were raised for these samples.

Samples received outside recommended technical holding times for Alkalinity and Hexavalent Chromium.

SIGNATORIES

Hue Thanh Ly
Spectroscopy Chemist

Jeremy Truong
Inorganics Co-ordinator

P. Ads.

Pamela Adams
Organic Team Leader

S. Hirad

Said Hirad
Laboratory Manager

		Sample Number	PE057307.001	PE057307.002	PE057307.003	PE057307.004	PE057307.005
		Sample Matrix	Water	Water	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	MW1	MW2	MW3	MW4	MW5
Parameter	Units	LOR					

Total Dissolved Solids (TDS) in water Method: AN113

Total Dissolved Solids Dried at 180°C	mg/L	10	2000	2000	9800	6700	130000

Alkalinity Method: AN135

Total Alkalinity as CaCO3	mg/L	5	350	280	400	510	370
Carbonate Alkalinity as CO3	mg/L	1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as HCO3	mg/L	5	420	340	490	630	450

Chloride by Discrete Analyser in Water Method: AN274

Chloride	mg/L	1	780	930	5400	3900	87000

Sulphate in water Method: AN275

Sulphate	mg/L	1	170	170	800	350	5200

Sulphide by Titration in Water Method: AN149

Hydrogen Sulphide at 20 C	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Filterable Reactive Phosphorus (FRP) Method: AN278

Filterable Reactive Phosphorus	mg/L	0.002	<0.002	0.004	0.003	0.008	0.007

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.06	0.09	0.16	0.79	0.11

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	1.7	3.3	1.9	0.82	1.1
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate Nitrogen, NO_3 as N	mg/L	0.005	1.7	3.3	1.9	0.82	1.1

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Total Nitrogen (calc)	mg/L	0.05	2.5	3.9	2.6	2.1	5.1

Low Level Ammonia Nitrogen by FIA Method: AN261

Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.038	0.20	0.054	0.74	0.056

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Calcium, Ca	mg/L	0.2	200	99	120	39	1000
Magnesium, Mg	mg/L	0.1	63	66	300	100	4100
Manganese, Mn	mg/L	0.005	0.17	<0.005	0.020	0.014	0.20
Potassium, K	mg/L	0.1	10	19	130	110	1900
Silica, Soluble	mg/L	0.05	30	26	34	19	10
Silicon, Si	mg/L	0.02	14	12	16	8.7	4.9
Sodium, Na	mg/L	0.5	350	570	3400	2700	48000
Hardness by Calculation	mg CaCO3/L	5	760	520	1500	520	19000

Sample Number			PE057307.001	PE057307.002	PE057307.003	PE057307.004	PE057307.005
Sample Matrix			Water	Water	Water	Water	Water
Sample Date			30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
Sample Name			MW1	MW2	MW3	MW4	MW5
Parameter	Units	LOR					

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Aluminium, Al	μg/L	1	**10**	**5**	**13**	<5↑	<50↑
Arsenic, As	μg/L	1	<1	<1	<5↑	<5↑	<50↑
Cadmium, Cd	μg/L	0.1	<0.1	<0.1	<0.5↑	<0.5↑	<5.0↑
Chromium, Cr	μg/L	1	<1	<1	<5↑	<5↑	<50↑
Iron, Fe	μg/L	5	**8**	<5	<25↑	<25↑	<250↑
Lead, Pb	μg/L	1	<1	<1	<5↑	<5↑	<50↑
Manganese, Mn	μg/L	1	**170**	**5**	**22**	**13**	**220**
Selenium, Se	μg/L	2	<2	**3**	<10↑	<10↑	<100↑
Zinc, Zn	μg/L	1	**16**	**13**	**20**	**10**	<50↑

Mercury (dissolved) in Water Method: AN311/AN312

Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	**0.00011**

Hexavalent Chromium in water by Discrete Analyser Method: AN283

Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	**0.010**
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Calculation of Anion-Cation Balance (SAR Calc) Method: AN121

Sum of Ions*	mg/L	-	**1920**	**2120**	**10600**	**7710**	**148000**
Anion-Cation Balance	%	-100	**-3**	**1**	**1**	**0**	**-1**

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

TRH C6-C9	μg/L	40	<40	<40	<40	<40	<40

Surrogates

Dibromofluoromethane (Surrogate)	%	-	**103**	**107**	**103**	**102**	**106**
d4-1,2-dichloroethane (Surrogate)	%	-	**104**	**119**	**112**	**100**	**109**
d8-toluene (Surrogate)	%	-	**102**	**104**	**101**	**98**	**96**
Bromofluorobenzene (Surrogate)	%	-	**104**	**109**	**99**	**97**	**99**

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403

TRH C10-C14	μg/L	50	<50	<50	<50	<50	**81**
TRH C15-C28	μg/L	200	<200	<200	<200	<200	<200
TRH C29-C36	μg/L	200	<200	<200	<200	<200	<200

Surrogates

TRH (Surrogate)	%	-	**75**	**76**	**82**	**75**	**93**

		Sample Number	PE057307.006	PE057307.007	PE057307.008
		Sample Matrix	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	DUP01	Trip Blank	RIN 1
Parameter	Units	LOR			

Total Dissolved Solids (TDS) in water Method: AN113

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Total Dissolved Solids Dried at 180°C	mg/L	10	**2000**	-	-

Alkalinity Method: AN135

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Total Alkalinity as CaCO3	mg/L	5	**310**	-	-
Carbonate Alkalinity as CO3	mg/L	1	<1	-	-
Bicarbonate Alkalinity as HCO3	mg/L	5	**380**	-	-

Chloride by Discrete Analyser in Water Method: AN274

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Chloride	mg/L	1	**800**	-	-

Sulphate in water Method: AN275

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Sulphate	mg/L	1	**170**	-	-

Sulphide by Titration in Water Method: AN149

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Hydrogen Sulphide at 20 C	mg/L	0.5	<0.5	-	-

Filterable Reactive Phosphorus (FRP) Method: AN278

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Filterable Reactive Phosphorus	mg/L	0.002	<0.002	-	-

Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	**0.05**	-	-

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**1.4**	-	-
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	-	-
Nitrate Nitrogen, NO_3 as N	mg/L	0.005	**1.4**	-	-

TKN Kjeldahl Digestion by Discrete Analyser Method: AN281

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Total Nitrogen (calc)	mg/L	0.05	**2.0**	-	-

Low Level Ammonia Nitrogen by FIA Method: AN261

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	**0.047**	-	-

Metals in Water (Dissolved) by ICPOES Method: AN320/AN321

Parameter	Units	LOR	PE057307.006	PE057307.007	PE057307.008
Calcium, Ca	mg/L	0.2	**190**	-	-
Magnesium, Mg	mg/L	0.1	**62**	-	-
Manganese, Mn	mg/L	0.005	**0.18**	-	-
Potassium, K	mg/L	0.1	**10**	-	-
Silica, Soluble	mg/L	0.05	**31**	-	-
Silicon, Si	mg/L	0.02	**14**	-	-
Sodium, Na	mg/L	0.5	**390**	-	-
Hardness by Calculation	mg CaCO3/L	5	**730**	-	-

		Sample Number	PE057307.006	PE057307.007	PE057307.008
		Sample Matrix	Water	Water	Water
		Sample Date	30/4/11 16:37	30/4/11 16:37	30/4/11 16:37
		Sample Name	DUP01	Trip Blank	RIN 1
Parameter	Units	LOR			

Trace Metals (Dissolved) in Water by ICPMS Method: AN318

Aluminium, Al	µg/L	1	**9**	<1	**2**
Arsenic, As	µg/L	1	<1	<1	<1
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1
Chromium, Cr	µg/L	1	<1	<1	<1
Iron, Fe	µg/L	5	**8**	<5	<5
Lead, Pb	µg/L	1	<1	<1	<1
Manganese, Mn	µg/L	1	**190**	<1	<1
Selenium, Se	µg/L	2	<2	<2	<2
Zinc, Zn	µg/L	1	**20**	**12**	**9**

Mercury (dissolved) in Water Method: AN311/AN312

Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005

Hexavalent Chromium in water by Discrete Analyser Method: AN283

Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002	-	-
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	-	-

Calculation of Anion-Cation Balance (SAR Calc) Method: AN121

Sum of Ions*	mg/L	-	**1930**	-	-
Anion-Cation Balance	%	-100	**-1**	-	-

Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434

TRH C6-C9	µg/L	40	<40	<40	<40

Surrogates

Dibromofluoromethane (Surrogate)	%	-	**103**	**104**	**107**
d4-1,2-dichloroethane (Surrogate)	%	-	**100**	**105**	**108**
d8-toluene (Surrogate)	%	-	**95**	**98**	**97**
Bromofluorobenzene (Surrogate)	%	-	**98**	**100**	**97**

TRH (Total Recoverable Hydrocarbons) in Water Method: AN403

TRH C10-C14	µg/L	50	<50	-	-
TRH C15-C28	µg/L	200	<200	-	-
TRH C29-C36	µg/L	200	<200	-	-

Surrogates

TRH (Surrogate)	%	-	**74**	-	-

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB018729	mg/L	5	<5	0 - 3%	110%
Carbonate Alkalinity as CO3	LB018729	mg/L	1	<1		
Bicarbonate Alkalinity as HCO3	LB018729	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Chloride	LB018886	mg/L	1	<1	0 - 2%	104 - 105%	110 - 119%

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Filterable Reactive Phosphorus	LB018710	mg/L	0.002	<0.002	2 - 4%	105%	103%

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Hexavalent Chromium, Cr6+	LB018860	mg/L	0.002	<0.002	0%	110%	114%
Trivalent Chromium, Cr3+	LB018860	mg/L	0.005	<0.005	0%		

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Ammonia Nitrogen, NH_3 as N	LB018769	mg/L	0.005	<0.005	0 - 2%	95 - 97%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB018744	mg/L	0.00005	<0.00005	0%	103%	103%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB018752	mg/L	0.2	<0.2	1%	101%	81%
Magnesium, Mg	LB018752	mg/L	0.1	<0.1	1%	106%	93%
Manganese, Mn	LB018752	mg/L	0.005	<0.005	0%	102%	93%
Potassium, K	LB018752	mg/L	0.1	<0.1	0%	114%	101%
Silica, Soluble	LB018752	mg/L	0.05	<0.05			
Silicon, Si	LB018752	mg/L	0.02	<0.02	1%	117%	81%
Sodium, Na	LB018752	mg/L	0.5	<0.5	0%	107%	95%
Hardness by Calculation	LB018752	mg	5	<5			

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB018769	mg/L	0.005	<0.005	1 - 2%	97 - 100%
Nitrite Nitrogen, NO_2 as N	LB018769	mg/L	0.005	<0.005	0 - 17%	99 - 105%
Nitrate Nitrogen, NO_3 as N	LB018769	mg/L	0.005	<0.005		

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Sulphate in water Method: ME-(AU)-[ENV]AN275

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sulphate	LB018886	mg/L	1	<1	2 - 8%	97 - 99%	NA

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Nitrogen (calc)	LB018702	mg/L	0.05	<0.05	15%	NA

Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Dissolved Solids Dried at 180°C	LB018766	mg/L	10	<10	0 - 5%	99%
	LB018911	mg/L	10	<10	0 - 1%	88 - 89%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB018702	mg/L	0.01	<0.01	4 - 18%	80%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB018757	µg/L	1	<1		114%	114%
Arsenic, As	LB018757	µg/L	1	<1	0 - 4%	114%	111%
Cadmium, Cd	LB018757	µg/L	0.1	<0.1		109%	102%
Chromium, Cr	LB018757	µg/L	1	<1		114%	115%
Iron, Fe	LB018757	µg/L	5	<5		101%	119%
Lead, Pb	LB018757	µg/L	1	<1	11 - 175%	107%	107%
Manganese, Mn	LB018757	µg/L	1	<1		117%	56%
Selenium, Se	LB018757	µg/L	2	<2	3%	110%	96%
Zinc, Zn	LB018757	µg/L	1	<1		101%	88%

TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C10-C14	LB018780	µg/L	50	<50	95%
TRH C15-C28	LB018780	µg/L	200	<200	110%
TRH C29-C36	LB018780	µg/L	200	<200	114%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH (Surrogate)	LB018780	%	-	88%	91%

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C6-C9	LB018699	µg/L	40	<40	99%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Dibromofluoromethane (Surrogate)	LB018699	%	-	96%	101%
d4-1,2-dichloroethane (Surrogate)	LB018699	%	-	99%	109%
d8-toluene (Surrogate)	LB018699	%	-	96%	102%
Bromofluorobenzene (Surrogate)	LB018699	%	-	93%	106%

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN075	This method uses an alkaline digestion to solubilise both water-soluble and waterinsoluble forms of hexavalent chromium in solids. The solution is then pH adjusted and the hexavalent chromium concentration in solution determined colourimetrically. Please refer to method AN283. The addition of magnesium chloride in a phosphate buffer at the digestion stage assists with preventing oxidation of trivalent chromium to hexavalent chromium.
AN083	Separatory funnels are used for aqueous samples and extracted by transferring an appropriate volume (mass) of liquid into a separatory funnel and adding 3 serial aliquots of dichloromethane. Samples receive a single extraction at pH 7 to recover base / neutral analytes and two extractions at pH < 2 to recover acidic analytes. QC samples are prepared by spiking organic free water with target analytes and extracting as per samples.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN149	Sulphide by Iodometric Titration: Sulphide is precipitated as zinc sulphide to overcome interferences with sulphite and thiosulphate. After filtration, sulphide is determined titrimetrically. Reference APHA 4500-S2-
AN258	Nitrate and Nitrite by FIA: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN261	Ammonia by Continuous Flow Analyser: Ammonium in a basic medium forms ammonia gas, which is separated from the sample matrix by diffusion through a polypropylene membrane. The ammonia is reacted with phenol and hypochlorite to form indophenol blue at an intensity proportional to the ammonia concentration. The blue colour is intensified with sodium nitroprusside and the absorbance measured at 630 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-NH3 H.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN275	Suphate by Aquakem DA: Sulphate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.
AN278	Reactive Phosphorus by Aquakem DA: Orthophosphate reacts with ammonium molybdate (Mo VI) and potassium antimonyl tartrate (Sb III) in acid medium to form an antimony-phosphomolybdate complex. This complex is subsequently reduced with ascorbic acid to form a blue colour and the absorbance is read at 880 nm. The sensitivity of the automated method is 10-20 times that of the macro method. Reference APHA 4500-P F
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the Aquakem 250 discrete analyser for colorimetric analysis.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN283	Hexavalent Chromium via Aquakem DA: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr6+. If total chromium is also measured the trivalent form of chromium Cr3+ can be calculated from the difference (Total Cr - Cr6+). Reference APHA3500CrB.
AN288	Digestion of the sample to convert amino nitrogen present in many organic materials to ammonium sulphate. Free ammonia and ammonium nitrogen also are converted to ammonium sulphate. Colorimetric determination of ammonium nitrogen using the Phenate-Hypochlorite Method (APHA, 2005). Ammonia, phenol and hypochlorite react in an alkaline buffered medium to form a blue coloured compound, indophenol. This reaction is catalysed by sodium nitroprusside. The intensity of the colour development is directly proportional to the concentration of ammonia-nitrogen.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with diffential polarity of the elluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependant on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	This analysis is not covered by the scope of accreditation.
^	Performed by outside laboratory.
LOR	Limit of Reporting
↑↓	Raised or Lowered Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
-	The sample was not analysed for this analyte

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

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STATEMENT OF QA/QC PERFORMANCE AGAINST DATA QUALITY OBJECTIVES

PE057307 R0

CLIENT DETAILS

Contact	Brent Carter
Client	ERM Australia Pty Ltd
Address	PO Box 7338 Cloisters Square PERTH WA 6850
Telephone	08 9321 5200
Facsimile	08 9321 5262
Email	brent.carter@erm.com
Project	**0086269 Burrup TANPF Dampier**
Order Number	**A06631**
Samples	8

LABORATORY DETAILS

Manager	Said Hirad
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	PE057307 R0
Report Number	0000019716
Date Reported	17 May 2011

COMMENTS

All the laboratory data for each environmental matrix was compared to the SGS Environmental Services' stated data quality objectives (DQO).
Comments arising from the comparison were made and are reported below.
The data relating to sampling was taken from the chain of custody document and was supplied by the client.
This QA/QC statement must be read in conjunction with the referenced analytical report.
The statement and the analytical report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Alkalinity	6 Items
	Hexavalent Chromium in water by Discrete Analyser	8 Items
Analysis Date	Alkalinity	6 Items
	Hexavalent Chromium in water by Discrete Analyser	8 Items
MS	Trace Metals (Dissolved) in Water by ICPMS	1 Item

SAMPLE SUMMARY

Sample counts by matrix	8 Water	Type of documentation received	COC
Date documentation received	2/5/2011	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	2.5
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	1

HOLDING TIME SUMMARY

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field sampling guide for containers and holding time" (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Alkalinity Method: ME-(AU)-[ENV]AN135								
MW1	PE057307.001	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW2	PE057307.002	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW3	PE057307.003	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW4	PE057307.004	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW5	PE057307.005	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
DUP01	PE057307.006	LB018729	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274								
MW1	PE057307.001	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
DUP01	PE057307.006	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278								
MW1	PE057307.001	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW2	PE057307.002	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW3	PE057307.003	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW4	PE057307.004	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
MW5	PE057307.005	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
DUP01	PE057307.006	LB018710	30 Apr 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011	02 May 2011
Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283								
MW1	PE057307.001	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW2	PE057307.002	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW3	PE057307.003	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW4	PE057307.004	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
MW5	PE057307.005	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
DUP01	PE057307.006	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
Trip Blank	PE057307.007	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
RIN 1	PE057307.008	LB018860	30 Apr 2011	02 May 2011	01 May 2011	**02 May 2011†**	01 May 2011	**02 May 2011†**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261								
MW1	PE057307.001	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
DUP01	PE057307.006	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312								
MW1	PE057307.001	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW2	PE057307.002	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW3	PE057307.003	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW4	PE057307.004	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
MW5	PE057307.005	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
DUP01	PE057307.006	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
Trip Blank	PE057307.007	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011
RIN 1	PE057307.008	LB018744	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	09 May 2011

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW2	PE057307.002	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW3	PE057307.003	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW4	PE057307.004	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
MW5	PE057307.005	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
DUP01	PE057307.006	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
Trip Blank	PE057307.007	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011
RIN 1	PE057307.008	LB018752	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	10 May 2011

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011
DUP01	PE057307.006	LB018769	30 Apr 2011	02 May 2011	28 May 2011	05 May 2011	28 May 2011	06 May 2011

Sulphate in water Method: ME-(AU)-[ENV]AN275

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW2	PE057307.002	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW3	PE057307.003	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW4	PE057307.004	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
MW5	PE057307.005	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011
DUP01	PE057307.006	LB018886	30 Apr 2011	02 May 2011	28 May 2011	06 May 2011	28 May 2011	06 May 2011

Sulphide by Titration in Water Method: ME-(AU)-[ENV]AN149

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW2	PE057307.002	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW3	PE057307.003	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW4	PE057307.004	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW5	PE057307.005	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
DUP01	PE057307.006	LB018704	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW2	PE057307.002	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW3	PE057307.003	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW4	PE057307.004	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW5	PE057307.005	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
DUP01	PE057307.006	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011

Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW1	PE057307.001	LB018766	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	07 May 2011	06 May 2011
MW2	PE057307.002	LB018766	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	07 May 2011	06 May 2011
MW3	PE057307.003	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011
MW4	PE057307.004	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011
MW5	PE057307.005	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011
DUP01	PE057307.006	LB018911	30 Apr 2011	02 May 2011	07 May 2011	07 May 2011	07 May 2011	07 May 2011

HOLDING TIMES

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS “Field sampling guide for containers and holding time” (Ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

The extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and Analysis dates are shown in **Green** when within suggested criteria and in **Bold** with an appended dagger symbol and Red† when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Sample Name	Sample Number	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293								
MW1	PE057307.001	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW2	PE057307.002	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW3	PE057307.003	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW4	PE057307.004	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
MW5	PE057307.005	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
DUP01	PE057307.006	LB018702	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	07 May 2011	05 May 2011
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318								
MW1	PE057307.001	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW2	PE057307.002	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW3	PE057307.003	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW4	PE057307.004	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
MW5	PE057307.005	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
DUP01	PE057307.006	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
Trip Blank	PE057307.007	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
RIN 1	PE057307.008	LB018757	30 Apr 2011	02 May 2011	27 Oct 2011	05 May 2011	27 Oct 2011	09 May 2011
TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403								
MW1	PE057307.001	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW2	PE057307.002	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW3	PE057307.003	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW4	PE057307.004	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
MW5	PE057307.005	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
DUP01	PE057307.006	LB018780	30 Apr 2011	02 May 2011	07 May 2011	05 May 2011	14 Jun 2011	16 May 2011
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434								
MW1	PE057307.001	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW2	PE057307.002	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW3	PE057307.003	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW4	PE057307.004	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
MW5	PE057307.005	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
DUP01	PE057307.006	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
Trip Blank	PE057307.007	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011
RIN 1	PE057307.008	LB018699	30 Apr 2011	02 May 2011	07 May 2011	04 May 2011	13 Jun 2011	06 May 2011

Samples received outside recommended technical holding times for Alkalinity and Hexavalent Chromium.

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403					
TRH (Surrogate)	MW1	PE057307.001	%	40 - 130%	75
	MW2	PE057307.002	%	40 - 130%	76
	MW3	PE057307.003	%	40 - 130%	82
	MW4	PE057307.004	%	40 - 130%	75
	MW5	PE057307.005	%	40 - 130%	93
	DUP01	PE057307.006	%	40 - 130%	74
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434					
Bromofluorobenzene (Surrogate)	MW1	PE057307.001	%	60 - 130%	104
	MW2	PE057307.002	%	60 - 130%	109
	MW3	PE057307.003	%	60 - 130%	99
	MW4	PE057307.004	%	60 - 130%	97
	MW5	PE057307.005	%	60 - 130%	99
	DUP01	PE057307.006	%	60 - 130%	98
	Trip Blank	PE057307.007	%	60 - 130%	100
	RIN 1	PE057307.008	%	60 - 130%	97
d4-1,2-dichloroethane (Surrogate)	MW1	PE057307.001	%	60 - 130%	104
	MW2	PE057307.002	%	60 - 130%	119
	MW3	PE057307.003	%	60 - 130%	112
	MW4	PE057307.004	%	60 - 130%	100
	MW5	PE057307.005	%	60 - 130%	109
	DUP01	PE057307.006	%	60 - 130%	100
	Trip Blank	PE057307.007	%	60 - 130%	105
	RIN 1	PE057307.008	%	60 - 130%	108
d8-toluene (Surrogate)	MW1	PE057307.001	%	60 - 130%	102
	MW2	PE057307.002	%	60 - 130%	104
	MW3	PE057307.003	%	60 - 130%	101
	MW4	PE057307.004	%	60 - 130%	98
	MW5	PE057307.005	%	60 - 130%	96
	DUP01	PE057307.006	%	60 - 130%	95
	Trip Blank	PE057307.007	%	60 - 130%	98
	RIN 1	PE057307.008	%	60 - 130%	97
Dibromofluoromethane (Surrogate)	MW1	PE057307.001	%	60 - 140%	103
	MW2	PE057307.002	%	60 - 140%	107
	MW3	PE057307.003	%	60 - 140%	103
	MW4	PE057307.004	%	60 - 140%	102
	MW5	PE057307.005	%	60 - 140%	106
	DUP01	PE057307.006	%	60 - 140%	103
	Trip Blank	PE057307.007	%	60 - 140%	104
	RIN 1	PE057307.008	%	60 - 140%	107

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Alkalinity Method: ME-(AU)-[ENV]AN135

LB018729.001

Parameter	Units	Control LOR	BLK MB
Total Alkalinity as CaCO3	mg/L	5	<5

LB018729.027

Parameter	Units	Control LOR	BLK MB
Total Alkalinity as CaCO3	mg/L	5	<5

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

LB018886.001

Parameter	Units	Control LOR	BLK MB
Chloride	mg/L	1	<1

LB018886.026

Parameter	Units	Control LOR	BLK MB
Chloride	mg/L	1	<1

Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278

LB018710.001

Parameter	Units	Control LOR	BLK MB
Filterable Reactive Phosphorus	mg/L	0.002	<0.002

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

LB018860.001

Parameter	Units	Control LOR	BLK MB
Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005

Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261

LB018769.001

Parameter	Units	Control LOR	BLK MB
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005

LB018769.027

Parameter	Units	Control LOR	BLK MB
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	<0.005

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

LB018744.001

Parameter	Units	Control LOR	BLK MB
Mercury	mg/L	0.00005	<0.00005

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

LB018752.001

Parameter	Units	Control LOR	BLK MB
Calcium, Ca	mg/L	0.2	<0.2
Magnesium, Mg	mg/L	0.1	<0.1
Manganese, Mn	mg/L	0.005	<0.005
Potassium, K	mg/L	0.1	<0.1
Silicon, Si	mg/L	0.02	<0.02
Sodium, Na	mg/L	0.5	<0.5

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Units	Control LOR	BLK MB
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258			
LB018769.001			
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005
LB018769.024			
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005
Sulphate in water Method: ME-(AU)-[ENV]AN275			
LB018886.001			
Sulphate	mg/L	1	<1
LB018886.026			
Sulphate	mg/L	1	<1
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113			
LB018766.001			
Total Dissolved Solids Dried at 180°C	mg/L	10	<10
LB018766.024			
Total Dissolved Solids Dried at 180°C	mg/L	10	<10
LB018911.001			
Total Dissolved Solids Dried at 180°C	mg/L	10	<10
LB018911.025			
Total Dissolved Solids Dried at 180°C	mg/L	10	<10
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318			
LB018757.001			
Aluminium, Al	µg/L	1	<1
Arsenic, As	µg/L	1	<1
Cadmium, Cd	µg/L	0.1	<0.1
Chromium, Cr	µg/L	1	<1
Iron, Fe	µg/L	5	<5
Lead, Pb	µg/L	1	<1
Manganese, Mn	µg/L	1	<1
Selenium, Se	µg/L	2	<2
Zinc, Zn	µg/L	1	<1
TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403			
LB018780.001			
TRH C10-C14	µg/L	50	<50
TRH C15-C28	µg/L	200	<200
TRH C29-C36	µg/L	200	<200

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, which is typically 2.5 times the statistically determined method detection limit (MDL).
Result is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Continued... TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403
LB018780.001
Surrogates

Parameter	Units	Control LOR	BLK MB
TRH (Surrogate)	%	-	88

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434
LB018699.001

Parameter	Units	Control LOR	BLK MB
TRH C6-C9	µg/L	40	<40

Surrogates

Parameter	Units	Control LOR	BLK MB
Dibromofluoromethane (Surrogate)	%	-	96
d4-1,2-dichloroethane (Surrogate)	%	-	99
d8-toluene (Surrogate)	%	-	96
Bromofluorobenzene (Surrogate)	%	-	93

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057287.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB018729.005						
Total Alkalinity as CaCO3	mg/L	5	21	21	39	2

		Sample Name		PE057291.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB018729.011						
Total Alkalinity as CaCO3	mg/L	5	84	82	21	2
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB018886.041						
Chloride	mg/L	1	7500	7500	15	0
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.041						
Sulphate	mg/L	1	670	650	15	3

		Sample Name		PE057291.004-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB018886.043						
Chloride	mg/L	1	6300	6300	15	1
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.043						
Sulphate	mg/L	1	570	550	15	5

		Sample Name		PE057296.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113						
LB018766.013						
Total Dissolved Solids Dried at 180°C	mg/L	10	152.000000000001	140	22	5

		Sample Name		PE057296.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281						
LB018702.018						
Total Nitrogen (calc)	mg/L	0.05	0.107	0.09	60	15

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057296.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293 LB018702.018						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.012	<0.01	126	18

		Sample Name		PE057298.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293 LB018702.004						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.05	0.05	37	4

		Sample Name		PE057302.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB018769.013						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.66	0.68	16	2
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB018769.013						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.018	0.020	41	11
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0	<0.005	200	0

		Sample Name		PE057307.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113 LB018766.026						
Total Dissolved Solids Dried at 180°C	mg/L	10	2000	2000	15	0

		Sample Name		PE057307.005-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312 LB018744.009						
Mercury	µg/L	0.00005	0.00011	0.11	62	5

		Sample Name		PE057307.006-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283 LB018860.014						
Hexavalent Chromium, Cr6+	mg/L	0.002	<0.002	<0.002	200	0
Trivalent Chromium, Cr3+	mg/L	0.005	<0.005	<0.005	200	0

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

			Sample Name	PE057320.001-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135 LB018729.030						
Total Alkalinity as CaCO3	mg/L	5	310	300	17	3
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB018886.015						
Chloride	mg/L	1	1400	1400	15	1
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB018886.015						
Sulphate	mg/L	1	800	870	15	8

			Sample Name	PE057320.004-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB018769.029						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.072	0.061	23	17
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB018769.026						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.31	0.31	17	1
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.05	0.050	25	0
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113 LB018911.014						
Total Dissolved Solids Dried at 180°C	mg/L	10	4100	4100	15	1

			Sample Name	PE057320.010-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278 LB018710.015						
Filterable Reactive Phosphorus	mg/L	0.002	0.045	0.047	19	4

			Sample Name	PE057320.011-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Alkalinity Method: ME-(AU)-[ENV]AN135 LB018729.041						
Total Alkalinity as CaCO3	mg/L	5	360	360	16	0
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274 LB018886.029						
Chloride	mg/L	1	710	730	15	2

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057320.011-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Sulphate in water Method: ME-(AU)-[ENV]AN275 LB018886.029						
Sulphate	mg/L	1	380	380	15	2

		Sample Name		PE057320.012-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278 LB018710.024						
Filterable Reactive Phosphorus	mg/L	0.002	0.006	0.006	51	2

		Sample Name		PE057322.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261 LB018769.040						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	6.1	6.1	15	0
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113 LB018911.027						
Total Dissolved Solids Dried at 180°C	mg/L	10	1390	1400	16	0

		Sample Name		PE057322.007-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258 LB018769.043						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	1.8	1.8	15	2
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.011	0.013	57	17

		Sample Name		PE057334.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312 LB018744.015						
Mercury	μg/L	0.00005	<0.0001	<0.00005	200	0
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321 LB018752.014						
Calcium, Ca	mg/L	0.2	64	65	15	1
Magnesium, Mg	mg/L	0.1	43	43	15	1
Manganese, Mn	mg/L	0.005	<0.005	<0.005	200	0
Potassium, K	mg/L	0.1	24	24	15	0
Silicon, Si	mg/L	0.02	8.2	8.2	15	1
Sodium, Na	mg/L	0.5	140	140	15	0

Duplicates are calculated as relative percent difference (RPD) using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
Where the MaxAllowableDifference evaluates to a number larger than 200 it is displayed as 200.
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Sample Name		PE057334.002-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

LB018757.014

Arsenic, As	µg/L	1	<0.002	<1	200	0
Lead, Pb	µg/L	1	0.002	2	59	11
Selenium, Se	µg/L	2	0.003	3	79	3

		Sample Name		PE057335.004-DUP		
Parameter	**Units**	**LOR**	**Original Result**	**Duplicate Result**	**Criteria %**	**RPD %**

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

LB018744.023

Mercury	µg/L	0.00005	<0.0001	<0.00005	200	0

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

LB018757.022

Arsenic, As	µg/L	1	0.005	5	35	4
Lead, Pb	µg/L	1	<0.001	<1	200	175
Selenium, Se	µg/L	2	0.003	3	74	3

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

	Control		LCS STD			
Parameter	**Units**	**LOR**	**Result**	**Expected Result**	**Criteria %**	**Recovery %**
Alkalinity Method: ME-(AU)-[ENV]AN135						
LB018729.002						
Total Alkalinity as CaCO3	mg/L	5	49	45	85 - 115	108
LB018729.028						
Total Alkalinity as CaCO3	mg/L	5	49	45	85 - 115	110
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB018886.002						
Chloride	mg/L	1	10	10	85 - 115	105
LB018886.027						
Chloride	mg/L	1	10	10	85 - 115	104
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278						
LB018710.002						
Filterable Reactive Phosphorus	mg/L	0.002	0.21	0.2	80 - 120	105
Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283						
LB018860.002						
Hexavalent Chromium, Cr6+	mg/L	0.002	0.11	0.1	80 - 120	110
Low Level Ammonia Nitrogen by FIA Method: ME-(AU)-[ENV]AN261						
LB018769.002						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.78	0.8	85 - 115	97
LB018769.028						
Ammonia Nitrogen, NH_3 as N	mg/L	0.005	0.76	0.8	85 - 115	95
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312						
LB018744.002						
Mercury	mg/L	0.00005	0.0026	0	NA	103
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
LB018752.002						
Calcium, Ca	mg/L	0.2	200	200	80 - 120	101
Magnesium, Mg	mg/L	0.1	210	200	80 - 120	106
Manganese, Mn	mg/L	0.005	2.0	2	80 - 120	102
Potassium, K	mg/L	0.1	2.3	2	80 - 120	114
Silicon, Si	mg/L	0.02	2.3	2	80 - 120	117
Sodium, Na	mg/L	0.5	210	200	80 - 120	107
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258						
LB018769.002						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.80	0.8	85 - 115	100
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.84	0.8	85 - 115	105

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Control	LCS STD			
Parameter	**Units**	**LOR**	**Result**	**Expected Result**	**Criteria %**	**Recovery %**
Continued... Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258						
LB018769.025						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	0.77	0.8	85 - 115	97
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	0.79	0.8	85 - 115	99
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.002						
Sulphate	mg/L	1	10	10	80 - 120	99
LB018886.027						
Sulphate	mg/L	1	10	10	80 - 120	97
Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113						
LB018766.002						
Total Dissolved Solids Dried at 180°C	mg/L	10	260	300	80 - 120	87
LB018766.025						
Total Dissolved Solids Dried at 180°C	mg/L	10	300	300	80 - 120	99
LB018911.002						
Total Dissolved Solids Dried at 180°C	mg/L	10	270	300	80 - 120	89
LB018911.026						
Total Dissolved Solids Dried at 180°C	mg/L	10	260	300	80 - 120	88
Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293						
LB018702.002						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.01	0.40	0.5	80 - 120	80
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB018757.002						
Aluminium, Al	µg/L	1	11	10	80 - 120	114
Arsenic, As	µg/L	1	11	10	80 - 120	114
Cadmium, Cd	µg/L	0.1	11	10	80 - 120	109
Chromium, Cr	µg/L	1	11	10	80 - 120	114
Iron, Fe	µg/L	5	10	10	80 - 120	101
Lead, Pb	µg/L	1	11	10	80 - 120	107
Manganese, Mn	µg/L	1	12	10	80 - 120	117
Selenium, Se	µg/L	2	11	10	80 - 120	110
Zinc, Zn	µg/L	1	10	10	80 - 120	101
TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403						
LB018780.002						
TRH C10-C14	µg/L	50	470	500	60 - 130	95
TRH C15-C28	µg/L	200	550	500	60 - 130	110
TRH C29-C36	µg/L	200	570	500	60 - 130	114
Surrogates						
TRH (Surrogate)	%	-	91.0	100	50 - 150	91

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022).
For more information refer to the footnotes in the concluding page of the report.
Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

Parameter	Control Units	Control LOR	LCS STD Result	LCS STD Expected Result	LCS STD Criteria %	LCS STD Recovery %
Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434						
LB018699.002						
TRH C6-C9	µg/L	40	<40	30	70 - 130	99
Surrogates						
Dibromofluoromethane (Surrogate)	µg/L	-	5.1	5	60 - 130	101
d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.5	5	60 - 130	109
d8-toluene (Surrogate)	µg/L	-	5.1	5	60 - 130	102
Bromofluorobenzene (Surrogate)	µg/L	-	5.3	5	60 - 130	106

Matrix spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of the report. Recovery is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

		Control		MS		
Parameter	**Units**	**LOR**	**Result**	**Original Result**	**Spike Added**	**Recovery %**
Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274						
LB018886.005						
Chloride	mg/L	1	200	82	100	119
LB018886.031						
Chloride	mg/L	1	300	192.333	100	110
Filterable Reactive Phosphorus (FRP) Method: ME-(AU)-[ENV]AN278						
LB018710.004						
Filterable Reactive Phosphorus	mg/L	0.002	0.21	<0.002	0.2	103
Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283						
LB018860.012						
Hexavalent Chromium, Cr6+	mg/L	0.002	0.11	<0.002	0.1	114
Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312						
LB018744.004						
Mercury	mg/L	0.00005	0.0021	<0.00005	0.0025	103
Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321						
LB018752.004						
Calcium, Ca	mg/L	0.2	360	200	200	81
Magnesium, Mg	mg/L	0.1	250	63	200	93
Manganese, Mn	mg/L	0.005	2.0	0.17	2	93
Potassium, K	mg/L	0.1	12	10	2	101
Silicon, Si	mg/L	0.02	16	14	2	81
Sodium, Na	mg/L	0.5	540	350	200	95
Sulphate in water Method: ME-(AU)-[ENV]AN275						
LB018886.005						
Sulphate	mg/L	1	160	29	-	NA
LB018886.031						
Sulphate	mg/L	1	160	30.462	100	127
Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318						
LB018757.004						
Aluminium, Al	µg/L	1	21	10	10	114
Arsenic, As	µg/L	1	12	<1	10	111
Cadmium, Cd	µg/L	0.1	10	<0.1	10	102
Chromium, Cr	µg/L	1	11	<1	10	115
Iron, Fe	µg/L	5	20	8	10	119
Lead, Pb	µg/L	1	11	<1	10	107
Manganese, Mn	µg/L	1	170	170	10	**56†**
Selenium, Se	µg/L	2	10	<2	10	96
Zinc, Zn	µg/L	1	25	16	10	88

Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as relative percent difference using the formula RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The original result is the analyte concentration of the matrix spike and the replicate result is the analyte concentration of the matrix spike duplicate.
The RPD is evaluated against the maximum allowable RPD criteria and can be graphically represented by a curve calculated from the statistical detection limit and limiting repeatability using the formula: MaxAllowableDifference = 100 x StatisticalDetectionLimit / Mean + LimitingRepeatability
RPD is shown in **Green** when within suggested criteria or **Bold** with an appended dagger symbol and Red† when outside suggested criteria.

No Matrix Spike Duplicates were required for this job.

FOOTNOTES

IS	Insufficient sample for analysis.	QFH	QC result is above the upper tolerance
LNR	Sample listed, but not received.	QFL	QC result is below the lower tolerance
*	NATA Accreditation does not cover this analysis.	NA	The sample was not analysed for this analyte
^	Performed by outside laboratory.		
LOR	Limit of Reporting		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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Attachment 9B

Letter from DEC Contaminated Sites Branch stating Acid Sulfate Soil investigation report meets the requirements of condition 9.1.

Government of **Western Australia**
Department of **Environment and Conservation**

Your ref: 0086269
Our ref: 2012/1501
Enquiries: Rowena Beaton
Phone: (08) 9333 7573
Fax: (08) 9333 7575
Email: rowena.beaton@dec.wa.gov.au

Steve Morrison
ERM Australia
6th Floor, 172 St Georges Terrace
Perth WA 6000

Dear Mr Morrison,

TECHNICAL AMMONIUM NITRATE PRODUCTION FACILITY
ACID SULFATE SOILS INVESTIGATION

Thank you for your submission of the report entitled "Burrup Nitrates Pty Ltd, Technical Ammonium Nitrate Production Facility (TANPF), Acid Sulfate Soils Investigation" (ERM Australia, December 2011) (the report) to the Contaminated Sites Branch (CSB) of the Department of Environment and Conservation (DEC). The report was received on 9 March 2012.

It is understood that the report was prepared to satisfy Condition No. 9 of Ministerial Statement 870 under Part IV of the *Environmental Protection Act 1986*, issued for Lots 3017 and 3018 Hearson Cove Road, Burrup Industrial Estate on 7 July 2011. Condition 9 reads as follows:

"9-1 The proponent shall undertake intrusive acid sulphate soils investigations prior to the commencement of construction.

9-2 In the event that acid sulphate soils are disturbed during construction of the TANPF, the proponent shall treat and manage acid sulphate soils in accordance with the requirements of the DEC's draft guideline on the treatment and management of acid sulfate soils and water in acid sulfate soil landscapes (DEC, 2009) and any subsequent revisions."

CSB has reviewed the report and provides the following comment.

Based on the information provided, CSB concurs with the results of the acid sulfate soil (ASS) investigation carried out at the site and agrees that no ASS appear to be present at the site.

It is understood that dewatering will be undertaken at the site, but that dewatering is not expected to disturb any ASS within the development area. Groundwater modelling was not provided, but soil investigations have also been undertaken in the surrounding area (in the most likely topographic area for ASS to be present) and these did not identify ASS. As such, CSB considers that dewatering is unlikely to disturb ASS and that groundwater modelling is not required.

As such, it is agreed that an acid sulfate soil and dewatering management plan (ASSDMP) is not necessary for the proposed works.

However, as total acidity was not included as an analyte in groundwater investigations, DEC recommends that the quality of dewatering effluent is monitored during any dewatering operations via measurements of pH (at a minimum) and total titratable acidity. These parameters can be measured in the field by dewatering contractors. If any deterioration in dewatering effluent quality is noted, this should be used as a trigger to implement contingency actions as described in section 5.3.7 of 'Treatment and management of soils and water in acid sulfate soil landscapes' (DEC, July 2011).

Ammonia, chromium and mercury were present in groundwater at concentrations exceeding the Aquatic Ecosystems – Marine guidelines, as published in 'Assessment Levels for Soil, Sediment and Water' (DEC, 2010). Dewatering effluent should not be discharged to the marine environment unless it can be shown to be of a suitable quality.

Should the site work program change such that excavation and/or dewatering is proposed to be undertaken outside the area shown in Figure 1, then further investigation and/or a comprehensive acid sulfate soil and dewatering management plan (ASSDMP) should be developed to the satisfaction of DEC.

Consequently, CSB considers that Condition No. 9 of Ministerial Statement 870 has been satisfactorily met for Lots 3017 and 3018 Hearson Cove Road, Burrup Industrial Estate.

Please contact Rowena Beaton, Environmental Officer of CSB, on 9333 7573 if you have any queries in relation to the above.

Yours sincerely

Kerry Laszig
MANAGER
CONTAMINATED SITES BRANCH

5 June 2012

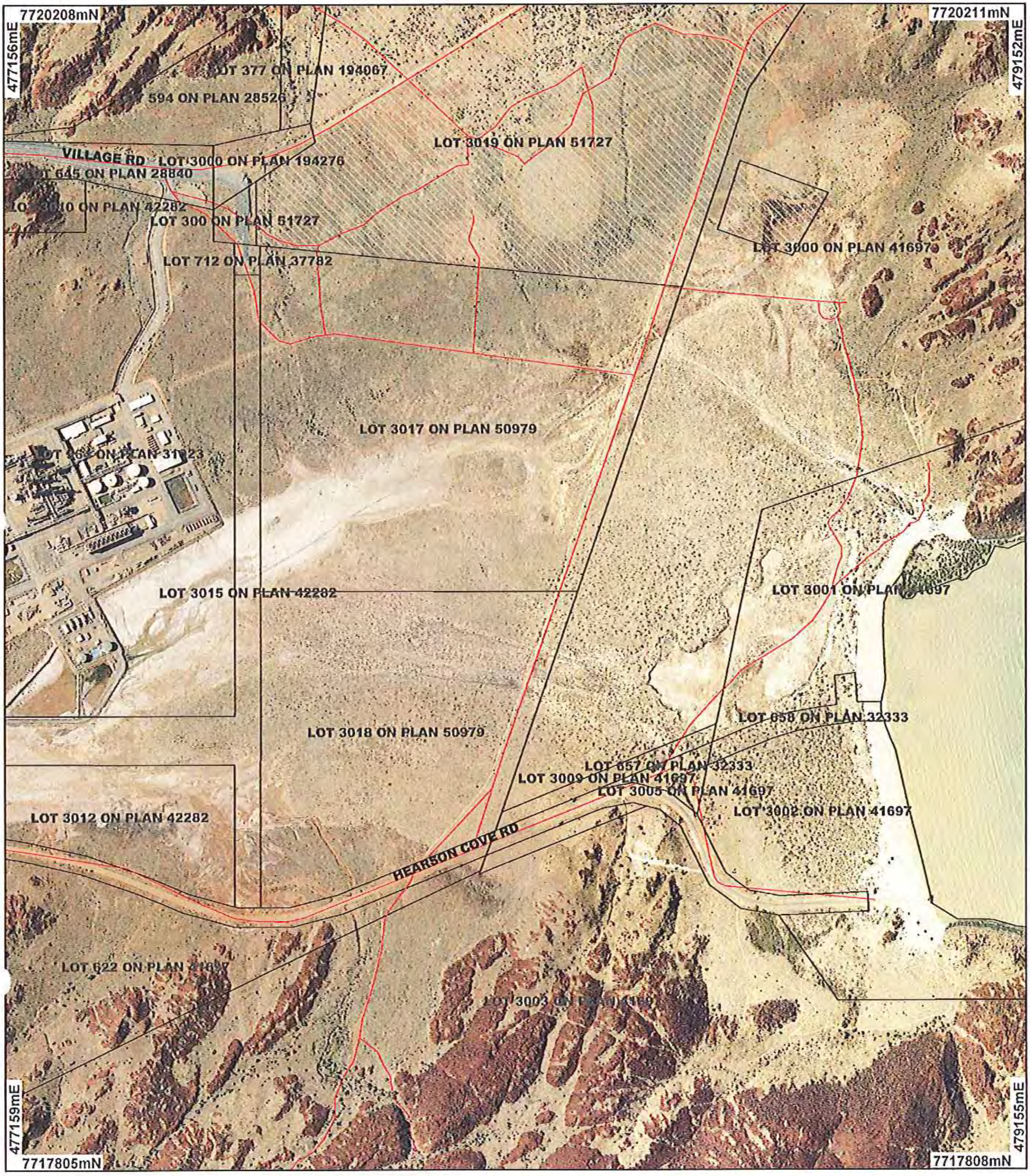
c.c. Regional Manager, Department of Water, Pilbara Region, PO Box 835, Karratha WA 6714

c.c. Shire of Roebourne, PO Box 219, Karratha WA 6714

c.c. Mr Ian Munro, Office of the Environmental Protection Authority, Locked Bag 33, Cloisters Square, Perth Western Australia 6850

Attachment 1: Site location figure

3017 & 3018 Hearson Cove Rd, Burrup - ASS



LEGEND

Contaminated - Reported Sites

- ☐ Contaminated - remediation required
- ☐ Contaminated - restricted use
- ☐ Remediated for restricted use
- ☐ Possibly contaminated - investigation required
- ☐ Not contaminated - unrestricted use
- ☐ Decontaminated
- ☐ Report not substantiated

(cont)

- ☐ Awaiting Classification

Cadastre for labelling_1

- ☐ Freehold
- ☐ Crown Reserve
- ☐ State Forest / Timber Reserve
- ☐ Marine Park
- ☐ Crown Lease
- ☐ Lease / Reserve
- ☐ Lease on State Forest / Timber Reserve

(cont)

- ☐ Public Roads
- ☐ Unallocated Crown Land
- ☐ Water

Road Centrelines

Groundwater Contours, Historic Maximum

Dampler and Extensions 50cm Orthomosaic - Landgate 2008

N

0 ~300 m

Scale 1:11518
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Prepared by: rowenab
Prepared for:
Date: 10/04/2012 10.30.32 AM

Information derived from this map should be confirmed with the data custodian acknowleged by the agency acronym in the legend.

Department of Environment and Conservation

Our environment, our future

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Attachment 10A

Decommissioning Environmental Management Plan, Revision 6.

Yara Pilbara Nitrates Process Facility

Decommissioning Environmental Management Plan (DEMP)

DOCUMENT No: 500-200-PLN-YPF-0001				**YARA PILBARA NITRATES**				
DOCUMENT CUSTODIAN: YPNPL Commissioning Manager				**DOCUMENT OWNER:** Business Services Manager				
REV	**DESCRIPTION**	**ORIGIN**	**VERIFIED**	**DATED**	**YARA APPROVAL**	**SIGNED**	**DATED**	**VALID THROUGH**
5	Amend to Yara Pilbara template and document updated for submission to EPA	R Lam	U Nylund	24-03-2015	R Sinha	RS	24-03-2015	24-03-2017
6	Update sections 6.1 and 6.3.6 as per comments from OEPA	R Lam	U Nylund	05-05-2015	R Sinha	RS	11-05-2015	11-05-2017

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1 Purpose and Application

Yara Pilbara Nitrates Pty Ltd (YPNPL) submitted a development application for the proposed Technical Ammonium Nitrate Production Facility (TANPF) to the City of Karratha.

The implementation of the proposal is subject to a set of conditions defined by the Environmental Protection Authority (EPA) and set forth in Ministerial Statement 870. Condition 10-1 (870:M10.1) refers to decommissioning as an overall phase of the TAN Burrup Project execution and therefore requires a management plan.

The Decommissioning Environmental Management Plan (DEMP) is a dynamic document that:

- Will be periodically reviewed and revised throughout the decommissioning phase;
- Will be reissued prior to the decommissioning phase; and
- Can be reissued at other intervals as required by HES.

Future submissions will include a summary of the effectiveness of the mitigation measures over the previous 12 months.

The issue of closing down, dismantling and demolishing the TANPF is an integral part of restructuring of YPNPL's business. The intention with this manual is to describe a best practice approach to the issue.

Information from several sources has therefore been combined into this manual. The document has, to a large extent, the form of a checklist. The document will be subject to changes and development to reflect the experience which will be gained.

More specific information will be found as enclosures to the document.

The site has been proposed and defined based different criteria including minimization of environmental disturbance (see section 5). The level of the site has been studied to ensure minimal alterations to original level. The site will be brought back to a level of an industrial zoned area. Relevant items for the final landform at closure to be considered:

- The requirement to think long term.
- The requirement to integrate the closure plan into current operations.

It is therefore essential to begin with determining the desired geometry at closure taking into consideration:

- The management of runoff and long term erosion;
- The slope profile that will generate minimum erosion;
- The potential effects of differential settlement; and
- Isolation of chemically adverse material within the dump such that it is unlikely to be exposed by erosion and that net infiltrated rainwater through the adverse material is minimized.

The decommissioning phase will last approximately four to six months with an average manning level of at least 30-40 persons. The number of persons involved in these activities is susceptible to increase. Upon decommissioning the TANPF is not considered likely to have any significant hazardous wastes or contaminate land. All wastes and contaminated material will be cleaned and removed in accordance with relevant legislation and the DEMP.

The site will be brought back to a level of an industrial zoned area. The original landform has not been significantly altered and for areas/sections of the site that could potentially be differing significantly from the original landform, restoration shall be considered.

In addition equipment, buildings and other facilities will be removed. Decommissioning activities will involve the recovery of catalyst (platinum) from the heat exchangers and vessels in the NA plant.

Clean and contaminated surface water ponds will be emptied and cleaned (with all contaminated waste to be appropriately removed by an approved waste contractor), and all interconnections (piping) to the YPFPL site will be removed.

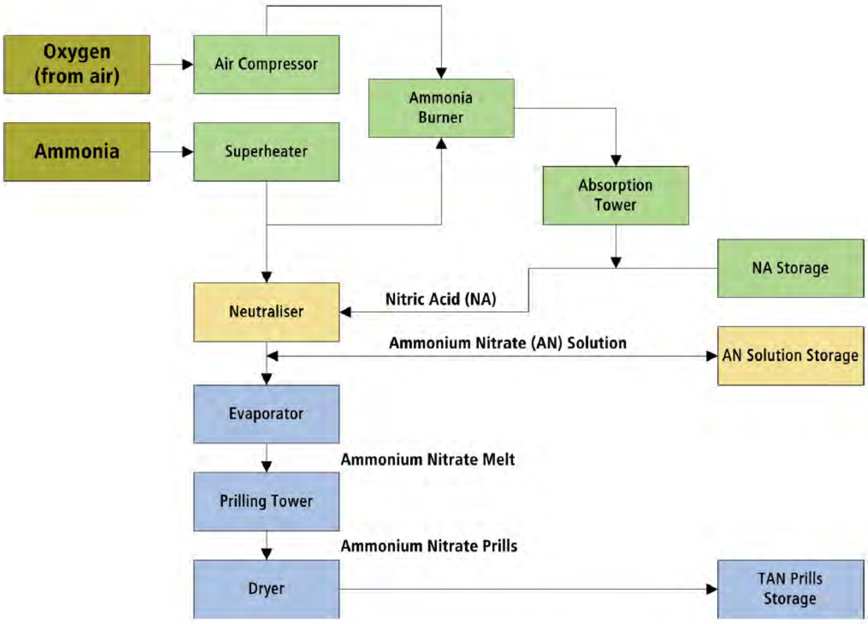


Figure 1: TAN Production Facility Production Process

This DEMP will indicate the mitigation measures to reduce and where possible prevent any significant adverse effects on the environment throughout the decommissioning phase of the Project. The decommissioning activity is divided into 3 phases as follows:

1. Care and Maintenance Preparations: is the first phase of decommissioning. During this phase most of the plant and buildings on the site will be dismantled and cleared.
2. Care and Maintenance: is the second phase of decommissioning, during which no significant dismantling will be carried out. The Site will continue to be managed, monitored and maintained.
3. Final Site Clearance: is the last phase. This involves the dismantling of the remaining structures on the Site and the clearance of any residual to bring it back to a level of an industrial zone area.

Environmental topics to be considered as a minimum are:

- Air Quality and Dust
- Archaeology and Cultural Heritage
- Ecology
- Geology, Hydrogeology and Soils
- Landscape and Visual
- Noise and Vibration
- Socio-Economic
- Surface Waters
- Traffic and Transport

Table 1 below summarizes the requirements given in Ministerial Statements 870, Condition 10-1

Requirements of Condition 10-1	**Description**	**Addressing Section**
Condition part 10-1(1)	Describe the rationale for siting and design of plant and infrastructure as relevant to environmental protection	Section 5
Condition part 10-1(2)	Prepare a conceptual plan of the final landform at closure	Section 6
Condition part 10-1(3)	Prepare for plan for care and maintenance phase	Section 8.1.5
Condition part 10-1(4)	Prepare an initial plan for the management of noxious materials following closure.	Section 8.1.8

Table 1: Conditions set out in MS 870 Condition 10-1

2 Abbreviations

DEMP	Decommissioning Environmental Management Plan
HES	Health Environment Safety
TAN	Technical Ammonium Nitrate
TANPF	Technical Ammonium Nitrate Production Facility
TR	Técnicas Reunidas S.A.
YPFPL	Yara Pilbara Fertilisers Pty Ltd
YPNPL	Yara Pilbara Nitrates Pty Ltd

3 Definitions

Company	Yara Pilbara Nitrates Pty Ltd
Contractor	Técnicas Reunidas S.A.
Construction	Includes any preparatory work required to be undertaken including clearing vegetation, cut and fill activities, the erection of any on-site temporary structures and the use of equipment for the purpose of breaking the ground for buildings or infrastructure.
Decommissioning	Planned shut-down or removal (partial or total) of a building, equipment, etc. from operation or usage.
Demolition	The controlled act of destroying a building, equipment, etc.
Project	TAN Burrup Project.
Rehabilitation	Activities performed in order to return the site to pre-construction conditions
The Site	35 Ha area where construction works are performed.

4 Rationale for Siting and Design of the Plant and Infrastructure Relevant to Environmental Protection

4.1 Site Selection

During the Site selection screening study, three industrial estates in the Pilbara region were assessed and ranked in terms of their suitability for development of a technical ammonium nitrate production facility (TANPF). The three industrial estates identified were:

- Mount Anketell Industrial Estate (MAIE) – A 4,775 Ha industrial estate located on the Pilbara coastline in the northwest of WA, 1,253 km north of Perth and 37km northeast of Karratha and situated in the Shire of Roebourne.
- Burrup Industrial Estate (BIE) – A 1,400 Ha strategic industrial estate located on the Burrup Peninsula, 13km northwest of Karratha.
- Maitland Industrial Estate (MIE) – A 3,300 Ha strategic industrial estate located about 17 km southwest of Karratha

Criteria used in selecting one of the three industrial estates included, but was not limited to:

1. Access:
   - Land tenure (current and historical)
   - Suitably industrial zoned land
   - Native title claims and their status
   - Aboriginal heritage
   - Year-round road access
2. Physical Environment:
   - Environmental sensitivity
   - Topography and geomorphology
   - Existing infrastructure
3. Development Considerations:
   - HES management factors
   - Proximity and reliability of a suitable source of liquid ammonia
   - Proximity and reliability of a natural gas supply
   - Availability of services such as power and water
   - Suitable for storage of technical ammonium nitrate
   - Constructability and operability

4. Commercial and Marketing Issues:
    - Proximity of a community with the appropriate support facilities
    - Availability of skilled labour
    - Transport access/egress
    - Proximity to market
    - Public opinion

Following site selection studies of the MAIE, BIE and MIE, it was decided that site D within King Bay/Hearson Cove Industrial Precinct, part of the BIE, was the only suitable identified site for the TANPF project.

All locations within the BIE were considered utilizing the evaluation criteria that is outlined above. Site D was selected for several reasons, of which the main reason is the close proximity to the Yara Pilbara Fertilisers Pty Ltd Ammonia Plant (YPFPL) operating about 100 m to the west of the proposed Site. The YPFPL plant will provide the required quantity of ammonia as feed stock for the production of TAN and will allow for a reliable supply to ensure uninterrupted operations at the TANPF. The proximity to the ammonia plant will also allow the existing infrastructure and utilities.

Other reasons behind choosing to develop the proposed TANPF in the BIE include:

- The Site is already zones for strategic industrial use under the City of Karratha Town Planning Scheme no.8 – The King Bay/Hearson Cove Industrial Precinct is government endorsed (at state and local levels) as identified in the Burrup Peninsula Land Use Plan and Management Strategy (O'Brian Planning Consultants, 1996).
- Site D provides for a safe distance between the bulk storage at the proposed TANPF and ammonia storage tanks located at the YPFPL plant. In addition this location provides a safe distance from the Burrup Road, the main causeway road, and associated infrastructure (e.g. the Dampier to Bunbury Natural Gas Pipeline as well as Hearson Cove).
- Native Title being extinguished over the Site – State government negotiated in 2003 a Native Title Agreement with the Native Title claimant groups of the Burrup Peninsula.
- Being compatible with adjacent industries – The TANPF Project is compatible with adjacent industries and will utilize power, water and ammonia from existing industries/facilities within the BIE.
- Proximity to the market – Within close proximity to numerous major mining operations in the Pilbara.
- Flat topography – This means that it is feasible to construct the TANPF with reduced civil works, therefore reducing impacts associated with construction of the TANPF.

- The Site is located in proximity to the existing available port facilities, allowing easy delivery of key plant components.
- The Site is serviced by existing trafficable roads allowing for easy access to the Site, as well as reducing the environmental impact and additional costs associated with a more isolated site.
- The proponent has a track record and extensive knowledge of operating in the BIE since the ammonia plant construction/operation commenced 10 years ago.
- All necessary infrastructure and services are already available for the project.
- Suitably qualified workforce is locally available – Karratha (13km to the southeast) and Dampier (6km to the southwest) has developed a qualified and experienced workforce as a result of large-scale mineral and petroleum resource developments in the region. The majority of the existing workforce is employed in the resources industry including Hamersley Iron, Dampier salt, the North West Shelf Gas Project, Woodside's Pluto Gas Project and YPFPL's ammonia plant.

4.2 Plant Layout Selection

The layout and location of the TANPF within Site D was determined based on, but not limited to, the following key factors:

1. Aboriginal heritage:
    - YPNPL are intent on disturbing no rock art and minimizing any potential impacts on heritage sites
2. Environmental impacts including flora and fauna, topography, supra-tidal flats, site inundation by flooding or storm surge:
    - YPNPL have a corporate and social responsibility to minimize the impacts on the environment where possible.
3. Geotechnical
    - To help determine the suitability of the ground and footings for the location of a TANPF.
4. Optimizing internal logistics and safety
    - Risk and safety impacts are to be minimized and are the main priority of YPNPL.
5. Site access
    - Site access from Village Road is important to ensure disturbance to important cultural heritage and recreational activities of Deep Gorge and Hearson Cove were minimized.

6. Feedstock and infrastructure
    - Location in close proximity to YPFPL plant which will be providing uninterrupted supplies of ammonia feedstock and utilities. Shared infrastructure will be provided by both YPFPL and the Water Corporation.
7. Impacts on surrounding land use and infrastructure
    - Industry, cultural heritage sites and recreational areas are all key aspects of the Burrup Peninsula.

Based on the key factors mentioned above, the TANPF was located in the northern section of the Site. The selected location in the northwestern corner of the Site was determined based on numerous internal reviews and optimizes the positioning of the TANPF when taking into account the issued mentioned above. Key reasoning behind the decision is that the location:

1. Provides the highest elevation above sea level on the Site to help avoid and mitigate any potential flooding or storm surge impacts from the low lying supra-tidal flats to the south
2. Is the furthest points from local from local sensitive receptors at Hearson Cove and Deep Gorge
3. Is in the optimal location from a safety standpoint, with risk contours all within the required ranges
4. Complies with WA government request that industries are positioned so as to enable optimal usage of all industrial estate land
5. Contains no identified threatened or priority flora, fauna habitats or threatened ecological communities
6. Is not within an area that will disturb any Aboriginal rock art
7. Is in an area of the Site, easily accessed from Village Road, avoiding access from the south via Hearson Cove Road.

5 Conceptual Plan of Final Landform at Closure

In agreement with the Stakeholders as identified in the PER, the Site shall be returned to an industrial zoned area:

- All above ground building and structures shall be removed
- Underground piping and equipment shall be removed
- Foundations / underground civil works / roads shall be removed at least to a depth of 400 mm and backfilled
- All excavation shall be back filled

The Site will remain as a single terrace. Structures such as embankment and Channels on the periphery of the Site shall remain in place so that drainage is still possible.

The proposed landform at closure in illustrated in Attachment 3.

The Plant area will remain at an overall level of +5.5 and the northern and western channels will remain. Embankments will also remain.

6 Project Approach to Decommissioning

As a natural part of the life cycle of a fixed asset, the asset will have to be decommissioned and disposed of in a satisfactory manner when it is no longer feasible to operate.

When a fixed asset comes to this stage, a project approach shall be used. The reason for this is the uniqueness of the activities, taking into account amongst others the production processes, feed stock materials, buildings, equipment, location, local conditions and legislation.

The project approach implies that three phases need to be considered; identification, planning and execution phase.

6.1 Closure Scenarios and Closure Management Strategies

There are three scenarios under which the plant may cease operation:

- Planned final closure
  Occurs when operation ceases due to economic or operational requirements
- Unplanned closure
  Occurs when operations suddenly cease due to financial constraints or if the operations are instructed to close due to non-conformances with regulatory requirements
- Temporary closure
  Care and maintenance is often required for operations that have temporarily ceased operations. In this situation a “caretaker” generally manages the site and the operation may recommence when more positive circumstances prevail

Closure management strategies have been developed for the three closure scenarios and described in detailed in section 6.2.6.

Both unplanned and temporary closure only last for a limited period of time before a decision is made to either recommence or to cease operation and enter planned final closure. It is appropriate for strategies to be developed for the environmental risk aspects of the closure scenarios.

For planned final closure it is possible to target physical aspects of the plant and site and develop closure strategies. Should the plant enter either unplanned or temporary closure it may ultimately go through planned final closure and all the strategies relating to physical aspects of the plant and site will then be addressed.

6.2 Identification Phase

This is the first, early phase when closing, dismantling, demolition and disposal of production facilities are considered. The purpose of this phase is to identify the scope of all activities on an overall level as a basis for a total estimate. The activities and their associated cost elements can be grouped as follows:

- Legal and contractual obligations towards redundant personnel (transfer, dismissal or early retirement or other social cost)
- Operation during the closing down period:
    - Supervision
    - Utilities
    - Consumables
- Non fulfilment of contractual obligations to partners, covering:
    - Feed stock
    - Energy import and export
    - Product and by-product delivery
    - Land lease and common infrastructure
- Preparations for dismantling and demolition of equipment, buildings, off-sites and utilities:
    - Emptying and cleaning
    - Disposal of waste products
    - Disposal of catalyst, lubrication agents, contaminated or toxic material
- Dismantling and demolishing (above ground level):
    - Dismantling sellable or reusable equipment and materials
    - Preservation, storing and transportation of sellable or reusable equipment and materials
    - Demolishing and sorting of materials
    - Recycling and/or disposal of materials
- Dismantling and demolishing (below ground level):
    - Foundations
    - Piles
    - Sewage systems
    - Cables and pipelines
    - Recycling and/or disposal of materials
- Preparation for further use of the site:
    - Replacement of contaminated soil
    - Rerouting of common infrastructure (cables, pipe racks, underground installations)
    - Ground levelling and final preparation

    - Site cleaning
- Special HES – issues:
    - Radiation/radioactivity
    - Possible less known contamination from previous activities at site
- Project management cost, including engineering and procurement activities during the dismantling and demolition phase.

Due to the sensitivity of such early phase work, only few persons will be involved in this phase. However, these shall be familiar with the local conditions and situation in order to cover as many aspects as possible. In this phase the accuracy of the estimate and schedule for activities will be on the lower side.

6.3 Planning Phase

When it has been decided that YPNPL (or part of it) shall be closed, dismantled and demolished, the activities can be split in two main groups:

- One dealing with personnel, the transition period from operation to standstill and contracts/agreements.
- The other group deals with the activities to prepare for and carry out dismantling, demolition, disposal and preparations for future use of the Site or area thereof.

This manual will deal with the latter.

6.3.1 Planning of dismantling, demolition, disposal and final preparation of the site

This is an important project phase because it will be the basis for a successful execution. It is to be compared to a pre-execution (main) study phase in a "normal" project. Competent personnel is essential, but especially when it comes to knowledge about the facility's history and the impact this may have on content of toxic, contaminated or polluting material in equipment, buildings and the ground.

The purpose of the study is to clarify all aspects relevant for estimating the cost and also to establish methods, philosophies and schedules for the execution phase. One aspect is also to optimise the cost by identifying the potential for income from sale of useful equipment and material, but also to reduce transportation, recycling and disposal cost e.g. by separation of material in contaminated and non-contaminated fractions.

6.3.2 Definition of the works

A clear description of the scope of work for the decommissioning and the objectives of it is an important basis also for this type of activities.

6.3.3 Execution and procurement strategy

This has to be developed in the planning phase. It will be dependent on the project's scope and objective, but also on available personnel at YPNPL being closed.

An important factor is to survey the market for (demolishing and second hand equipment) contractors in order to choose the most suitable contract format and contractors for the actual scope. A prequalification is going to be made in order to short list contractors which can meet the requirements to safety and which are able to deal properly with the environmental aspects of the works.

6.3.4 Organisation

Planning and execution of demolition work can be organised in two principal ways:

- Performed by operating / maintenance personnel from existing plant operations/maintenance personnel working in the established plant organisation
- Performed by personnel wholly or partly dedicated to the organisation for the demolition work

Selection between the two alternatives would normally be based on:

- Local knowledge of the plant
- Extent of demolition work
- Complexity of demolition work
- Current work load for operations personnel

Generally, small demolition work would be executed within an existing plant organisation, whilst larger and more complex demolition work would be executed by establishing a dedicated organisation.

For execution of big and complex demolition work by a dedicated organisation some important issues must be taken into account when organising the project team:

- The team need in-depth knowledge of plant history, available documentation, knowledge about previous production processes, etc.
- Capability of systematic planning and evaluation of all related costs and risks according to the general requirement of Yara, i.e. capability of performing the works according to the same standards as for any other investment activities.
- Capability of utilising external contractors according to the same standards as for any other investment project, i.e. focus and competence on competitive bidding processes, contractor qualifications and track records (safety), contract quality.
- Availability of personnel with proper technical competence as well as continuity in the team during this phase.

- Need for YPNPL to maintain and continuously update experience in demolition works.

The above requirements can be met by various project organisation models and utilisation of personnel.

An example is shown in Attachment 2.

6.3.5 Legislation and other requirements

An important basis for planning is to clarify national and local legislation and requirements.

For Yara's best practices for closing down, dismantling, demolition and disposal of production plants please refer to section 11 for minimum references that are going to be considered.

6.3.6 Care and Maintenance (C&M) plan

Note that any relevant environmental monitoring under Ministerial Statement shall be continued and in particular groundwater monitoring (condition 8).

6.3.6.1 Unplanned Closure

Should the TANPF be suddenly shut down there will be little or no preparation and planning period and the following are considered to pose significant environmental risks:

Environmental Risk	Closure strategy	Timing	Responsible
Liquid ammonia	Empty all pipes and vessels	<1 week	Plant manager
Nitric acid	Consolidate all nitric acid in the main storage tanks	<1 week	Plant manager
Ammonium nitrate	Consolidate all ammonium nitrate solution in the main storage tank. If air conditioning of bulk storage is in operation TAN can be kept in storage, if not the bulk should be emptied and product sold to customers. Bagged product is sold or kept in storage. If possible off-spec product is bagged and stored away from final product.	<1 week or <1 month if full storage needs to be bagged	Plant manager
Dangerous goods	Drain all pipes and consolidate fluids into storage tanks which are bunded and stored safely in an area where damage by weather events (including cyclones) is not possible.	<1 week	Plant manager
Hydrocarbons	Keep all stored lubricants, fuels, additives, coatings and solvents according to standard operational practices and procedures. Ensure storage is in an area where damage by weather events (including cyclones) is not possible	Ongoing	Plant manager
	Ensure adequate supplies of diesel are stored on Site (in appropriately constructed and bunded vessels) for continued operation of power supply generators	Ongoing	Plant manager
	Do not remove lubricating oils from rotating equipment. Keep this equipment well maintained and free from leaks	Ongoing	Plant manager
Ponds	Keep contaminated storm water system operational and maintain evaporation ponds during closure period.	Ongoing	Plant manager
Sewage system	Keep operating to standard operating specifications	Ongoing	Plant manager

6.3.6.2 Temporary closure

Should the TANPF be temporarily shut down and placed in care and maintenance the following environmental risks shall be considered:

Environmental Risk	Closure strategy	Timing	Responsible
Liquid ammonia	Empty all pipes and vessels and put under nitrogen atmosphere	<1 week	Plant manager
Nitric acid	Empty storage tanks and sell nitric acid	<2 week	Plant manager
Ammonium nitrate	Empty ammonium nitrate solution storage tank by selling solution to clients. Empty the TAN bulk and bag storage (deliver to customers). Off-spec product shall be bagged and removed from site for special treatment.	<1 month	Plant manager
Dangerous goods	All vessels, piping and equipment to be thoroughly cleaned, as far as practicable, free from dangerous goods and dispose of in an approved DGs disposal facility	<1 month	Plant manager
Hydrocarbons	Keep all stored lubricants, fuels, additives, coatings and solvents according to standard operational practices and procedures. Ensure storage is in an area where damage by weather events (including cyclones) is not possible	Ongoing	Plant manager
	Reduce warehouse stock levels so that only the minimum amount of lubricants, fuels additives, coatings and solvents required to keep equipment exercised, are kept on Site	Ongoing	Plant manager
	Ensure adequate supplies of diesel are stored on Site (in appropriately constructed and bunded vessels) for continued operation of power supply generators	Ongoing	Plant manager
	Do not remove lubricating oils from rotating equipment. Keep this equipment well maintained and free from leaks	Ongoing	Plant manager
Ponds	Keep contaminated storm water system operational and maintain evaporation ponds during closure period.	Ongoing	Plant manager
Sewage system	Keep operating to standard operating specifications	Ongoing	Plant manager

6.3.6.3 Planned Final Closure

After the decision has been taken to close the Plant an evaluation of possible relocation or reuse of equipment, materials and systems is done. A status report is made and based on this the decision for salvage is taken. The next step is then to develop a detailed report for adequate preservation to maintain the physical integrity of equipment. After proper cleaning, preservation is done according to vendor's recommendation and/or YPNPL experience from previous projects and all preservation activities are recorded.

Following the decision to decommission the Plant, there are certain environmental obligations to be met. An environmental audit of the Site is carried out to identify environmental risks associated with the decommissioning. A care and maintenance plan for the plant and equipment on Site as described above as well as for the management of environmental aspects of the Site is developed to follow-up and meet environmental obligations. The risks identified in the audit are managed in the C&M plan which will:

- Identify and prioritize system required during C&M.
- Assess the facility environmental monitoring system requirements.
- Rationalize examinations, inspection, maintenance and testing activities.
- Consider activities to minimize waste/ pollution during this period
- Assess resources required during this period
- Help identify project risks.

The C&M plan shall demonstrate that the environmental obligations will be met during the decommissioning period. An ongoing requirement to continue monitoring the environment to ensure that the closure was successful and that any continuing environmental impacts are within acceptable limits. There may also be a requirement to conduct remedial work should closure targets not be reached within an acceptable timeframe. Details about activities to be performed as part of the C&M plan and mitigating measures are given in the table below and in attachment 1.

Monitoring	Closure strategy	Timing	Responsible
Erosion	TBA	TBA	TBA
Dust	TBA	TBA	TBA
Water quality	TBA	TBA	TBA
Vegetation and flora	TBA	TBA	TBA
Weeds	TBA	TBA	TBA
Fauna	TBA	TBA	TBA
Photographic record	TBA	TBA	TBA
Fire management	TBA	TBA	TBA
Rehabilitation maintenance	TBA	TBA	TBA
Remedial action	TBA	TBA	TBA
Reporting	TBA	TBA	TBA

Note: TBA – to be determined during final decommissioning plan

The requirement for this ongoing management and monitoring ceases once the Site lease is relinquished.

6.3.7 Dismantling

Conventional plant and buildings will be removed and demolished using standard construction industry methods. The interior of buildings will be removed first and decontaminated if necessary prior to demolition of the buildings themselves. Large or heavy equipment are going to be cut or split into components or sub-component parts prior to their removal. It is expected that after removal is complete, demolition will be carried out using conventional methods. All buildings will be demolished in their entirety, the structures including any cabling removed to ground level and the voids backfilled. Once removed, the footprints of buildings will be backfilled. Any remaining below ground building structures (*e.g.* basements will be punctured to prevent ‘ponding’ (accumulation of water).

Equipment and piping will be dismantled and removed and the metal recycled.

All suitable demolition material from buildings will be retained on-site to be used for the backfilling of deep voids.

It will also be considered involving a professional second hand dealer and demolition contractor in this process.

Potential solid waste materials that will be created during decommissioning of the YPNPL Plant are (but not limited to):

- Insulation.
- Cabling (copper will be recovered).
- Piping (to be recycled).
- Equipment (to be recycled).
- Concrete.
- Asphalt.
- Rubber (belt conveyors).
- Gaskets.
- Catalysts (to be recovered and recycled)
- Buildings structures
- Prill tower skirts (fabric).
- Glass from windows.

Some instruments will contain radioactive substances and these will be handled in accordance with relevant legislation and YPNPL's waste management plan previously defined.

Non-hazardous waste materials that need to be handled during decommissioning of the YPNPL Plant are (but not limited to):

- Oil (from compressor and other equipment with lubrication).
- Sludge (from cleaning from ponds).

6.3.8 Demolition and disposal of material

The following needs to be considered in connection with demolition of civil and structural material:

- Definition of the demolition scope and disposal works.
- Mapping and analysis of all chemical, toxic and polluting materials above and below ground, and the magnitude of such. It will be beneficial in this respect to:
    - Know the history of the facility throughout its lifetime
- How to handle the above in view of:
    - Legislation
    - Yara's directives and procedures
- A plan for approval of handling and disposal of chemical, toxic and polluting material.

- Documentation for structures, foundations, piles, pipe racks, conduits for cables, sewage and other underground installations.
- Possible methods for demolition.
- How to dispose of the waste material:
  - Unsorted.
  - Sorted as for instance as:
    - I. Clean concrete which can be crushed and recycled (backfill), steel and other metal scrap which can be recycled.
    - II. Reusable material (doors, windows, roof tiles etc.).
    - III. Polluted material for disposal in approved storage.
    - IV. Polluted and toxic material for destruction.
- A plan for transport of waste material.
- Stability of concrete and steel structures during demolition:
  - Need for temporary support.
  - Permanent support if only parts of structures shall be removed.
- Replacement of contaminated soil.
- Termination and/or rerouting of connections to outside battery limit installations.
- Safety and health:
  - Personal protection, also against toxic material.
  - Fencing and entrance control to the site.
- A schedule for these activities according to the execution of the works
- Documentation of the Site's status when the works have been completed.

6.3.9 Decontamination and management of noxious materials following closure

Decommissioning activities will also involve removal of contaminants (decontamination) from equipment and piping as well as liquid waste storages and buildings. The objective of decontamination activities is to

- Reduce/eliminate the environmental exposure
- Ensure safe dismantling of the facility
- Salvage the facility, equipment and materials as far as possible
- Restore the Site for future use (which may be different)

A structured decontamination process is carried out in multiple stages, each stage resulting in equipment progressively reaching a clean status. The different stages are:

1. Primary decontamination – This is the initial cleaning of equipment and the main purpose is to reduce occupational exposure.
2. Dismantling – The equipment is dismantled and checked for cleanliness. The equipment can now be inspected and evaluated for possible future use.
3. Secondary decontamination – In some cases dismantled equipment needs further cleaning for safety reasons or depending on future use.
4. Disposal of equipment – The equipment is ready for disposal; it can be relocated, sold or scrapped.
5. Disposal of waste – The decontamination process generates liquid and/or solid waste that needs to be disposed of in a systematic manner and according to regulations. The waste disposal process often requires the involvement of specialized companies.

When selecting the decontamination process requirements like safety, efficiency, cost-effectiveness, waste minimization and feasibility must be considered.

The TANPF produces ammonium nitrate as a raw material for mining explosives. Ammonium nitrate is basically a fertilizer made from ammonia and nitric acid and is classified as an oxidizer. According to the Dangerous Goods (DG) license the TANPF has the following DG inventory:

> Anhydrous ammonia - Nitric acid - Ammonium nitrate - Diesel - Nitrogen – Hydrogen – Nitrogen oxides – Nitrous oxide – Oxygen scavenger (Elim-Ox) – Trisodium phosphate - Ammonia oxidation catalyst – DeNOx catalyst – DeN$_2$O catalyst – Hydraulic lube oil – Hydrochloric acid – Caustic soda – Sodium hypochlorite – Sodium metabisulphite – Corrosion inhibitor (Nalco Trac-100) – Sulphuric acid – Methanol – Karl Fisher reagent.

Regarding DG inventory – all vessels, piping and equipment shall be thoroughly cleaned as far as practicable, to be free from DG material and disposed of in an approved DGs disposal facility.

In addition to these DG chemicals the operation is also utilizing a coating agent (oil/wax based) and an organic internal additive (sulphonate) as well as an inorganic internal additive (aqueous solution of diammonium phosphate, ammonium sulphate and boric acid) for product quality improvement.

Raw material for the production of TAN is ammonia, nitric acid (intermediate) and coating agent and internal additive. Most of the above chemicals are stored on site in limited amounts (IBC) and are used for water treatment, corrosion inhibition and neutralization of effluents to storage ponds. The gases listed above are generally stored in cylinders and mainly used for calibration of analyzers.

If possible the nitric acid in the storage tanks will be consumed before stopping the operation as will be the case for AN solution. AN solution in the storage tank can also be delivered to customers (for emulsion production). Ammonia handling equipment and pipelines will also be emptied and then flushed to ensure there is no ammonia left.

After final closure of the operation all unused chemicals will be returned to the various vendors. Opened bottles/drums/IBC's etc. that cannot be returned to vendors will be treated as special waste and disposed of according to regulations.

After nitric acid equipment, piping and tanks have been emptied a specialized company will be engaged to recover platinum catalyst from heat exchangers and vessels. The platinum catalyst deposit represents a significant amount of money and destructive as well as non-destructive techniques will be applied depending on possible later use or scrapping of the equipment. The used DeNOx (Vanadium pentoxide) as well as DeN_2O catalysts do not represent any residual value and will be removed from DeNOx reactor and ammonia oxidation reactor and disposed of according to regulations.

AN equipment, piping and tanks will, after emptying, be flushed to remove any deposits. This is to ensure safe dismantling in case hot work is applied as well as to ensure no AN contaminated items sold to any third party. The liquid used for flushing will be collected in the contaminated water ponds (for later removal).

The diesel storage tanks as well as the lube oil skid for the compressor train will be emptied by a certified company and any fluid reused or disposed of according to regulations.

There are two evaporation ponds for contaminated water on Site. After these ponds have been emptied (by evaporation and pumping), any sludge and sediments (which will mainly be contaminated with nitrate) will be collected and disposed of according to regulations. These ponds are designed with double bottom and leak protection and the potential for contaminated soil below the ponds is minimal.

6.3.10 Schedule

Experience shows that it is important to allow for enough time to plan, clean, dismantle and prepare the site before the execution of final demolition by contractor(s).

For schedule purposes it is important to note that experience shows that it often takes longer than one would expect to dispose of all sellable material and equipment.

A master schedule shall be based upon schedules for the different main activities, and milestones that are going to be given. This is useful for the interfaces with other parts of the Site or Plant.

6.3.11 Risks

This type of activities need careful evaluation of the risks and how to deal with each of the risk factors related to:

- environment/pollution
- safety and health
- stability of structures during demolition
- schedule
- contracts
- cost
- income from sale of equipment

Risk reduction and risk avoidance must be evaluated.

6.4 Execution Phase

When budget and schedule have been approved for the dismantling and demolition works, a dedicated project team needs to be formed to execute and control the activities.

The team need to have competence to cover the following:

- Project management and project control
- Procurement (and sale for sellable equipment and material)
- Operational issues (documentation, history, temporary arrangements)
- Civil and structural
- HSE issues

The main tasks for the project team will be to execute the activities according to the plans, schedule and budget which have been prepared in the planning phase, or even improve compared to this.

An important issue in this phase is to control the risks. Risks in such activities are mainly related to:

- HSE
- Stability of structures
- Cost

Analysis, response to and control of these items are essential.

For HSE, specific plans and applicable procedures have to be established. Co-operation and communication with involved contractors is important in order to get an understanding of the issue and the response YPNPL has taken to reduce the risks. Follow up closely and implement corrective actions without hesitation.

During demolishing, stability of remaining structures has to be continuously assessed. Control of the risk has to be done by involving competent personnel.

The Site will be brought back to a level of an industrial zoned area. Specific control measures will be used to guide the management of water resources, landforms, re-vegetation and infrastructure and support facilities during decommissioning. If a contamination issue is identified before or during the closure, specific closure actions will be included in the plan. In addition, equipment, buildings and other facilities will be removed. Surface water ponds will be emptied and cleaned (with any contaminated waste to be appropriately removed by an approved waste contractor). Interconnections (piping) with YPFPL will be removed.

Decommissioning would entail similar noise sources to those expected during the construction of the plant, i.e. cranes, trucks for removal of material, and earthmoving equipment. Typical noise impacts would be as for the construction phase. Additional likely noise sources would include rock-breaker equipment to break up concrete foundations. No significant impact is expected at any sensitive receptor.

Emissions associated with decommissioning include equipment removal and site rehabilitation. Emissions will be controlled through the implementation of an environmental management plan. As such, emissions are anticipated to be small in magnitude.

Potential waste materials are going to be generated during decommissioning of the YPNPL. This will likely include grey water, waste oils and other and non-specified liquid wastes.

The construction and operation of the YPNPL is not expected to generate large volumes of solid waste. During decommissioning activities there will be significant quantities of solid waste.

All hazardous wastes will be managed by contractors who hold the appropriate Carrier’s License, which will be checked for current validity before a contract is placed and implemented. The specific contractor used will depend on the type of waste requiring disposal. All records are auditable and will be checked regularly.

In general, the management of waste at YPNPL will aim to minimize the need to use landfill by reducing waste volumes wherever possible by following the hierarchy of waste management, i.e. reduce, reuse, and recycle. YPNPL follows the Environmental Protection Act 1986 principles for all waste arising and where waste is transferred, it is accompanied by a transfer note and a full written description of the wastes.

Scrap metal (e.g. steel and copper) and glass will be sent to an appropriate contractor for recycling. If it is not practicable to reuse or recycle any scrap materials they will be disposed of via approved routes.

Effluent will be disposed in accordance with YPNPL’s discharge consents under the Water Resources Act. Discharges under these consents include cooling water, rain water and fully treated effluent from the site sewage treatment plant.

7 Mitigation Measures

There are no specific changes to the mitigation measures that were submitted in the Environmental Statement and reported in the Construction Environmental Management Plan.

Mitigation measures already identified for the care and maintenance preparations & activities can be considered in Attachment 1.

8 Stakeholders Engagement

Whilst decommissioning represents a new phase in the lifecycle of the site, YPNPL remains committed to engaging with stakeholders at all phases in the process. Regular meetings have been and will continue to be held with the Site Stakeholder Group as well as environmental agency, local authorities, etc. that will also be kept informed of activities at the Site. Organizations will be also involved in the public consultation process for the Environmental Statement. As well as regular meetings with stakeholders, where appropriate, other interested parties will also be kept informed of specific decommissioning activities.

9 Documentation

When the Site has been cleared, final documentation has to be prepared.

The main reason is to document towards Australian Authorities and future users of the Site the status of the cleared Site and how the toxic and contaminated materials have been disposed of and who presently has the responsibility for it.

Such documentation will consist of:

- Demolition Contract Evaluation Report
- Demolition Contract
- Lists/receipts from receiver of all demolition materials
- Final (as-built) layout drawings indicating remaining structures in the ground
- Final (as-built) layout drawings indicating any remaining contamination in the ground
- Final accounts, reports etc.

10 References

- AS 2601 – Demolition of Structures
- PER – Public Environmental Review, January 2010.
- Works Approval granted for YPNPL
- *Environmental Protection Act 1986*
- *Environmental Protection (Noise) Regulations 1997*
- *Environmental Protection and Biodiversity Conservation Act 1986*
- *Waterways Conservation Act 1976*
- *Soil and Land Conservation Act 1945*
- *Environmental Protection (Controlled Waste) Regulations 2004*
- *Wildlife Conservation Act 1950*
- *Agricultural and Related Resources Protection Act 1976*
- *Public Health Act 2005*
- *Fisheries Act 1994*
- *Aboriginal Heritage Act 1972*
- *Work Health and Safety Act 1984*
- Ministerial Statement 870
- Burrup Peninsula Land Use Plan and Management Strategy, *O'Brien Planning Consultants* (1996)
- Closing down, dismantling, demolition and disposal of production plants – Yara Best Practices

11 Attachments

Attachment 1:	Mitigation measures.
Attachment 2:	Potential organization chart for decommissioning activities.
Attachment 3:	Landform at closure

11.1 Attachment 1: Mitigation Measures

Environmental Impact	Mitigation measure	Action	Comments
Air quality & dust			
Dust Emissions (from on-site) • Increase in site dust emissions due to construction, demolition and waste / materials handling operations, etc. which could impact on residential and industrial receptors.	The following best practice measures will be implemented as appropriate: • On-site roads to be regularly cleaned of mud/dust deposits, including the use of re-circulating water wheel washers and road cleaners as appropriate; and sheeting of vehicles carrying potentially dusty loads; • Minimization of unnecessary material and waste handling as far as practicable; • Use of water sprays for external demolition activities as appropriate; • Use of water sprays during outside in-fill operations; • Avoidance of vehicular use of un-surfaced (soft) ground where possible and limits on vehicle speeds on such surfaces where it cannot be avoided; • Use of water sprays during particularly windy or dry conditions; • Use of water sprays to maintain	• Routine control will be enforced through existing site procedures. Any additional requirements will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans. • The effectiveness of dust mitigation will be monitored. There are a variety of means of measuring dust deposition; directional monitoring will be used if possible. It is appropriate to initiate monitoring before works commence in order to determine the background contribution to which the site need to add. Arrangements will be discussed and agreed in advance with the local authority as necessary.	• These mitigation measures primarily concern impacts on humans. However, their implementation will also offset possible impacts of dust deposition on sensitive habitats immediately adjacent to the site.

Environmental Impact	Mitigation measure	Action	Comments
	damp surfaces during dry and windy weather (e.g. soil stockpiles, demolition rubble); or sheeting or seeding of surfaces of stockpiles of soil or other dusty materials; ☐ Sheeting or seeding of surfaces and/or use of wind fences; and ☐ Covering of containers and/or use of wind fences.		
Dust Emissions (road side from vehicles) Increase in dust at residential properties along traffic routes due to soiled vehicles or vehicles carrying dust loads.	As appropriate: ☐ Sheeting of lorries carrying dusty loads; and ☐ Provision of wheel and body washing where appropriate for, as a minimum, heavy goods vehicle leaving the site.	☐ Routine control will be enforced through existing site procedures. Any additional requirements will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans. ☐ These mitigation measures will be considered as part of the development of the Transport Management Plan.	These mitigation measures primarily concern impacts on humans and aim to reduce the potential for complaints associated with fugitive dust.
Archaeology and Cultural Heritage			
No significant adverse environmental impacts identified arising from decommissioning activities			
Geology, Hydrogeology and Soils			
Inadvertent or uncontrolled disturbance or spreading of existing	☐ Desk studies and site investigation, if necessary, before	These mitigation measures will be considered as part of the	☐ Wheel washing addresses dust, ecology, surface waters and

Environmental Impact	Mitigation measure	Action	Comments
contaminated soils, including movement by windblown dust, entrainment in runoff, attachment to vehicles and/or inappropriate soil handling operations.	works commence in order to determine the presence or absence of contamination, so that appropriate working practices can be adopted from the outset. ☐ Controlled access to or from known or potentially contaminated working areas as appropriate. ☐ Use of re-circulating wheel washers on HGVs leaving site as appropriate. ☐ Compliance with Pollution Prevention. ☐ Dust control measures. ☐ Measures under 'Inadvertent contamination of soils and/or groundwater arising from temporary storage of contaminated soils, wastes or materials.'	environmental, health and safety justification produced as part of individual decommissioning working plans.	highways impacts also.
☐ Mobilization of existing contamination by direct rainwater infiltration due to changes in ground cover or the creation of open excavations.	☐ Investigation of contaminated soils prior to the removal of hard-standings or buildings/foundations with prior remediation if necessary. ☐ Excavation dewatering, if necessary, with monitoring and appropriate management/disposal of any waters arising.	☐ These mitigation measures will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	☐ Although the impact has been assessed as 'not significant' these mitigation measures are proposed because they constitute good practice.

Environmental Impact	Mitigation measure	Action	Comments
	☐ Tenting of exposed areas or excavations, if necessary.		
☐ Mobilization of existing contamination due to changes in water table levels and consequential changes to the groundwater flow regime (e.g. due to changes in ground covering and rainwater infiltration).	☐ Desk studies and site investigation, if necessary, to determine groundwater levels, flows and characterize the full extent of any contamination (both in the saturated and unsaturated zones). ☐ Dewatering of affected areas, if necessary, to avoid mobilization of contaminants. Remediation shall be required if contamination is significant. ☐ Better constrain current baseline conditions for groundwater quality to provide suitable comparison to any future changes.	These mitigation measures will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	
Creation of new contaminant migration pathways.	Production of risk assessments, method statements and contingency plans. ☐ Compliance with relevant guidelines. ☐ Production of risk assessments, method statements and contingency plans. ☐ Use of made ground that does not exceed average permeability of in-	☐ Routine control will be enforced through existing site procedures. Any additional requirements will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	

Environmental Impact	Mitigation measure	Action	Comments
	situ material to cause groundwater flow issues. □ Placement of flow barriers and monitoring of level and flow pattern impacts, as required.		
□ Inadvertent contamination of soils and/or groundwater arising from temporary storage of contaminated soils, wastes or materials.	□ Sampling and testing of soils, wastes and materials prior to storage as appropriate. □ Segregation as appropriate. □ Use of containment (e.g. membranes) to eliminate cross-contamination, as appropriate. □ Management of rainwater run-off from storage areas for contaminated or potentially contaminated soil, wastes and materials	□ Routine control will be enforced through existing site procedures. Any additional requirements will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	
□ Inadvertent effects on groundwater flow and quality due to infill of deep basements and the breaching of basement structures to prevent ponding.	□ Improved characterization of groundwater levels and flow direction prior to the start of decommissioning. □ Sampling and testing of potentially contaminated soils, wastes and materials prior to use as appropriate. □ Puncture all remaining services and foundations to reduce the likelihood of ponding.	□ These mitigation measures will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	
Changes in soil and groundwater	□ Bunding of chemical and fuel	□ Routine control will be enforced	

Environmental Impact	Mitigation measure	Action	Comments
quality due to spills or leaks of substances.	storage according to Pollution Prevention Guidance. ☐ Appropriate protocols for chemicals and fuel handling, with trained staff only to operate facilities. ☐ Emergency spill response plan, including spill kits kept on site and trained staff available.	through existing site procedures. Any additional requirements will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning plans.	
Landscape & Visual			
☐ Light spill	☐ Any new lighting to be installed on site will be directional lighting.	☐ This mitigation will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	☐ The impact associated with any additional lighting on site has been assessed as 'not significant'. However, this mitigation measure is proposed as a measure of best practice, in order to contain the extent of illumination to those areas which are intended to be lit only.
☐ Flora	Careful sitting and use of protective fencing where necessary.	☐ This mitigation will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	☐ The impact associated with the construction of car parking or working areas has been assessed as 'not significant'. However, this mitigation measure is proposed as a measure of best practice in order to protect existing flora. Any damaged flora to be re-planted at the end of Care and Maintenance Preparations.

Environmental Impact	Mitigation measure	Action	Comments
Noise & Vibration			
☐ General changes to noise directly from the site and associated changes in traffic.	As appropriate: ☐ Use of equipment fitted with effective silencers where practicable; ☐ Appointment of a site contact to whom complaints/queries about construction/demolition activity can be directed - any complaints to be investigated and action taken where appropriate; ☐ Local neighbours informed of exceptional activities; ☐ No potentially significant external working outside of normal working hours without prior agreement with the local authority; and ☐ All construction activity to be undertaken in accordance with good practice for Noise and Vibration Control on Construction and Open Sites. This includes minimizing unnecessary reviving of engines, turning off machines when not required and routine maintenance of equipment.	☐ These mitigation measures will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	The use of noise barriers between particularly noisy activities and sensitive receptors shall be appropriate.
Socio economic			

Environmental Impact	Mitigation measure	Action	Comments
Direct Employment ☐ Long-term loss of jobs	☐ YPNPL will encourage its contractors to make use of local labour, equipment & services as far as practicable. ☐ YPNPL will attempt to re-deploy affected staff & support staff in re-training/re-skilling for decommissioning roles.	☐ Contractors will be provided with a list of local companies known to be capable of involvement as sub-contractors in decommissioning works.	
Surface water			
☐ The potential release of turbid and/or contaminated water from decommissioning activities on the site.	Where necessary: ☐ Wetting down (e.g. excavation or construction/demolition areas) to prevent windblown spread of dust into locations where subsequent washing into surface water drains would be likely, and appropriate management of wastewater arising. ☐ On-site roads to be regularly kept free from mud/dust deposits, including the use of re-circulating water wheel washers and road cleaners as appropriate. ☐ Sheeting or seeding of any long term stockpiles of soil to reduce wash-off of suspended solids. ☐ Careful design and siting of spoil mounds as necessary to manage	Where necessary: ☐ Wetting down (e.g. excavation or construction/demolition areas) to prevent windblown spread of dust into locations where subsequent washing into surface water drains would be likely, and appropriate management of wastewater arising. ☐ On-site roads to be regularly kept free from mud/dust deposits, including the use of re-circulating water wheel washers and road cleaners as appropriate. ☐ Sheeting or seeding of any long term stockpiles of soil to reduce wash-off of suspended solids. ☐ Careful design and siting of spoil mounds as necessary to manage	☐ Wheel washing addresses dust, ecology, geology etc. and road impacts also.

Environmental Impact	Mitigation measure	Action	Comments
	run-off, including use of low walls around such mounds if appropriate. ☐ See also measures under geology, hydrogeology and soils in relation to turbid and/or contaminated water entering the storm drainage system.	run-off, including use of low walls around such mounds if appropriate. ☐ See also measures under geology, hydrogeology and soils in relation to turbid and/or contaminated water entering the storm drainage system.	
Potential minor spills and leaks of substances.	☐ Careful siting of concrete plant and fuel/chemical handling facilities according to Pollution Prevention standards. ☐ Bunding of chemical and fuel storage according to best practices. ☐ Oil separation facilities on the surface water drainage system at appropriate locations. ☐ Appropriate protocols for chemicals and fuel handling, with trained staff only to operate facilities. ☐ Emergency/spill response plan, including spill kits kept on site and trained staff available at all times.	☐ Routine control will be enforced through existing site procedures. Any additional requirements will be considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans.	
Traffic & Transport			
☐ Impacts on safety on roads.	Promote collective transport & car sharing. Proper vehicle maintenance.	Development of a specific Transport Management Plan to encourage collective transport or car sharing.	
Environmental Impacts.	Promote collective transport & car	☐ These mitigation measures will be	☐ Wheel washing addresses dust,

Environmental Impact	Mitigation measure	Action	Comments
	sharing. Proper vehicle maintenance. Wheel washing as necessary.	considered as part of the environmental, health and safety justification produced as part of individual decommissioning working plans. ☐ The mitigation measures will be considered as part of the development of the Transport Management Plan.	ecology, geology, etc. and surface waters impacts also can be motivated.
Environmental impact			
Additional mitigation measures (or any changes required to those measures listed above) for activities during final site clearance will be based on the technologies available at that time, decommissioning experience and any future environmental assessment deemed necessary. In particular, repeat ecology and traffic checking, the protected aboriginal heritage, flora, fauna and weed species, prior to final site clearance are proposed followed by a reconsideration of the appropriate mitigation measures.			

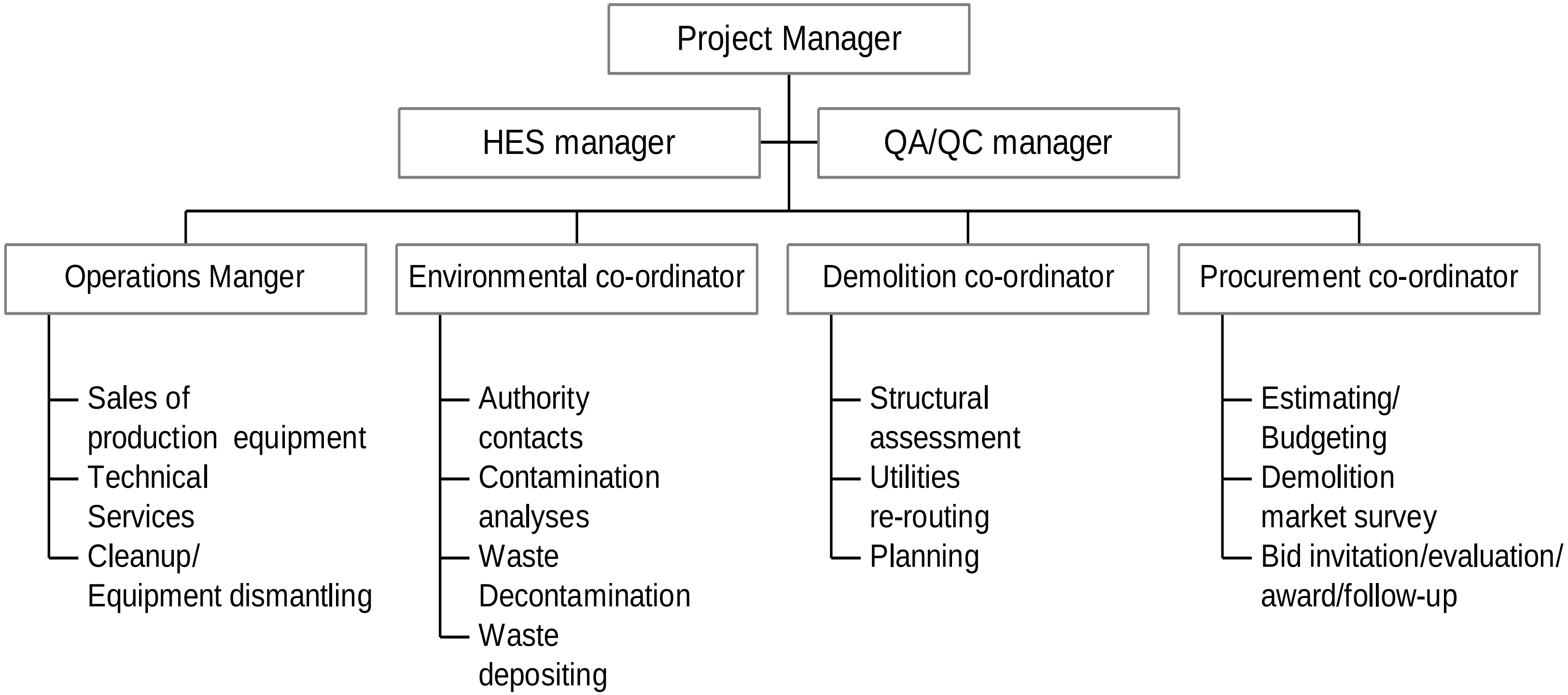
11.2 Attachment 2: Potential Organisational Chart for Decommissioning Activities

Note: This attachment must be read in connection with item 8.1.3 in the manual.

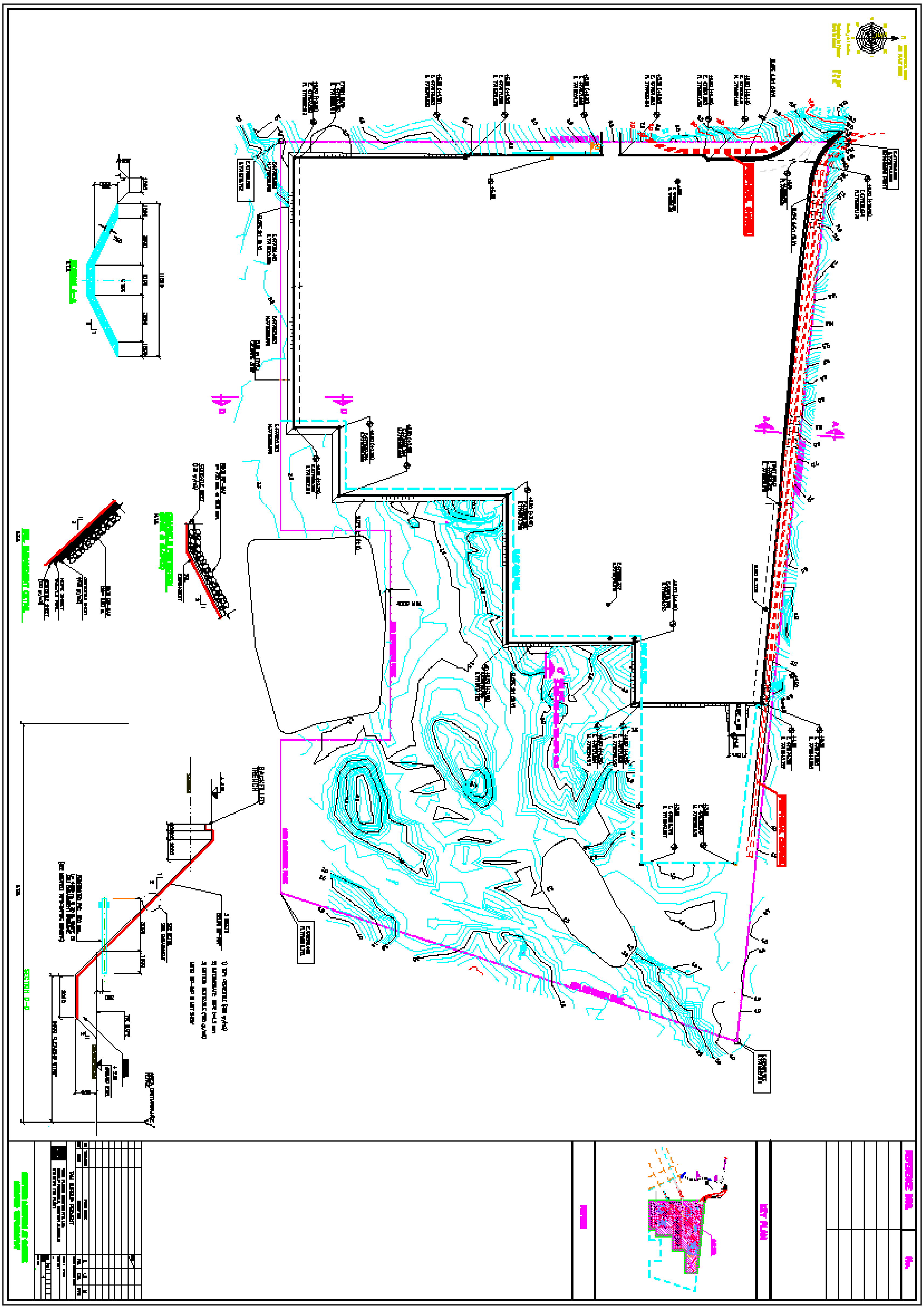
The below organisation chart is an example designed to cover the following requirements:

- Need for in-depth knowledge in the project team of plant history, available documentation, knowledge about previous production processes etc.
- Capability of systematic planning and evaluation of all related costs and risks according to the general requirement of Yara, i.e. capability of performing the activities according to the same standards as for any other investment projects.
- Capability of utilising external contractors according to the same standards as for any other investment project i.e. focus and competence on competitive bidding processes, contractor qualifications and track records (safety), contract quality.
- Availability of personnel with proper technical competence as well as continuity in the project team during the works.
- Need for Yara to maintain and continuously update experience in demolition projects

The organisation chart would be applicable for major demolition projects, where the demolition waste includes contaminated fractions and where the operations organisation is being dissolved as part of the restructuring/closing of current operations. The model is based on the condition that certain key personnel from operations be retained and not given new tasks until the demolition project has been completed.


Project Manager
HES manager
QA/QC manager
Operations Manger
Environmental co-ordinator
Demolition co-ordinator
Procurement co-ordinator
Sales of production equipment
Technical Services
Cleanup/ Equipment dismantling
Authority contacts
Contamination analyses
Waste Decontamination
Waste depositing
Structural assessment
Utilities re-routing
Planning
Estimating/ Budgeting
Demolition market survey
Bid invitation/evaluation/ award/follow-up

11.3 Attachment 3: Landform at Closure



Attachment 10B

Letter from OEPA, dated 23 October 2015, approving the DEMP Revision 6.

Government of **Western Australia**
Office of the **Environmental Protection Authority**

Mr Rajan Sinha
Technical Services & Business
Development Manager
Yara Pilbara Nitrates Pty Ltd
Level 5, 182 St Georges Terrace
PERTH WA 6000

Our Ref: *2015-0001138042; AC05-2014-0074*
Enquiries: *John Güld, 6145 0853*
Email: *john.guld@epa.wa.gov.au*

Dear Mr Sinha

TECHNICAL AMMONIUM NITRATE PRODUCTION FACILITY – MINISTERIAL STATEMENT 870 – DECOMMISSIONING ENVIRONMENTAL MANAGEMENT PLAN

Thank you for your letter of 11 May 2015 submitting the Decommissioning Environmental Management Plan (Doc Ref: 500-200-PLN-YPN-0001, Rev 06) to the Office of the Environmental Protection Authority (OEPA) for review.

I note the Decommissioning Environmental Management Plan has been prepared to satisfy condition 10-1 of Ministerial Statement 870

I am satisfied with the preparation of the Decommissioning Environmental Management Plan (Doc Ref: 500-200-PLN-YPN-0001, Rev 06), and consider the requirements of condition 10-1 of Ministerial Statement 870 have been met.

Please note any changes to the management actions or targets of the Decommissioning Environmental Management Plan (Doc Ref: 500-200-PLN-YPN-0001, Rev 06) would require the approval of the OEPA.

Yours sincerely

Mr Kim Taylor
GENERAL MANAGER

23 October 2015