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GROUNDWATER MONITORING REPORT





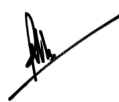
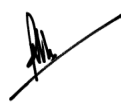
Coramba

Coffs Harbour City Council

4/09/2015



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Groundwater Monitoring Report

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Coffs Harbour City Council

4/09/2015

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Executive Summary

WSP Environmental Pty Ltd (WSP) was engaged by Coffs Harbour City Council (CHCC) to conduct a Groundwater Monitoring Event (GME) from previously installed monitoring wells located between the BP service station and the Orara River within the township of Coramba, NSW (“the site”)

The most recent previous GME for the site was conducted in March 2015, following approximately 18 months operation of the SVE and air sparge system (the system), which is installed at the site. Based on the results of the investigation in March, a decision was made to switch the system off for a trial period of 3 months.

This investigation is required to update the existing concentrations of contaminants of concern (COC) ((namely TRH (formerly TPH) and BTEX) and to ascertain if there has been a ‘rebound’ in hydrocarbon impact (increase in reported concentrations of COCs) in the immediate and general vicinity of the system. The GME includes all previously installed monitoring wells at the site.

This report presents the results of the most recent groundwater sampling, including a comparison with results from WSP’s previous groundwater monitoring event(s) conducted at the site (in particular the GME undertaken in March, 2015).

Water level gauging and sampling was conducted for twenty (20) existing monitoring wells at the site. WSP notes that two (2) previously installed monitoring wells (MW1 and MW19) could not be located and two (2) monitoring wells (MW2 and MW5) were reported ‘dry’. All groundwater samples were analysed for Total Recoverable Hydrocarbons (TRH), ((previously known as Total Petroleum Hydrocarbons (TPH)) and Benzene, Toluene, Ethylbenzene, Xylene (BTEX). In addition, selected samples (MW6, MW11 and MW14) were analysed for natural attenuation factors (Ammonia, Major Cations, Major Anions, Ferrous Iron and Free Carbon Dioxide).

The following provides a summary of the key findings for the GME, including a comparison of results from the previous groundwater monitoring events conducted by WSP at the site. In particular WSP has compared the results of the GME conducted in March 2015 to determine if any identified rebound in hydrocarbon impact is likely attributable to the shut-down of the system;

- BTEX are present within groundwater monitoring wells MW4B, MW6, MW12, MW14, MW16 and MW23 at concentrations above the adopted groundwater assessment criteria. Concentrations of BTEX have been relatively stable or have shown a declining trend since 2013;
- TRH (formerly reported as TPH) is present within groundwater monitoring wells MW4B, MW6, MW11, MW12, MW13, MW14, MW16, MW17 and MW24 at concentrations above adopted groundwater assessment criteria. WSP notes that the adopted assessment criteria for TRH is used as a ‘screening’ criteria only. The fluctuation in reported TRH concentrations since the GME in 2013 is considered a potential effect of seasonal variations and the highly variable rainfall, which is known to occur at the Site;
- The reported contaminant concentrations for monitoring wells MW14, MW16 and MW23, which are in the vicinity of the service station, are indicative of phase separate hydrocarbons, smearing or high dissolved phase impact;
- Based on a comparison of results with the GME conducted in March, 2015, WSP does not consider that there has been a ‘rebound’ in hydrocarbon impact at the Site, which is likely attributable to the system being switched off; and
- MNA is occurring within monitoring wells affected by the plume at the site; however, the rate of degradation is likely limited due to a lack of available electron donors.

1 Introduction

1.1 Background

WSP Environmental Pty Ltd (WSP) was engaged by Coffs Harbour City Council (CHCC) to conduct a Groundwater Monitoring Event (GME) from previously installed monitoring wells located between the BP service station and the Orara River within the township of Coramba, NSW (“the site”). The site investigation area and monitoring well network is presented in Figures 1 and 2, **Appendix A**.

The most recent previous GME for the site was conducted in March 2015, following approximately 18 months operation of the SVE and air sparge system (the system), which is installed at the site. Based on the results of the investigation in March, a decision was made to switch the system off for a trial period of 3 months.

This investigation is required to update the existing concentrations of contaminants of concern (COC) ((namely TRH (formerly TPH) and BTEX) and to ascertain if there has been a ‘rebound’ in hydrocarbon impact (increase in reported concentrations of COCs) in the immediate and general vicinity of the system. The GME includes all previously installed monitoring wells at the site

For consistency with previous investigations conducted at the site and to assist future decision making with respect to monitored natural attenuation (MNA), WSP analysed MNA parameters from three (3) monitoring wells (MW6, MW11 and MW14) at the site (MW2 was reported dry and could not be sampled).

1.2 Aims & Objectives

The aim of the GME was to establish existing concentrations of COC at the Site. The overarching objective of the works was to determine if there has been a ‘rebound’ in hydrocarbon impact at the Site, which is likely attributable to the system being switched off.

This report presents the results of the most recent groundwater sampling, including a comparison with results from WSP’s previous groundwater monitoring event(s) conducted at the site (in particular the results from March, 2015). Based on the outcomes of this GME, WSP understands that a groundwater management program is likely required for on-going management of hydrocarbon impact at the Site

1.3 Scope of Work

The following scope of works was completed as part of the GME:

- Review of previous groundwater monitoring results and in particular the results of the GME conducted in March, 2015 at the time the system was switched off;
- Water level gauging and sampling of twenty-two (22) existing monitoring wells at the site. WSP notes that two (2) previously installed monitoring wells (MW1 and MW19) could not be located;
- Measurement of groundwater field parameters including pH, dissolved oxygen (DO), electrical conductivity (EC), oxygen redox potential (redox) and temperature prior to the collection of groundwater samples;
- Groundwater wells were purged and sampled using either a micropurge or peristaltic low flow pump. Dedicated tubing was used for each groundwater monitoring well to minimise the potential for cross-contamination;
- Submission of all groundwater samples to a NATA certified laboratory (Envirolab) for analysis of total recoverable hydrocarbons (TRH) (previously referred to as TPH) and benzene, toluene, ethyl-benzene and xylenes (BTEX);
- In addition, selected samples (MW2, MW6, MW11 and MW14) were analysed for natural attenuation factors (Ammonia, Major Cations, Major Anions, Ferrous Iron and Free Carbon Dioxide);

- Collection of a Quality Assurance/Quality Control (QA/QC) groundwater sample, which included one duplicate;
- Assessment of analytical data against adopted site criteria; and,
- Preparation of this GME report detailing the findings of the investigation.

1.4 Report Limitations

The findings of this report are based on the scope of work outlined in Section 1.3. WSP performed its 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.

Subject to the scope of work, WSP's assessment was limited strictly to identifying the environmental conditions associated with the subject property and does not include evaluation of any other issues. The absence of any identified hazardous or toxic materials should not be interpreted as a guarantee that such materials do not exist on the subject property.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work undertaken for the Client. It is a report based on the concentrations of contaminants observed in groundwater at the time of the sample collection. These conditions may change with time and space.

All conclusions and recommendations regarding the property are the professional opinions of the WSP personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, WSP assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements or sources outside of WSP, or developments resulting from situations outside the scope of this project.

WSP is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes.

2 Site Identification

The investigation area is located in the township of Coramba and the site is defined (WSP, 2011) as the area encompassed by all previously installed monitoring wells located north, east and west of the BP Service Station, extending to the Orara River (approximately 180m north-east from the service station). The site investigation area and monitoring well network are presented in Figure 1 and Figure 2, **Appendix A**, respectively. A conceptual cross section of the Site is shown in Figure 4, **Appendix A**.

3 Methodology

The following outlines the methodology adopted by WSP for the GME, including description of field equipment used, decontamination procedures, field and laboratory quality assurance and control, laboratory analytical methods and sample preservation, transport and handling.

3.1 Boundaries of the Study

The investigation works were limited to previously installed monitoring wells ((by Golder in 2004 (4 wells) and WSP in 2006 (20 wells)), which are located in the vicinity of the BP service station on Gale Rd, Coramba and extending to the Orara River. Monitoring well locations are presented in Figure 2, **Appendix A**.

The temporal boundaries of the study were limited to those dates that the investigation was undertaken.

3.2 Groundwater Well Purging and Sampling

Groundwater samples were collected on 10 - 11 June 2015 using low flow sampling techniques.

Prior to sampling, all wells were gauged with an interface water level meter. Monitoring wells were then purged using either a micropurge or peristaltic pump (depending on observed standing water levels) to ensure minimal losses of Volatile Organic Compounds (VOCs). Purging continued until groundwater parameters stabilised to within 10% of the previous reading. Water quality parameters recorded included pH, redox potential (Eh), electrical conductivity, dissolved oxygen and temperature. Dedicated tubing was used for each individual well and purging equipment was thoroughly decontaminated between purge events with a phosphate free detergent (Decon 90) and rinsed with potable and deionised water.

Samples were placed directly into laboratory supplied sampling containers.

Field records of the groundwater monitoring event are provided in **Appendix E**.

3.3 Sample Storage and Handling

For preservation and in accordance with NEPM (2013) procedures, samples were immediately placed in an ice-filled Esky to ensure that the samples start cooling as soon as possible before reaching the laboratory.

A chain of custody (CoC) form was filled out with the sample ID and required analyses, and dispatched to the laboratory for analysis.

A copy of the chain of custody documentation is included with laboratory certificates in **Appendix D**.

3.4 Laboratory Analysis and Methods

Sample analysis was conducted by Envirolab Services (NATA No. 2901). All analysis was undertaken in accordance with NATA approved methods as detailed on the laboratory certificates of analysis (**Appendix D**). All groundwater samples were analysed for the previously identified contaminants of concern; TRH and BTEX. Selected groundwater samples (MW6, MW11 and MW14) were analysed for natural attenuation factors (Ammonia, Major Cations, Major Anions, Ferrous Iron and Free Carbon Dioxide)

4 Quality Assurance/Quality Control (QA/QC)

For any given project, all investigation data are potentially subject to sampling and data reduction errors. Quality control (QC) procedures are designed to both increase sample data quality and help interpret discrepancies in results.

All work was conducted in accordance with industry-accepted standards and quality assured procedures. Field quality control included rigorous sample collection, decontamination procedures, and sample documentation.

WSP implemented QC procedures during groundwater sampling by collecting representative QC samples for subsequent laboratory analyses. Following these analyses, laboratory and sampling data quality objectives were analysed and reported in terms of data precision, accuracy, and completeness. WSP standard field procedures require that samples are collected from discrete locations. WSP standard field procedures specify that field duplicates be collected at the rate of at least one sample per twenty samples collected in the field. The following provides a summary of QA/QC samples collected:

- One intra-laboratory duplicate was collected and analysed for contaminants of concern (TRH and BTEX); and
- One trip blank and one field blank was analysed for volatile TRH fractions (vTRH) and BTEX, to determine potential cross contamination by volatiles during sample collection and transportation.

Laboratory Quality Assurance (QA) and Quality Control (QC) procedures included sample spikes for organic analysis. The results of the QC testing are presented in the laboratory reports, which also indicate how much of a particular analyte was recovered. Duplicate testing is undertaken by the laboratory to compare the results obtained in analysing samples.

5 Assessment Criteria

5.1 Contaminants of Concern

Based on a review of the site history and previous groundwater investigations conducted at the site, the following potential contaminants of concern (COC) have been identified:

- Benzene, Toluene, Ethyl-benzene and Xylene (BTEX); and
- Total recoverable hydrocarbons (TRH) including fraction chain lengths consisting of volatile fractions ($C_6 - C_9$) and semi-volatile fractions ($C_{10} - C_{36}$).

In addition and to allow comparison with results from previous groundwater investigations, the following natural attenuation factors were analysed for monitoring wells MW6, MW11 and MW14:

- Ammonia
- Major anions (alkalinity, nitrate, nitrite, chloride, sulphate);
- Major cations (calcium, magnesium, sodium, potassium);
- Ferrous iron; and
- Free carbon dioxide

5.2 NEPM ASC 2013

The National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM 1999) was made under the National Environment Protection Council Act 1994 (Cth) and is given effect by individual legislation and guidelines in each state or territory.

On 11 April 2013, the National Environment Protection Council (NEPC) agreed to vary the NEPM 1999 by approving the amending instrument NEPM ASC 2013 (NEPM 2013).

The 12 month transition period for full implementation of the amended ASC NEPM has now expired. WSP considers however, that to meet the overarching objective for the investigation - which is to compare existing and historical groundwater conditions to assess the effectiveness of the remediation system – the assessment criteria should remain consistent with ones used historically.

5.3 Assessment Criteria

This assessment included a comparison of individual sample results to the following published guidelines. These guidelines are considered acceptable, given the sites current landuse setting and for consistency with comparison of results from previous investigations:

- ANZECC (2000) Australian and New Zealand Guidelines for Fresh Water Quality (95% Protection Levels), Groundwater Investigation Levels, Aquatic Ecosystems; and
- National Health and Medical Research Council (NHMRC) & Natural Resource Management Ministerial Council (NRMCC) (2011) Australian Drinking Water Guidelines.

In the absence of relevant state and national guidance for TRH in groundwater, the following guidelines were adopted as screening levels:

- NSW EPA (1994) Contaminated Sites: Service Station Guidelines for petroleum hydrocarbons in groundwater; and
- Ministry of Housing ((Netherland (2000)), Spatial Planning and the Environment (2000) Environment Quality Objectives in the Netherlands for petroleum hydrocarbons in groundwater.

The adopted Groundwater Assessment Criteria (GAC) for the contaminants of concern is presented in Table 5.3 below:

Table 5.3 *Adopted Groundwater Assessment Criteria*

Parameter	ANZECC 2000 95% Freshwater ¹ (ug/L)	NSW EPA (1994) ² (ug/L)	Netherlands (2000) ³ (ug/L)	NHMRC ADW (2011) ⁴ (ug/L)
BTEX				
Benzene	950	-	-	1
Toluene	-	300	-	800
Ethyl benzene	-	140	-	300
m & p-xylene	200	-	-	
o-xylene	350	-	-	
Xylene total	550	-	-	600
TRH				
Total Recoverable Hydrocarbons (TRH) C ₁₀ -C ₃₆	-	-	600	-

1. ANZECC (2000) Australian and New Zealand Guidelines for Freshwater Quality (95% Protection Levels), the National Environment Protection (Assessment of Site Contamination) Measure (1999) Schedule B(1) *Groundwater Investigation Levels, Aquatic Ecosystems, Freshwaters*;
2. NSW EPA (1994) *Service Station Guidelines (screening levels only)*;
3. Ministry of Housing (Netherlands), Spatial Planning and the Environment (2000) *Environment Quality Objectives in the Netherlands for petroleum hydrocarbons in groundwater (screening levels only)*.
4. National Health and Medical Research Council (NHMRC) & Natural Resource Management Ministerial Council (NRMMC) (2004) *Australian Drinking Water Guidelines*;
5. (-) denotes no applicable criteria

6 Data Quality Assessment

The following QA/QC samples were collected in the field:

- DUP 1 (10/06/15) was an intra-laboratory duplicate of primary groundwater sample MW4B; and

In addition, one (1) field blank and one (1) trip blank provided by the primary lab (Envirolab) were analysed for volatiles to determine potential cross contamination during sampling or transportation.

Summary groundwater relative percentage difference (RPD) results are presented in Table 1d, **Appendix B**.

Laboratory QA/QC comprised of chain-of-custody requirements, sample integrity and holding times, use of acceptable NATA-registered laboratory methods and laboratory QA/QC results (refer to laboratory certificates in **Appendix D**).

The following comments are made as a summary regarding the quality of the field and analytical components of this project:

- Sample integrity and container requirements were documented as acceptable;
- Holding time compliances were documented as acceptable. All samples were received by the laboratory within the relevant holding times;
- A qualitative review of groundwater sample duplicate RPD values indicated that field precision was acceptable. No RPD exceedences were reported;
- The trip blanks reported concentrations for all volatiles below the laboratory limit of reporting indicating that cross contamination of volatiles did not occur during sample collection and transportation;
- The primary (Envirolab) laboratory, including all laboratory test methods were NATA registered at the time of analysis; and,
- All laboratory QA/QC method blanks and field blanks were found to be within acceptable limits.

In summary, the QA/QC data is determined to be of sufficient quality to ensure validity of the conclusions reached for the investigation.

7 Observations and Analytical Results

7.1 Field Observations

The following section presents an overview of field observations of groundwater encountered during the GME. Copies of field observations sheets are provided in **Appendix E**.

During sampling, groundwater was generally observed to be clear or slightly cloudy. With the exception of MW2, MW3, MW5, MW7, MW8, MW9, MW10, MW13, MW15, MW21 and MW24, hydrocarbon odours were noted in 50% of the monitoring wells sampled at the site. Monitoring wells MW1 and MW19 could not be located and were consequently not sampled. In addition, monitoring wells MW2 and MW5 were 'dry' and could not be sampled. Groundwater physicochemical data for each of the wells sampled are presented on field sheets in **Appendix E** and summarised in Table 7.1 below.

Table 7.1 Groundwater Field Parameters

Monitoring Well ID	Temp (°C)	pH (pH units)	Dissolved Oxygen (ppm)	Redox / ORP ¹ (mV)	Electrical Conductivity (µs/cm)
MW1	Could not locate				
MW2	Dry				
MW3	18.9	5.30	1.61	103.0	160.3
MW4B	20.5	6.55	0.18	-109.0	345.1
MW5	Dry				
MW6	20.9	5.76	0.16	-124.0	234.0
MW7	19.6	5.82	0.82	104.0	189.1
MW8	20.5	5.46	0.28	153.3	191.8
MW9	19.3	5.02	2.10	201.0	136.8
MW10	15.4	6.78	0.39	-75.0	81.3
MW11	20.5	6.49	0.33	-122.0	339.0
MW12	21.5	6.44	0.69	-138.0	352.9
MW13	20.6	5.61	0.78	-79.0	335.0
MW14	20.7	6.45	0.25	-141.0	348.0
MW15	17.9	5.52	1.21	132.0	193.0
MW16	20.4	6.42	0.21	-154.0	303.2
MW17	20.0	6.34	0.25	-151.0	258.3
MW18	21.3	6.28	0.28	-74.0	268.1
MW19	Could not locate				
MW20	19.8	5.61	0.37	-36.0	122.7
MW21	19.9	5.46	0.57	101.0	134.6
MW22	19.9	6.27	0.67	-93.0	214.1
MW23	20.5	6.68	0.23	-92.0	353.1
MW24	20.8	6.41	0.32	37.0	220.5

In summary, Table 7.1 indicates the following:

- The temperature of the groundwater ranged between 15.4°C and 21.5°C, which is typical of seasonal (winter) groundwater conditions at the Site;

- pH ranged between 5.02 and 6.78, indicating acidic to slightly acidic groundwater conditions across the Site;
- Dissolved oxygen in the groundwater ranged from 0.16 and 2.10ppm indicating both anaerobic and aerobic groundwater conditions across the Site;
- Conductivity levels were reported between 81.3 and 348.0 micro Siemens/cm ($\mu\text{s}/\text{cm}$), which indicates fresh groundwater conditions across the site.

With the exception of SWL, groundwater conditions are considered comparable with field observations observed made during the GME conducted in March, 2015.

Reported SWLs were an average 1 – 2m lower than those observed for wells sampled during the March, 2015 monitoring event. Higher groundwater levels in March were considered to be a consequence of the high levels of rainfall observed just prior (1 – 2 weeks) to the monitoring event.

A cursory inspection of Bureau of Meteorology records for the area prior to this sampling event indicates that no notable rainfall events occurred just prior to this GME.

7.2 Analytical Results

Groundwater sampling locations are presented in Figure 2, **Appendix A**. Result summary tables are included in Table 1a, **Appendix B** with copies of laboratory certificates included in **Appendix D**. Current and historical groundwater monitoring results are presented in Table 1b, **Appendix B**.

No phase separated hydrocarbons (PSH) were detected in any well during the GME.

Concentrations of BTEX and TRH $C_{10} - C_{36}$ were reported either below the laboratory detection limit and/or the adopted GAC for all samples submitted for analysis; with the exceptions outlined in Table 7.2

Exceedances of the groundwater assessment criteria are also presented in Figure 3, **Appendix A** and the extent of the dissolved phase benzene plume is shown in Figure 5, **Appendix A** (based on data for the GME in March, 2015).

Table 7.2 Groundwater Exceedences

Contaminant	Groundwater Investigation Level (ug/L)	Groundwater Well ID	Concentration (ug/L)
Benzene ¹	950	MW14	7,000
		MW16	1,800
		MW23	3,300
Toluene ²	300	MW14	8,600
		MW16	2,400
		MW23	1,000
Ethyl-benzene ²	140	MW4B	590
		MW6	420
		MW12	480
		MW14	1,600
		MW16	570
		MW23	440
Xylene (total) ¹	550	MW12	592
		MW14	7,900
		MW16	3,130
		MW23	1,160
TRH C₁₀ – C₃₆ ³	600	MW4B	2,600
		MW6	1,300
		MW11	1,000
		MW12	2,700
		MW13	1,230
		MW14	7,820
		MW16	4,100
		MW17	700
		MW24	1,500

1. ANZECC (2000) Australian and New Zealand Guidelines for Freshwater Quality (95% Protection Levels), the National Environment Protection (Assessment of Site Contamination) Measure (1999) Schedule B(1) Groundwater Investigation Levels, Aquatic Ecosystems, Freshwaters;
2. NSW EPA (1994) Contaminated Sites: Service Station Guidelines for petroleum hydrocarbons in groundwater (screening levels only).
3. Ministry of Housing (Netherlands), Spatial Planning and the Environment (2000) Environment Quality Objectives in the Netherlands for petroleum hydrocarbons in groundwater (screening levels only).

7.3 Monitored Natural Attenuation

Monitored natural attenuation is the recording and evaluation of naturally occurring physical, chemical and biological parameters to demonstrate via multiple lines of evidence that one or a combination of these processes to reduce the mass, concentration or toxicity of identified hydrocarbon impact is occurring in groundwater.

Current and historical natural attenuation parameter results for selected monitoring wells (MW2 (no access provided in 2014 and 'dry' in June 2015), MW6, MW11 (not located in 2013), MW14 and MW24 (2006 only) are presented in Table 1c, **Appendix B**.

Similar to the findings from the March (2015) GME, there are indications in field measurements and analytical results that biodegradation is occurring within the plume, which is supported by the following. Concentrations of dissolved iron in sampled wells within the plume (MW6, MW11, MW14) are relatively high in comparison with MW24 (below detection limit in 2006), which is located outside of the plume area. The increased iron concentration is generally indicative of reduction of insoluble iron (III) to soluble iron (II) by oxidation (biodegradation) of contamination;

- The Oxidation Reduction Potential is significantly more reducing within the plume than along the edges of the plume (MW24 to the south-east and wells MW3, MW8 and MW9 to the north-west). This is indicative of oxidation of contamination having occurred within the plume;
- Bicarbonate levels (total alkalinity) are reported high in all wells, but highest in monitoring wells MW11 and MW14. This indicates that biodegradation is occurring within these wells. MW2 (based on data reported in March) and MW6 are also undergoing MNA but not at the same rate due to a lower hydrocarbon concentrations; and
- A comparison of relationships between native ions (in particular Cl/Fe) indicates that over time conditions in MW11 may be getting more reducing (increasing trend in Fe), while MW14 may have stabilised. The results indicate that the rate of MNA in both wells is likely limited due to a lack of electron donors.

WSP notes that the findings are consistent with those observed for the GMEs undertaken in December 2014 and March 2015.

8 Discussion

The following provides a summary of the key findings for the GME, including a comparison of results from the previous groundwater monitoring events conducted by WSP at the site. In particular WSP has compared the results of the GME conducted in March 2015 to determine if any identified rebound in hydrocarbon impact is likely attributable to the shut-down of the system. Trend analysis of identified benzene concentrations (all wells) and TRH fractions for MW14 and MW23 is represented graphically in **Appendix C**.

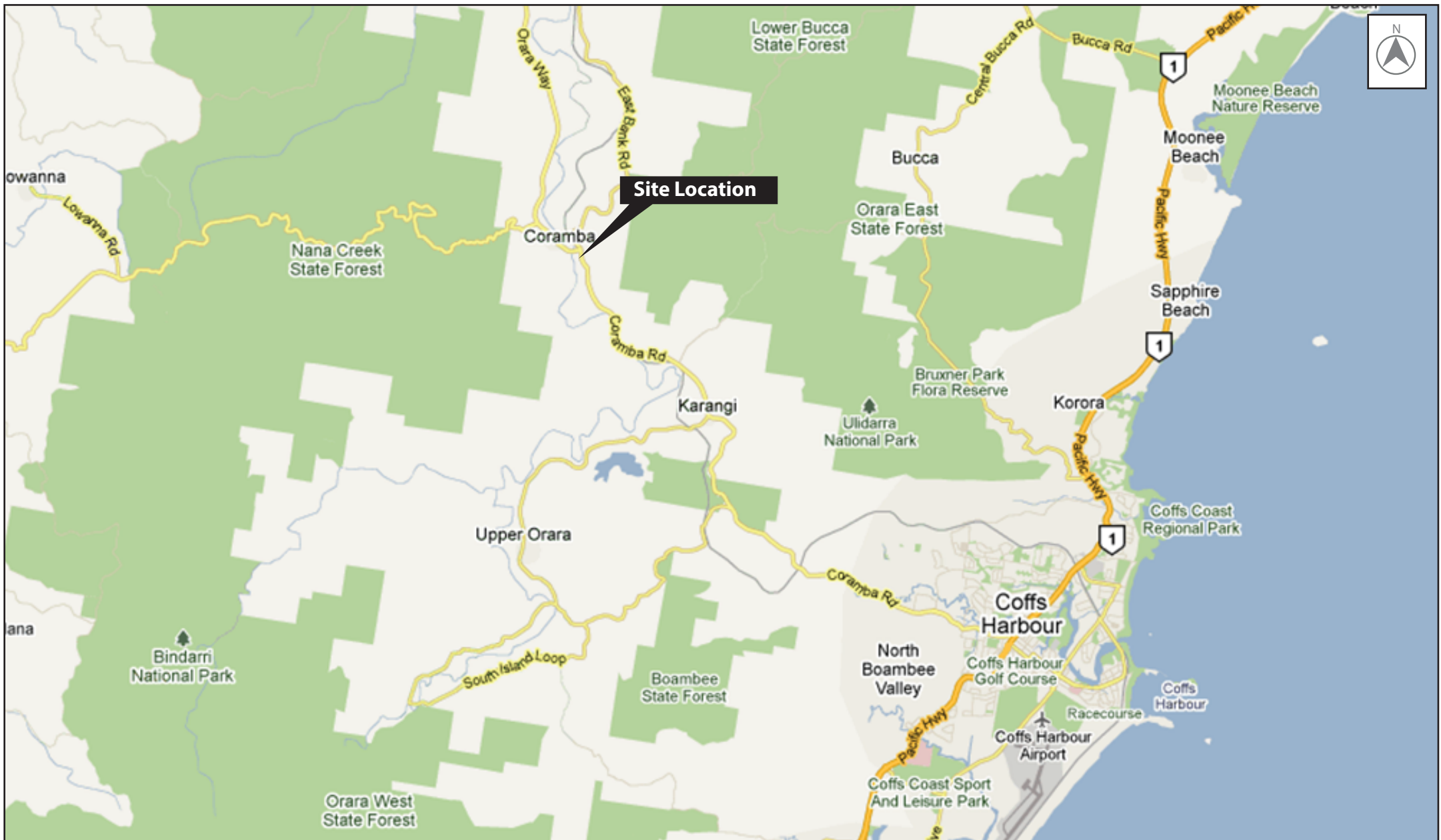
- The trial shut-down period for the system commenced on the 3 March 2015 and remains switched off. At the time of sampling for this GME, the system had been shut-down for approximately 3 months;
- With the exception of MW23, monitoring wells which reported concentrations of benzene above adopted site criteria (MW14, MW16 and MW23) observed a decreasing trend in concentrations since the GME conducted in March, 2015. Detectable concentrations of benzene for all other wells have been declining or relatively stable since 2013;
- Concentrations of toluene was reported above adopted site criteria for monitoring wells MW14, MW16 and MW23, which is within the historically defined groundwater plume at the Site. Monitoring wells MW16 and MW23 observed an increase in toluene concentrations since the GME conducted in March, 2015; however the existing concentrations have been declining or relatively stable since 2013;
- Concentrations of ethyl-benzene was reported above adopted site criteria for monitoring wells MW4B, MW6, MW12, MW14, MW16 and MW23, which is within the historically defined groundwater plume at the Site. Monitoring wells MW4B, MW12, MW16 and MW23 observed a slight increase in ethyl-benzene concentrations since the GME conducted in March, 2015; however the existing concentrations have been declining or relatively stable since 2013;
- Concentrations of total xylene was reported above adopted site criteria for monitoring wells MW12, MW14, MW16 and MW23, which is within the historically defined groundwater plume at the Site. Concentrations of total xylene have shown a declining trend since 2013.
- Concentrations of TRH $C_{10} - C_{36}$ (formerly reported as TPH $C_{10} - C_{36}$) was reported above the adopted site criteria (screening criteria only) for monitoring wells MW4B, MW6, MW11, MW12, MW13, MW14, MW16, MW17 and MW24. With the exception of MW24, all wells were within the historically defined groundwater plume at the Site. Concentrations of TRH $C_{10} - C_{36}$ have shown a fluctuating trend since the GME conducted in 2013; and
- MNA is occurring within monitoring wells affected by the hydrocarbon plume at the site. However a comparison of the relationships between native ions (Cl/Fe) indicates that the rate of MNA is likely limited due to a lack of electron donors.

9 Conclusions

The following conclusions have been reached based on field observations and review of analytical data for the most recent GME; including a comparison with WSP's previous GME's conducted at the site:

- BTEX are present within groundwater monitoring wells MW4B, MW6, MW12, MW14, MW16 and MW23 at concentrations above the adopted groundwater assessment criteria. Concentrations of BTEX have been relatively stable or have shown a declining trend since 2013;
- TRH (formerly reported as TPH) is present within groundwater monitoring wells MW4B, MW6, MW11, MW12, MW13, MW14, MW16, MW17 and MW24 at concentrations above adopted groundwater assessment criteria. WSP notes that the adopted assessment criteria for TRH is used as a 'screening' criteria only. The fluctuation in reported TRH concentrations since the GME in 2013 is considered a potential effect of seasonal variations and the highly variable rainfall, which is known to occur at the Site;
- The reported contaminant concentrations for monitoring wells MW14, MW16 and MW23, which are in the vicinity of the service station, are indicative of phase separate hydrocarbons, smearing or high dissolved phase impact;
- Based on a comparison of results with the GME conducted in March, 2015, WSP does not consider that there has been a 'rebound' in hydrocarbon impact at the Site, which is likely attributable to the system being switched off; and
- MNA is occurring within monitoring wells affected by the plume at the site; however, the rate of degradation is likely limited due to a lack of available electron donors.

Appendix A – Site Figures



Map Courtesy of Google Maps (2011)

Site Location

Coramba, NSW

FIGURE 1



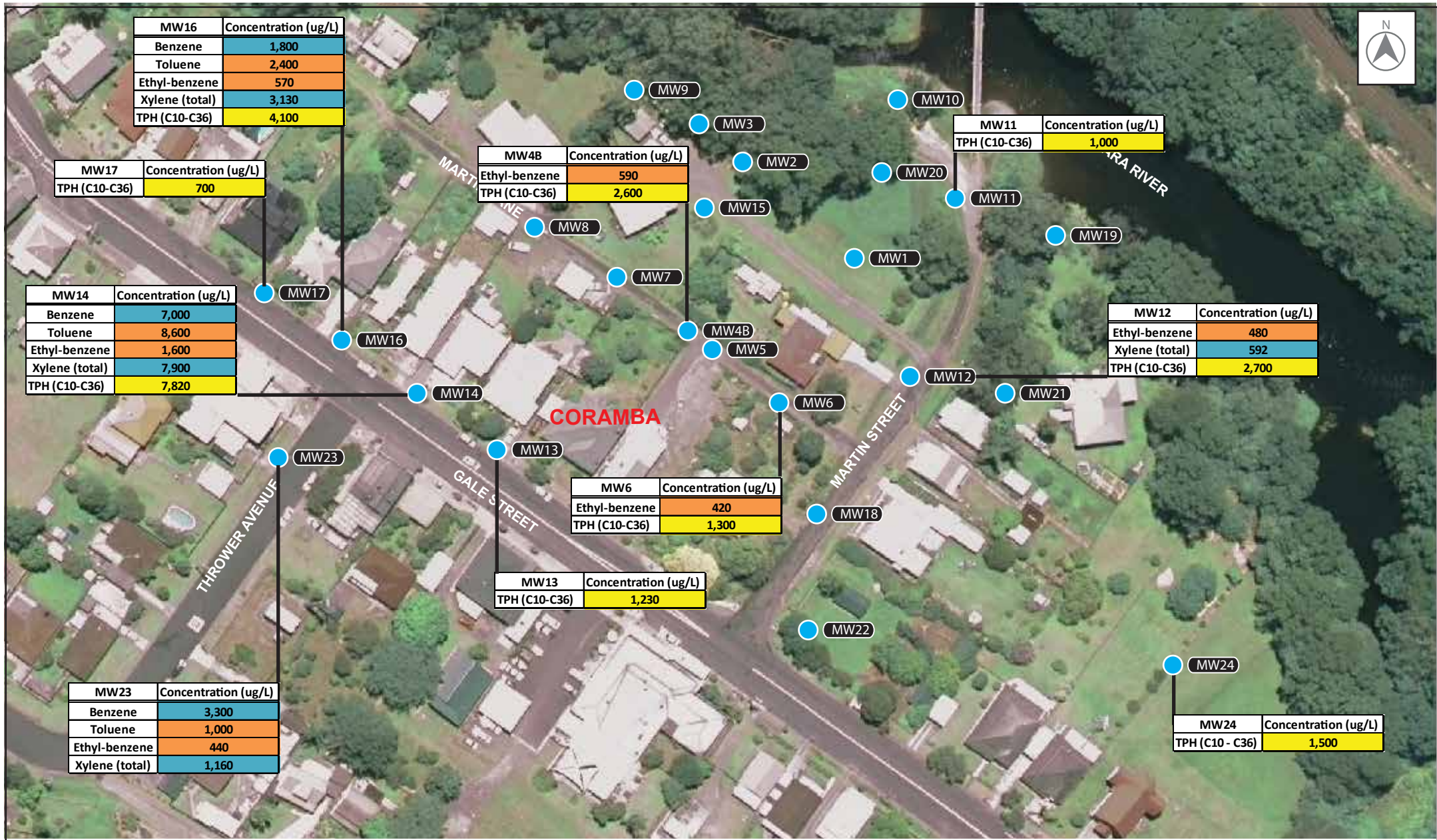
KEY

● MW23 Monitoring Well Location

Monitoring Well Locations

Coramba, NSW

FIGURE 2



MW16	Concentration (ug/L)
Benzene	1,800
Toluene	2,400
Ethyl-benzene	570
Xylene (total)	3,130
TPH (C10-C36)	4,100

MW17	Concentration (ug/L)
TPH (C10-C36)	700

MW14	Concentration (ug/L)
Benzene	7,000
Toluene	8,600
Ethyl-benzene	1,600
Xylene (total)	7,900
TPH (C10-C36)	7,820

MW4B	Concentration (ug/L)
Ethyl-benzene	590
TPH (C10-C36)	2,600

MW11	Concentration (ug/L)
TPH (C10-C36)	1,000

MW12	Concentration (ug/L)
Ethyl-benzene	480
Xylene (total)	592
TPH (C10-C36)	2,700

MW6	Concentration (ug/L)
Ethyl-benzene	420
TPH (C10-C36)	1,300

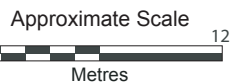
MW13	Concentration (ug/L)
TPH (C10-C36)	1,230

MW23	Concentration (ug/L)
Benzene	3,300
Toluene	1,000
Ethyl-benzene	440
Xylene (total)	1,160

MW24	Concentration (ug/L)
TPH (C10 - C36)	1,500

KEY

● MW01 Monitoring Well Location



Monitoring Well Location	MW6	Concentration (ug/L)	Standard
Analyte	Benzene		ANZECC (2000) FW 95%
	Ethyl-benzene		EPA (1994) FW
	TPH (C10-C36)		Netherlands (2000)

Groundwater Exceedance Results

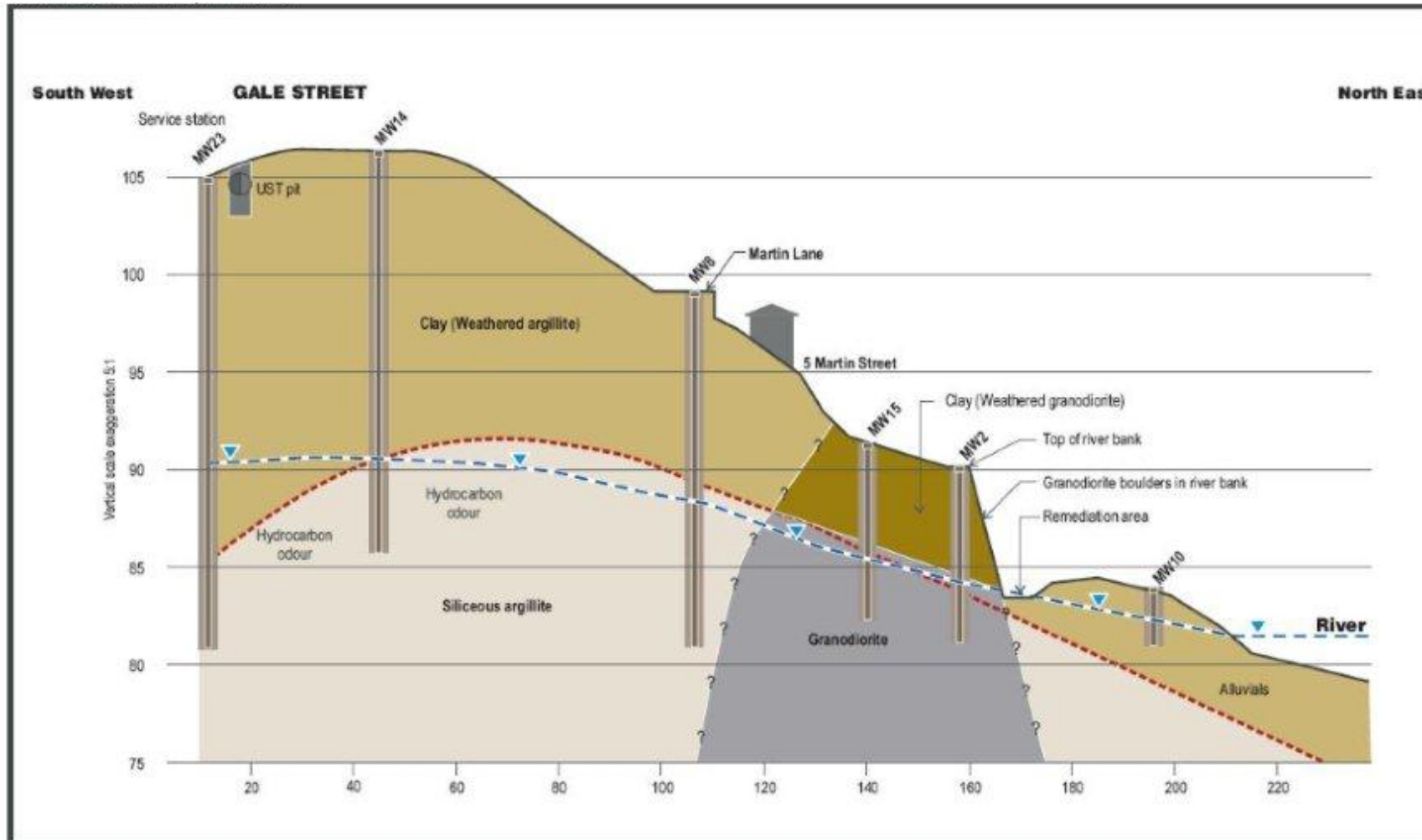
GME, Coramba NSW
00027055

Figure 3

DO NOT SCALE

FIGURE NOTES:

- Groundwater level (mbTOC) – Assuming good connectivity between all geological units
- Bedrock surface – clay grades to bedrock



CLIENT:
Coffs Harbour City Council

PROJECT:
GME Coramba



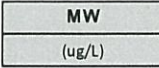


TITLE:
Conceptual Site Cross Section

SCALE@SIZE: NOT TO SCALE	ISSUE: DRAFT
DESIGN/DRAWN: JB	DATE: MAY 2015
PROJECT No: 00027055	DRAWING No: FIGURE 04

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 http://www.wspgroup.com

DO NOT SCALE

FIGURE NOTES:

-  GROUNDWATER WELL LOCATION
-  **MW** Benzene Concentration (ug/L)
 (Exceedance – ANZECC 2000 FW 95%)
-  **MW** Benzene Concentration (ug/L)
- ND – Non-detect
-  Dissolved Benzene Plume (Exceeding adopted guidelines)
-  Dissolved Benzene Plume (Detection above LOR)



CLIENT: Coffs Harbour City Council

PROJECT: GME Coramba

TITLE: Dissolve Phase Benzene Plume Extent

SCALE@SIZE: NOT TO SCALE ISSUE: DRAFT

DESIGN/DRAWN: JB DATE: APRIL 2015

PROJECT No: 00027055 DRAWING No: FIGURE 05

Appendix B – Results Summary Tables

	BTEX						TPH					
	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylene (m & p) µg/L	Xylene (o) µg/L	Xylene Total µg/L	C6 - C9 µg/L	C10 - C14 µg/L	C15 - C28 µg/L	C29-C36 µg/L	C10 - C36 (Sum of total) µg/L	
EQL	1	1	1	2	1	ND	10	50	100	100	ND	
NHMRC ADW 2011	1	800	300			600						
ANZECC 2000 FW 95%	950			200	350	550						
Netherlands (2000)											600	
EPA 1994 Freshwater Ecosystems		300	140									
Field_ID	Sampled Date											
MW1	1/05/06	2,950	960	840	900	450	1,350	5,800	2,840	ND	90	2,930
	29/01/08	1,020	156	375	288	224	512	3,150	1,440	ND	ND	1,440
	17/03/2011	310	<100	240	<100	<100	ND	1100	620	<100	<100	720
	22/08/2013	Could not locate										
	4/12/2014	Not Sampled										
	4/03/2015	Could not locate										
	11/06/2015	Could not locate										
MW2	1/05/06	720	15,500	1,820	8,800	3,290	12,090	28,200	10,300	300	60	10,660
	29/01/08	50	1,690	853	4,750	2,050	6,800	13,000	7,030	ND	ND	7,030
	17/03/2011	4	<1	24	8	3	11	260	690	<100	<100	790
	21/08/2013	<1	<1	1	<2	<1	ND	370	210	<100	<100	310
	4/12/2014	Not Sampled										
	4/03/2015	3	2	3	2	5	7	19	<50	<100	<100	ND
	11/06/2015	Dry										
MW3	1/05/06	<5	<5	<5	<10	<5	ND	ND	ND	ND	ND	ND
	29/01/08	<1	<1	<1	<2	<1	ND	ND	ND	ND	ND	ND
	17/03/2011	5	<1	7	3	<1	3	260	690	<100	<100	790
	21/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	4/12/2014	Not Sampled										
	4/03/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
	10/06/2015	<1	2	<1	<1	<2	ND	<10	<50	<100	<100	ND
MW4B	15/06/06	1,510	1,240	700	4,030	1,950	5,980	9,700	1,340	ND	ND	1,340
	30/01/08	2,150	3,700	918	2,300	1,580	3,880	13,000	2,130	ND	ND	2,130
	17/03/2011	89	110	46	60	65	125	310	570	<100	<100	670
	19/08/2013	82	39	160	64	55	119	1100	1200	<100	<100	1300
	4/12/2014	15	13	60	70	17	87	900	920	320	<100	1240
	3/03/2015	200	37	210	21	75	96	1200	580	<100	<100	580
	10/06/2015	490	88	590	68	470	538	4800	2600	<100	<100	2600
MW6	15/06/06	13,500	13,800	2,290	7,170	3,130	10,300	47,500	7,610	ND	70	7,680
	30/01/08	7,080	8,690	2,050	5,130	3,180	8,310	28,400	11,600	36,600	1,620	49,820
	17/03/2011	270	170	77	180	130	310	920	1000	<100	<100	1100
	21/08/2013	2000	190	1100	700	180	880	8000	2700	200	<100	2950
	3/12/2014	410	22	520	270	120	390	2900	2000	1200	110	3310
	4/03/2015	540	380	670	350	870	1220	4400	1900	<100	<100	1900
	10/06/2015	750	37	420	35	200	235	3000	1300	<100	<100	1300
MW7	15/06/06	2	ND	ND	ND	4	4	ND	ND	ND	ND	ND
	30/01/08	<1	<1	<1	<2	<1	ND	ND	ND	ND	130	130
	17/03/2011	1	4	3	8	5	13	17	79	<100	<100	179
	19/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	3/12/2014	<1	<1	<1	<2	<1	ND	<10	<50	190	<100	190
	3/03/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
	10/06/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
MW8	15/06/06	4	ND	ND	ND	4	4	ND	ND	ND	ND	ND
	30/01/08	<1	<1	<1	<2	<1	ND	ND	ND	ND	140	140
	17/03/2011	<1	3	2	6	3	9	14	62	<100	<100	162
	19/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	4/12/2014	Not Sampled										
	3/03/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
	11/06/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
MW9	15/06/06	1	5	2	150	170	320	370	1550	ND	ND	1550
	29/01/08	<1	<1	<1	<2	<1	ND	ND	ND	ND	<50	ND
	17/03/2011	<1	<1	1	<2	<1	ND	<10	<50	<100	<100	ND
	21/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	4/12/2014	Not Sampled										
	4/03/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND

Field_ID	Sampled Date	BTEX						TPH				
		Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	C6 - C9	C10 - C14	C15 - C28	C29-C36	C10 - C36 (Sum of total)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		1	1	1	2	1	ND	10	50	100	100	ND
NHMRC ADW 2011		1	800	300			600					
ANZECC 2000 FW 95%		950			200	350	550					
Netherlands (2000)												600
EPA 1994 Freshwater Ecosystems			300	140								
MW10	13/06/06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	29/01/08	<1	<1	<1	<2	<1	ND	ND	190	1,780	80	2,050
	16/03/2011	8	2	10	19	3	22	44	<50	<100	<100	ND
	20/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	3/12/2014	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	3/03/2015	2	<1	<1	<1	<2	ND	12	<50	<100	<100	ND
	10/06/2015	<1	1	<1	<1	<2	ND	<10	<50	<100	<100	ND
MW11	14/06/06	12,200	12,200	2,190	5,950	2,950	8,900	46,200	6,800	ND	ND	6,800
	29/01/08	4,520	5,740	1,810	4,330	2,790	7,120	20,600	2,810	ND	ND	2,810
	16/03/2011	2500	340	1100	1,500	310	1,810	7900	3400	<100	<100	3500
	22/08/2013						Could not locate					
	4/12/2014	1100	8	5	45	<1	45	2600	1200	<100	<100	1200
	3/03/2015	340	27	17	2	160	162	1500	890	<100	<100	890
	10/06/2015	640	5	4	<1	31	31	2000	1000	<100	<100	1000
MW12	14/06/06	8,850	7,380	1,510	3,990	2,080	6,070	28,700	6,490	ND	ND	6,490
	30/01/08	4,620	4,710	1,500	3,350	2,200	5,550	18,300	2,400	ND	ND	2,400
	17/03/2011	520	130	110	250	120	370	940	810	100	<100	960
	20/08/2013	1500	32	560	880	3	883	5000	2100	150	<100	2300
	4/12/2014						Not Sampled					
	3/03/2015	550	97	470	22	720	742	3400	2200	<100	<100	2200
	10/06/2015	930	13	480	2	590	592	4300	2700	<100	<100	2700
MW13	14/06/06	3,650	8,410	910	3,770	1,410	5,180	18,500	6,790	ND	ND	6,790
	30/01/08	1,160	5,020	1,210	4,280	1,880	6,160	15,900	2,940	ND	ND	2,940
	16/03/2011	18	58	13	49	26	75	220	120	<100	<100	220
	20/08/2013	220	800	430	1100	480	1580	4300	1200	<100	<100	1300
	4/12/2013						Not Sampled					
	3/03/2015	13	25	30	21	64	85	610	330	<100	<100	330
	11/06/2015	38	72	61	50	120	170	1200	1100	130	<100	1230
MW14	14/06/06	17,300	19,000	2,350	8,490	3,560	12,050	69,200	11,500	250	ND	11,750
	30/01/08	22,400	41,200	3,380	12,600	6,050	18,650	89,300	7,000	240	100	7,340
	16/03/2011	3500	6900	980	3,500	2,000	5,500	15,000	5,900	540	<100	6490
	21/08/2013	10,000	16,000	2300	8300	3700	12,000	53,000	5,100	440	<100	5590
	4/12/2014	11,000	12,000	2400	9400	3800	13,200	52,000	76,000	5,100	460	81,100
	2/03/2015	9400	15,000	2700	4300	9900	14,200	56,000	7400	290	<100	7690
	11/06/2015	7000	8600	1600	2400	5500	7900	38,000	7400	420	<100	7820
MW15	15/06/06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	29/01/08	<1	<1	<1	<2	<1	ND	ND	ND	ND	ND	ND
	17/03/2011	1	<1	2	<2	<1	ND	<10	<50	<100	<100	ND
	21/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	4/12/2014						Not Sampled					
	3/03/2015	2	<1	2	<1	2	2	<10	<50	<100	<100	ND
	10/06/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
MW16	14/06/06	10,600	14,000	1,690	6,770	2,760	9,530	41,700	6,810	ND	ND	6,810
	30/01/08	7,240	12,900	1,460	5,050	2,430	7,480	31,000	2,250	ND	ND	2,300
	16/03/2011	9400	11,000	2300	6,800	4,000	10,800	46,000	1200	<100	<100	1300
	21/08/2013	3200	5600	1100	4300	1800	6100	21,000	2900	110	<100	3060
	4/12/2014						Not sampled					
	2/03/2015	1900	2100	420	660	1500	2160	9000	2400	<100	<100	2400
	11/06/2015	1800	2400	570	930	2200	3130	12,000	4000	100	<100	4100

	BTEX						TPH					
	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylene (m & p) µg/L	Xylene (o) µg/L	Xylene Total µg/L	C6 - C9 µg/L	C10 - C14 µg/L	C15 - C28 µg/L	C29-C36 µg/L	C10 - C36 (Sum of total) µg/L	
EQL	1	1	1	2	1	ND	10	50	100	100	ND	
NHMRC ADW 2011	1	800	300			600						
ANZECC 2000 FW 95% Netherlands (2000)	950			200	350	550					600	
EPA 1994 Freshwater Ecosystems		300	140									
Field_ID	Sampled Date											
MW17	15/06/06	5,940	8,560	2,090	7,130	2,800	9,930	27,400	4,960	ND	ND	4,960
	30/01/08	2,930	1,250	1,280	2,130	1,510	3,640	10,600	2,020	ND	ND	2,020
	16/03/2011	96	8	27	37	13	37	190	520	<100	<100	620
	20/08/2013	130	2	22	10	2	12	470	400	<100	<100	500
	4/12/2014	Not Sampled										
	2/03/2015	150	41	90	63	280	343	1600	890	<100	<100	890
	11/06/2015	140	5	41	3	22	25	720	700	<100	<100	700
MW18	14/06/06	4,940	2,830	850	3,220	1,160	4,380	13,000	7,540	ND	ND	7,540
	30/01/08	905	204	434	931	290	1,221	4,980	3,810	ND	ND	3,810
	17/03/2011	76	5	26	32	2	34	210	520	<100	<100	620
	20/08/2013	290	6	150	110	<1	110.5	1,800	970	130	<100	1,150
	4/12/2014	Not Sampled										
	3/03/2015	140	28	62	3	59	62	1000	630	<100	<100	630
	11/06/2015	130	4	59	<1	41	41	750	480	<100	<100	480
MW19	15/06/06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	30/01/2008	<1	<1	2	3	2	5	ND	ND	ND	ND	ND
	17/03/2011	Could not locate										
	22/08/2013	Could not locate										
	4/12/2014	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	4/03/2015	Could not locate										
	11/06/2015	Could not locate										
MW20	14/06/06	1,390	62	160	360	55	415	2,080	410	ND	ND	410
	30/01/08	<1	<1	<1	16	8	24	50	ND	ND	ND	ND
	17/03/2011	21	3	31	110	4	114	180	110	<100	<100	210
	20/08/2013	6	<1	5	31	<1	31.5	100	<50	<100	<100	ND
	3/12/2014	<1	<1	1	8	<1	8	36	71	520	<100	591
	3/03/2015	2	<1	1	<1	5	5	17	<50	<100	<100	ND
	10/06/2015	6	<1	10	<1	54	54	130	82	<100	<100	82
MW21	14/06/06	190	94	490	2,590	890	3,480	6,070	9,200	ND	ND	9,200
	30/01/08	1370	196	731	2,020	830	2,850	7,040	6,430	ND	ND	6,430
	17/03/2011	250	<1	27	<2	<1	ND	420	690	<100	<100	790
	20/08/2013	<1	<1	3	<2	<1	ND	140	400	<100	<100	500
	4/12/2014	Not Sampled										
	4/03/2015	45	<1	<1	2	<2	2	130	73	<100	<100	73
	11/06/2015	<1	<1	<1	<1	<2	ND	62	<50	<100	<100	ND
MW22	14/06/06	2,960	260	140	280	130	410	3,910	1,050	ND	ND	1,050
	30/01/08	1,720	456	395	686	378	1,064	4,130	780	ND	ND	780
	17/03/2011	120	9	42	52	5	57	260	250	<100	<100	350
	20/08/2013	16	<1	14	6	<1	6.5	140	140	<100	<100	240
	4/12/2014	Not Sampled										
	3/03/2015	<1	<1	<1	<1	<2	ND	35	<50	<100	<100	ND
	11/06/2015	20	<1	16	<1	3	3	170	160	<100	<100	160
MW23	14/06/2006	9,870	1750	190	660	350	1,010	13,900	2,030	ND	ND	2030
	30/01/2008	7,340	570	223	202	130	332	9,870	600	ND	ND	600
	17/03/2011	2500	750	180	300	180	480	3300	720	130	<100	900
	20/08/2013	4600	1100	600	1000	210	1210	11,000	1500	180	<100	1730
	4/12/2014	Not Sampled										
	2/03/2015	2000	110	210	14	280	294	4000	690	<100	<100	690
	11/06/2015	3300	1000	440	190	970	1160	8700	<50	<100	<100	ND
MW24	15/06/06	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	30/01/08	<1	<1	<1	<2	<1	ND	ND	ND	ND	ND	ND
	17/03/2011	5	4	4	12	6	18	25	<50	<100	<100	<250
	20/08/2013	<1	<1	<1	<2	<1	ND	<10	<50	<100	<100	ND
	4/12/2014	Not Sampled										
	4/03/2015	<1	<1	<1	<1	<2	ND	<10	<50	<100	<100	ND
	11/06/2015	<1	<1	<1	<1	<2	ND	<10	1500	<100	<100	1500

*ND - Non Detect



WSP Environmental Pty Ltd

Table 1c, Appendix B
Current and Historical Groundwater Summary Results - MNA Parameters only

27055 GME
Coramba
Coffs Harbour City Council
June 2015

		Field			Inorganics								Metals		
		Alkalinity (total)	Carbonate as CaCO3	CO2 (Free)	Ammonia	Bicarbonate as CaCO3	Chloride	Ferrous Iron	Hydroxide	Ionic Balance	Sodium (Filtered)	Sulphate	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)
		mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		5	5	0	0.005	5	1	0.05	5000		0.5	1	0.5	0.5	0.5
NHMRC ADW 2011												500			
ANZECC 2000 FW 95%					0.9										
Field ID	Sampled Date														
MW2	3/07/2006	36	-	-	0	-	21	29	-	-	23	14	3	2	3
	29/01/2008	33	-	83,000	0	-	21	1	-	-	25	10	4	2	3
	17/03/2011	100	-	44,000	0	-	27	26	-	-	22	3	5	4	2
	21/08/2013	59	<5	150,000	0.024	59	33	29	<5000	-22	19	7	4.2	4.2	1.6
	4/12/2014	No access													
	4/03/2015	<5	<5	71,000	0.018	-	37	<0.05		-2.1	16	2	0.7	3.3	1.3
	Not Applicable	Dry													
MW6	30/01/2008	144	-	58,000	<0.01	-	21	10	-	-	26	2	4	11	4
	17/03/2011	92	-	240,000	0	-	18	9	-	-	29	9	2	4	3
	21/08/2013	130	<5	120,000	0.009	130	25	10	<5000	-25	26	4	2.7	7.9	3.5
	3/12/2014	120	<5	120,000	0.033	120	23	4.4	<5000	-15	37	1	1.9	5	2.8
	4/03/2015	82	<5	90,000	0.058	-	23	9	-	-15	33	19	2.3	4.4	2.7
	10/06/2015	76	<5	94,000	0.072	-	23	6.2	-	-14	36	24	1.7	3.7	3
MW11	3/07/2006	120	-	-	1	-	24	7	-	-	24	<2	6	12	4
	29/01/2008	152	-	76,000	0	-	20	15	-	-	21	<2	5	12	4
	16/03/2011	160	-	11,000	0	-	20	14	-	-	20	<1	4	9	4
	22/08/2013	Could not locate													
	4/12/2014	140	<5	140,000	0.65	140	21	31	<5000	-26	18	<1	4.3	10	3.2
	3/03/2015	120	<5	86,000	0.14	-	21	27	-	-25	16	<1	4	9.1	3.7
	10/06/2015	130	<5	130	2	-	19	29	-	-32	17	<1	3.7	8.2	3.6
MW14	4/07/2006	130	-	-	0	-	27	4	-	-	28	2	4	11	6
	30/01/2008	136	-	68,000	<0.01	-	23	6	-	-	27	2	3	10	5
	16/03/2011	140	-	310,000	0	-	21	9	-	-	25	<1	3	8	6
	21/08/2013	150	<5	970,000	<0.005	150	26	10	<5000	-33	20	<1	3.1	9	5.4
	4/12/2014	160	<5	90,000	<0.02	160	24	7.6	<5000	-22	28	<1	3.8	12	5.4
	2/03/2015	160	<5	85,000	0.055	29	-	0.97	-	-25	26	<1	3.7	11	6.1
	11/06/2015	160	<5	92,000	<0.005	-	26	9.9	-	-26	25	<1	3.1	10	6.5
	MW24	4/07/2006	44	-	-	<0.01	-	27	<0.5	-	-	30	7	13	4

(-) Not analysed



WSP Environmental Pty Ltd

Table 1d, Appendix B
Groundwater RPD Summary Results

27055 GME
Coramba
Coffs Harbour City Council
June, 2015

Field Duplicates (water) Filter: ALL				SDG Field_ID Sampled_Date-Time	ENVIROLAB 2015-06-12T00:00:00 MW4B 10/06/2015	ENVIROLAB 2015-06-12T00:00:00 DUP1 10/06/2015	RPD
Chem_Group	ChemName	Units	EQL				
BTEX	Benzene	µg/L	1	490.0	480.0	2	
	Toluene	µg/L	1	88.0	84.0	5	
	Ethylbenzene	µg/L	1	590.0	580.0	2	
	Xylene (o)	µg/L	1	68.0	66.0	3	
	Xylene (m)	µg/L	2	470.0	470.0	0	
PAH/Phenols	Naphthalene	µg/L	1	88.0	86.0	2	
Total Recoverable Hydrocarbons	C6 - C9	µg/L	10	4800.0	4100.0	16	
	C10 - C14	µg/L	50	2600.0	2600.0	0	
	C15 - C28	µg/L	100	<100.0	110.0	10	
	C29-C36	µg/L	100	<100.0	<100.0	0	
	C6-C10	µg/L	10	6000.0	5100.0	16	
	>C10-C16	µg/L	50	1300.0	1400.0	7	
	>C16-C34	µg/L	100	<100.0	<100.0	0	
	>C34-C40	µg/L	100	<100.0	<100.0	0	
F1 C6-C10	µg/L	10	4300.0	3400.0	23		
F2 C10-C16	µg/L	50	1300.0	1300.0	0		

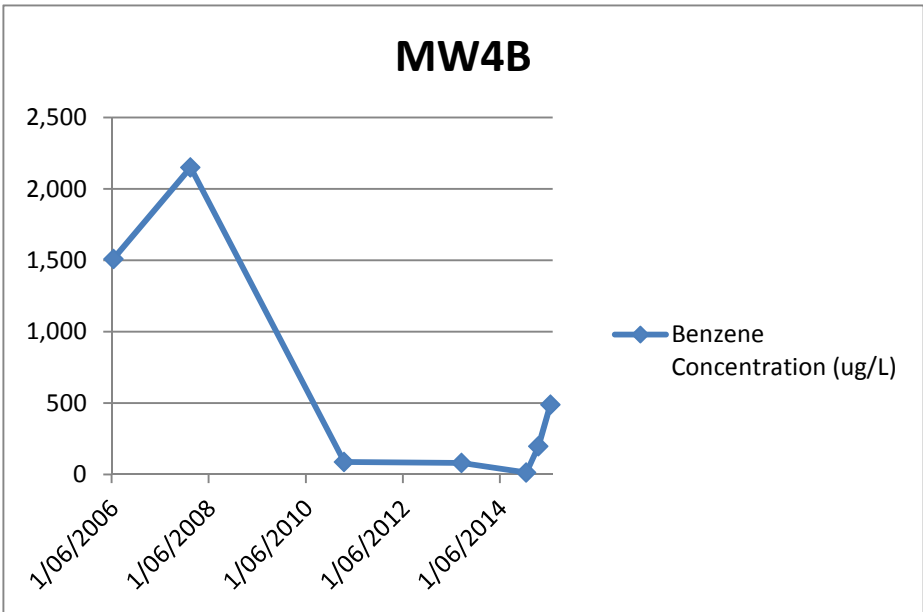
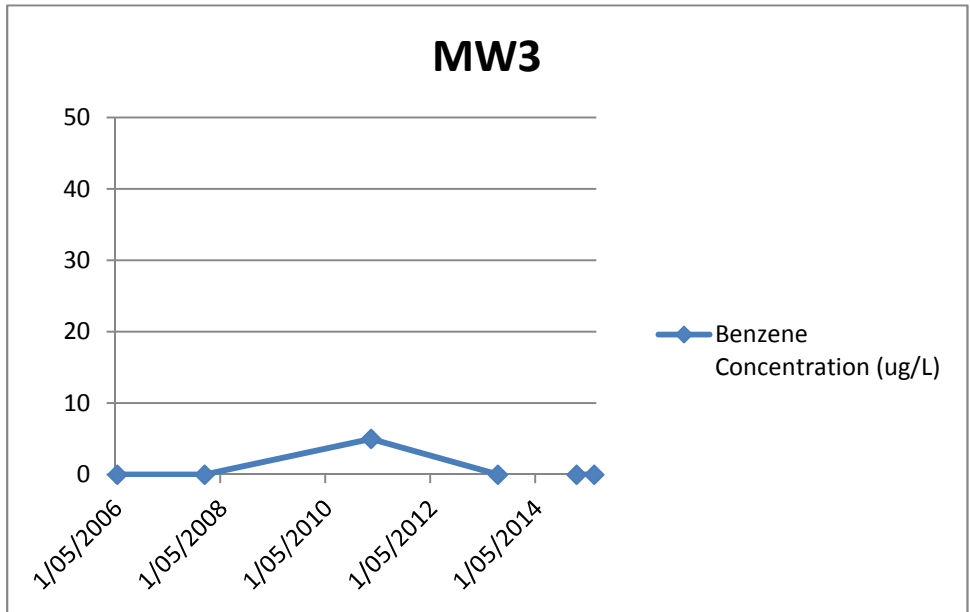
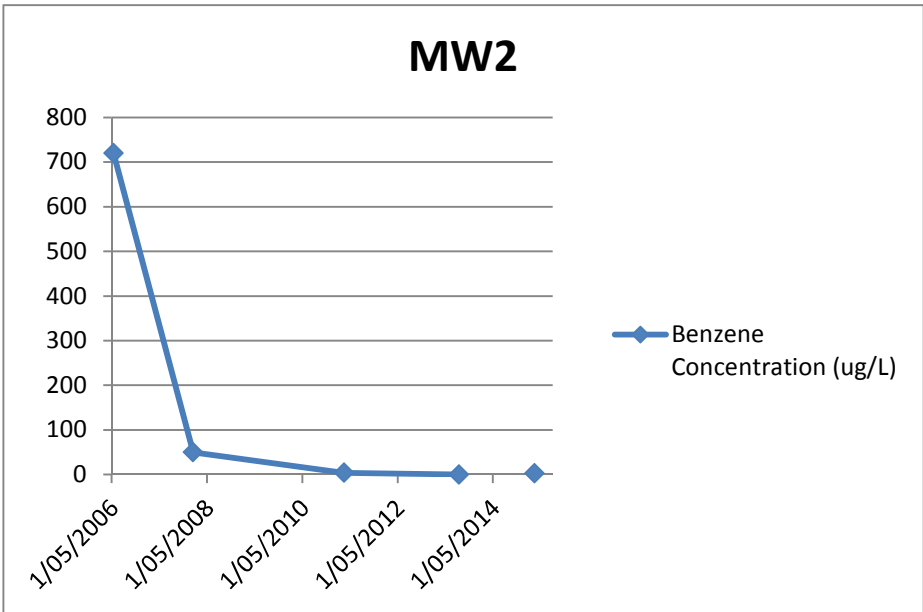
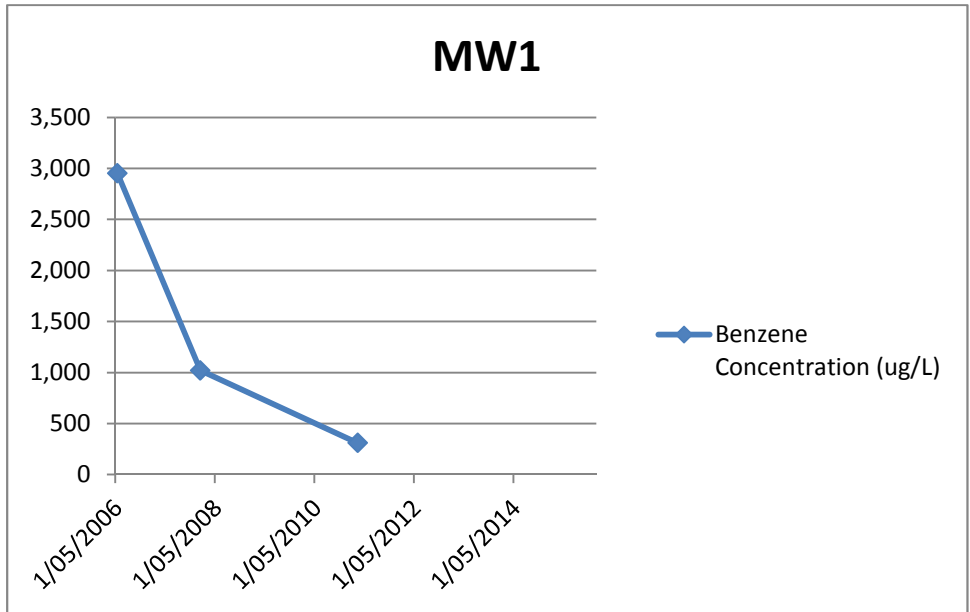
*RPDs have only been considered where a concentration is greater than 0 times the EQL.

**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 100 (0-5 x EQL); 75 (5-10 x EQL); 30 (> 10 x EQL))

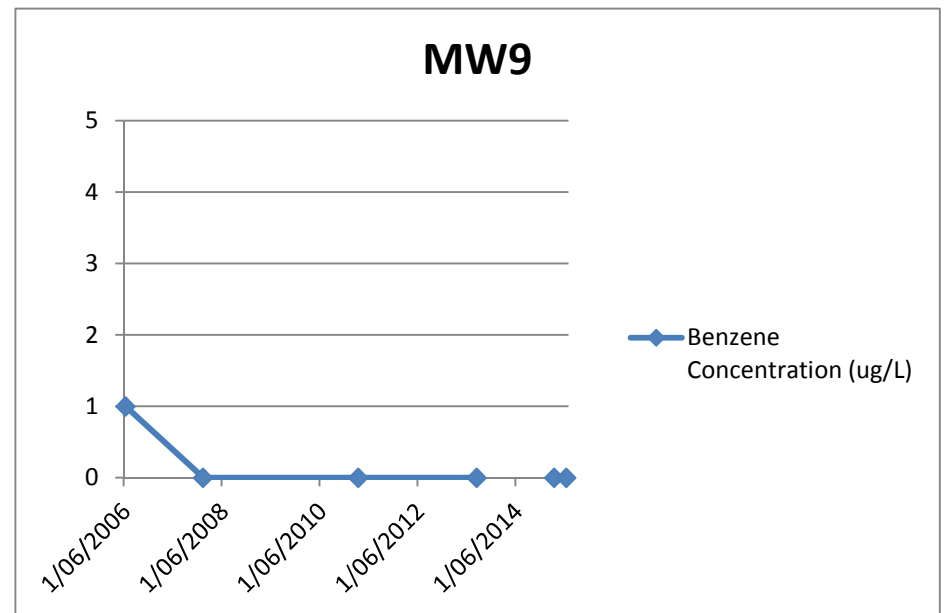
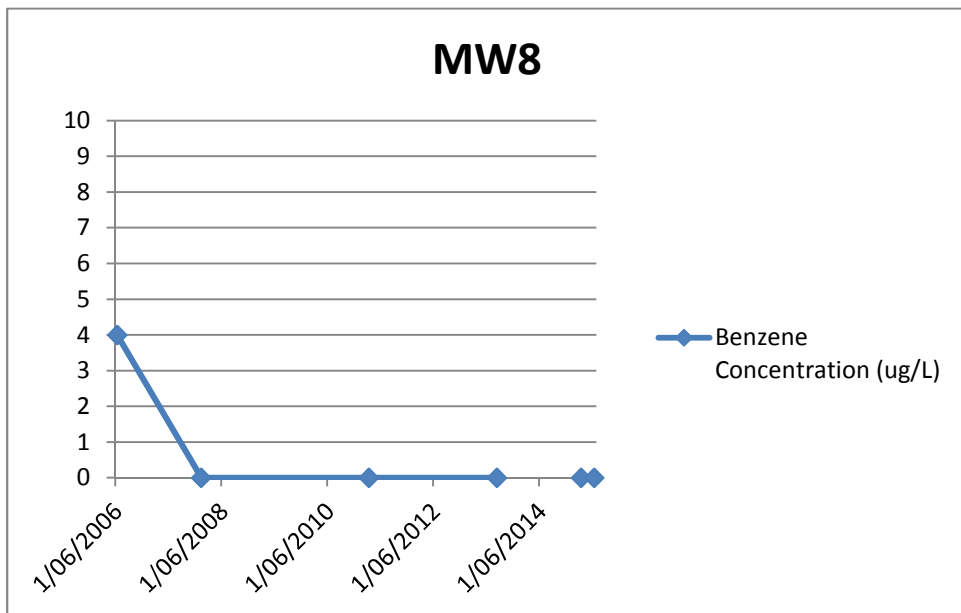
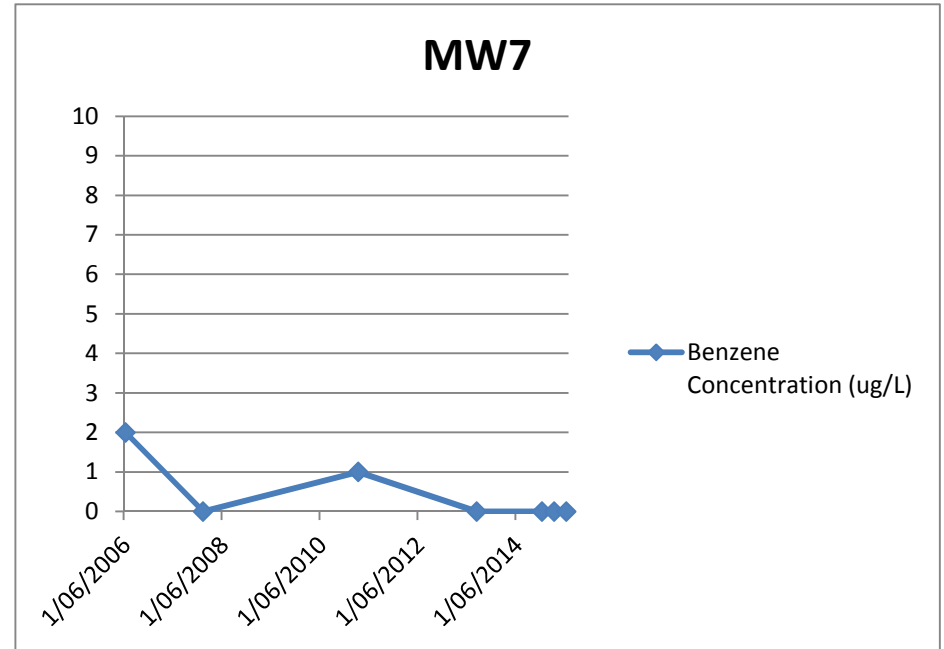
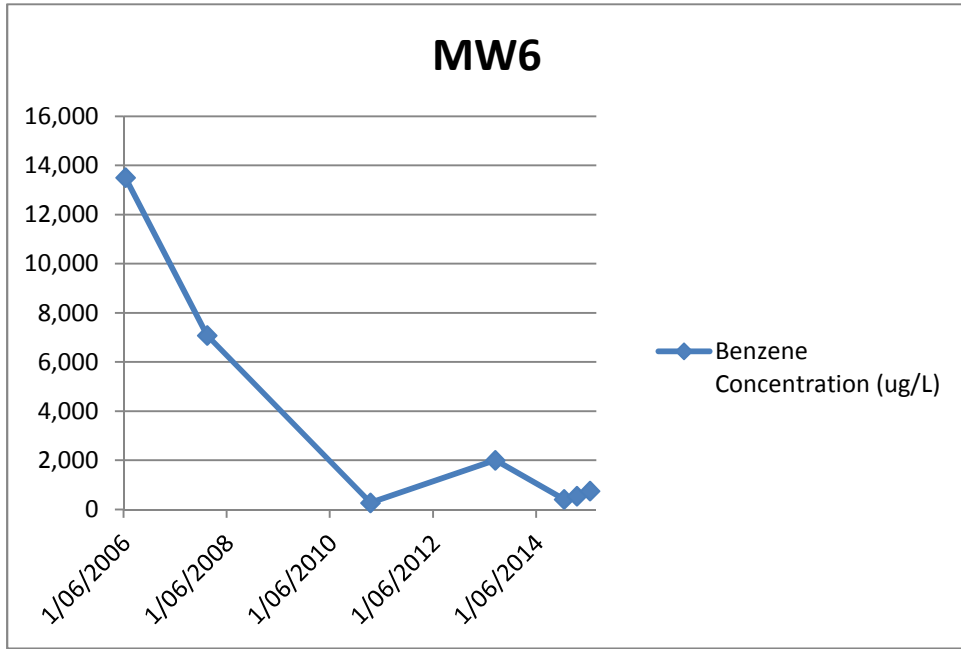
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix C – Benzene and TRH Trend Analysis

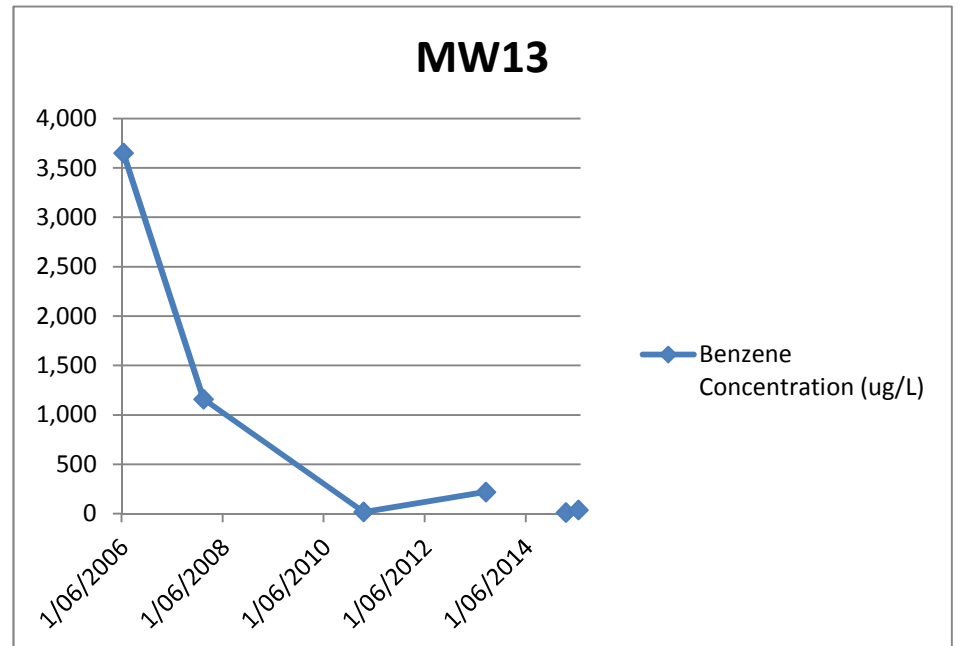
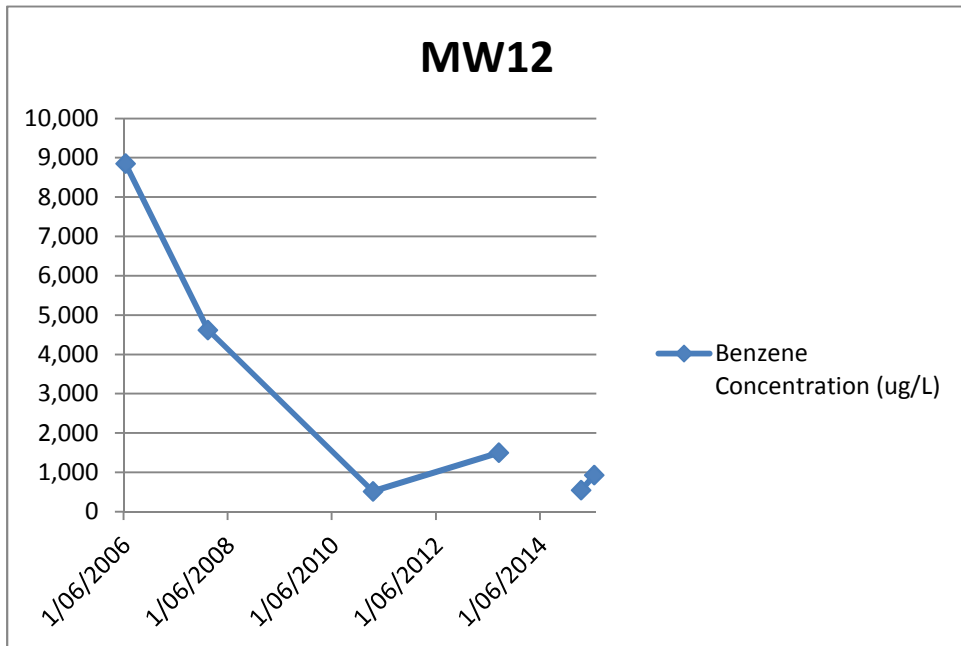
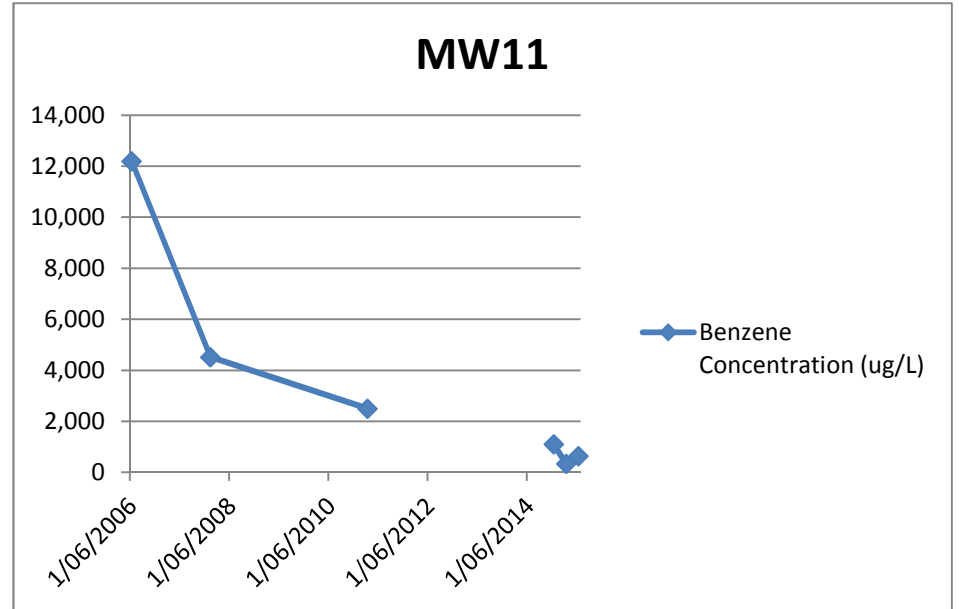
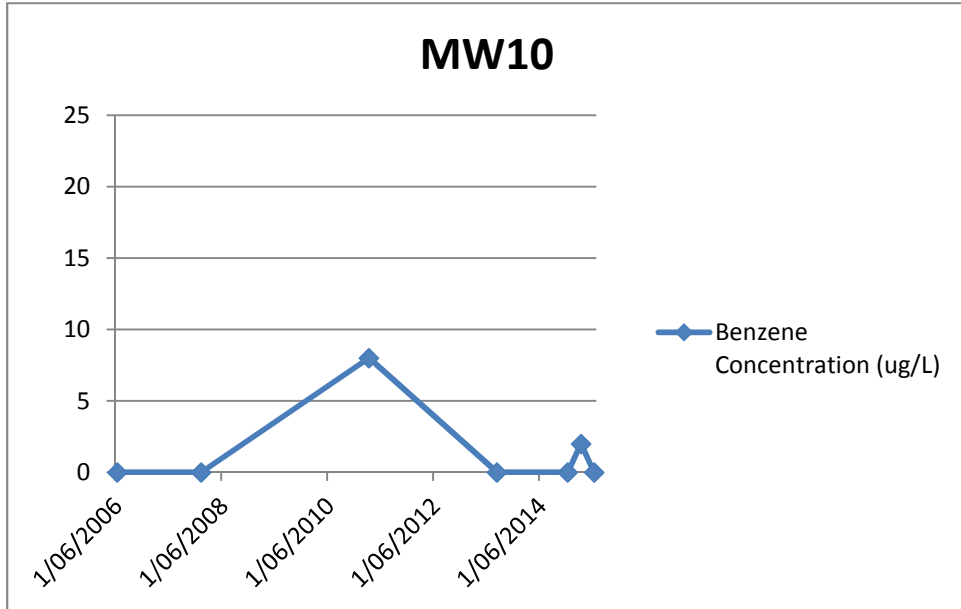
Benzene Trend Analysis (All Wells – 2006 – 2015)



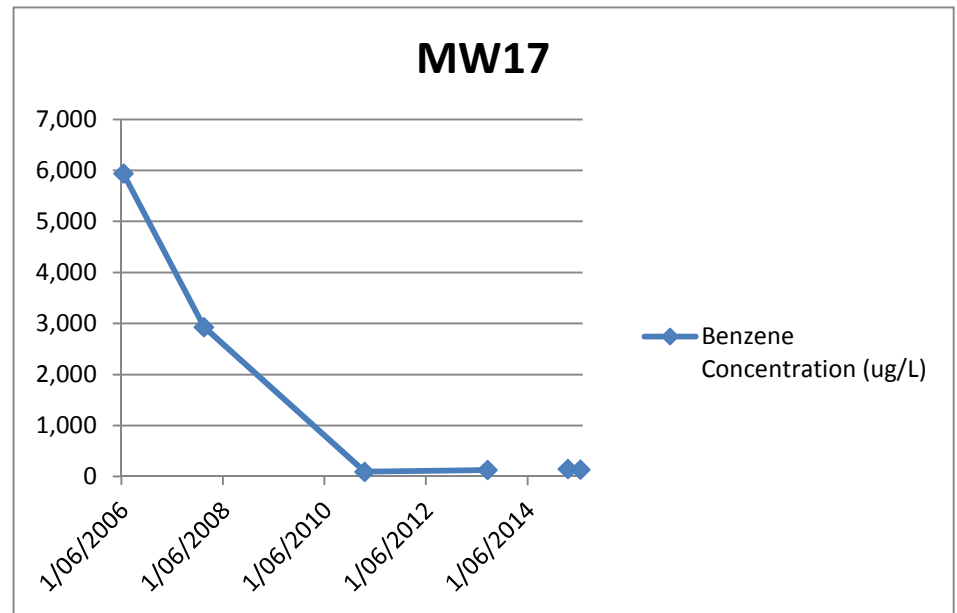
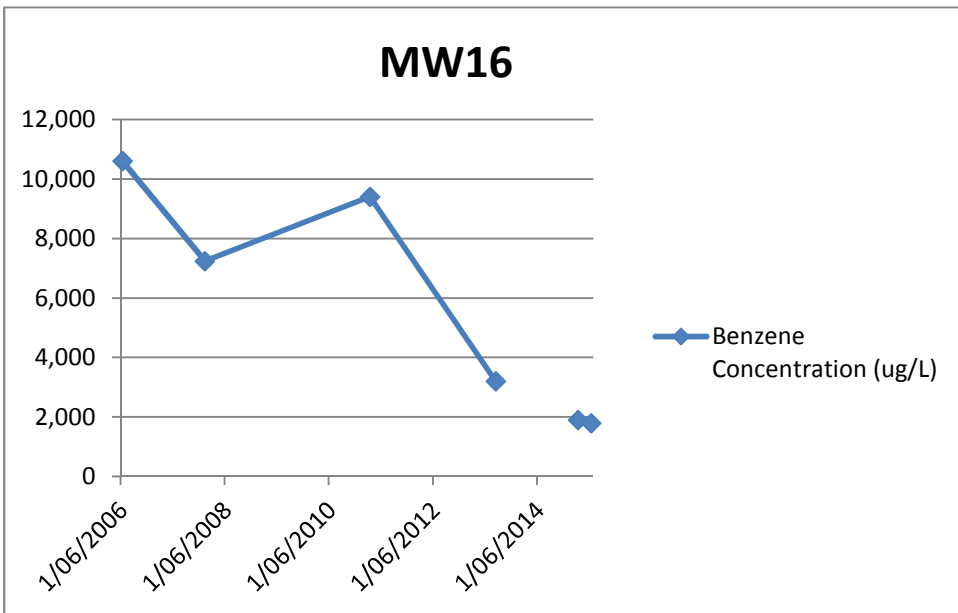
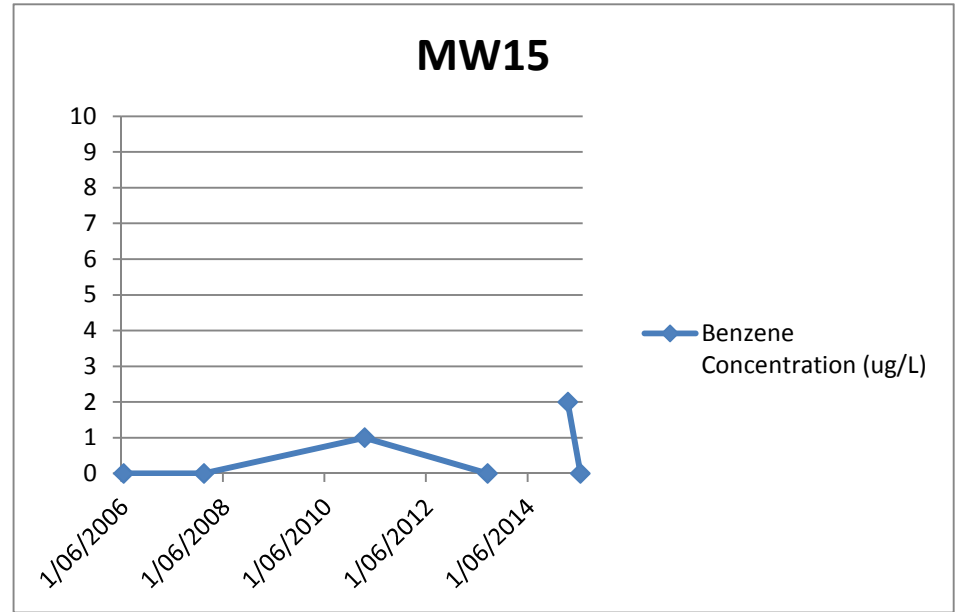
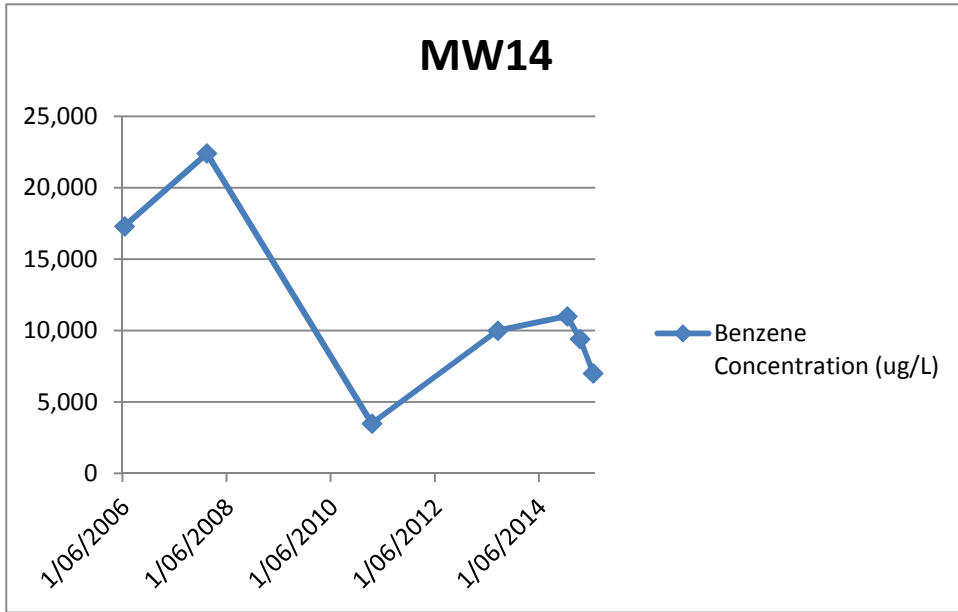
Benzene Trend Analysis (All Wells – 2006 – 2015)



Benzene Trend Analysis (All Wells – 2006 – 2015)

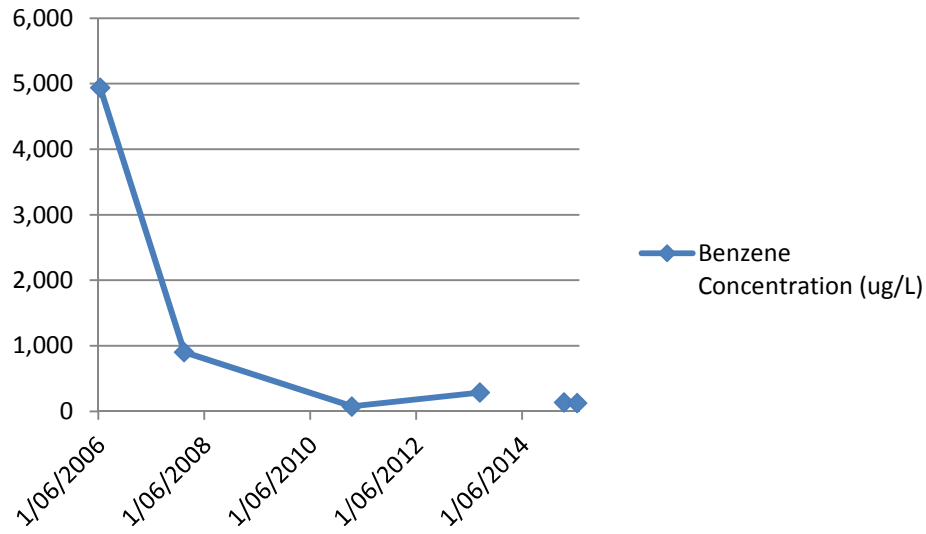


Benzene Trend Analysis (All Wells – 2006 – 2015)

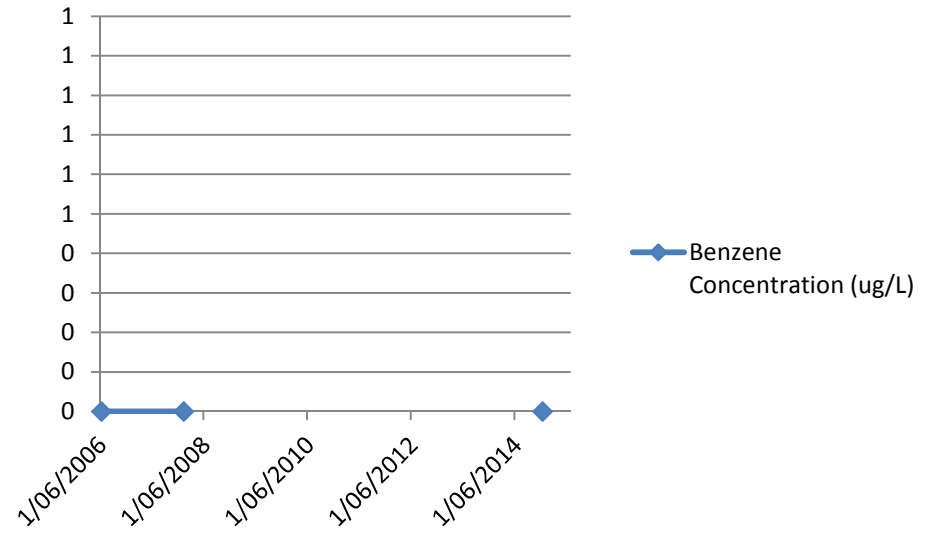


Benzene Trend Analysis (All Wells – 2006 – 2015)

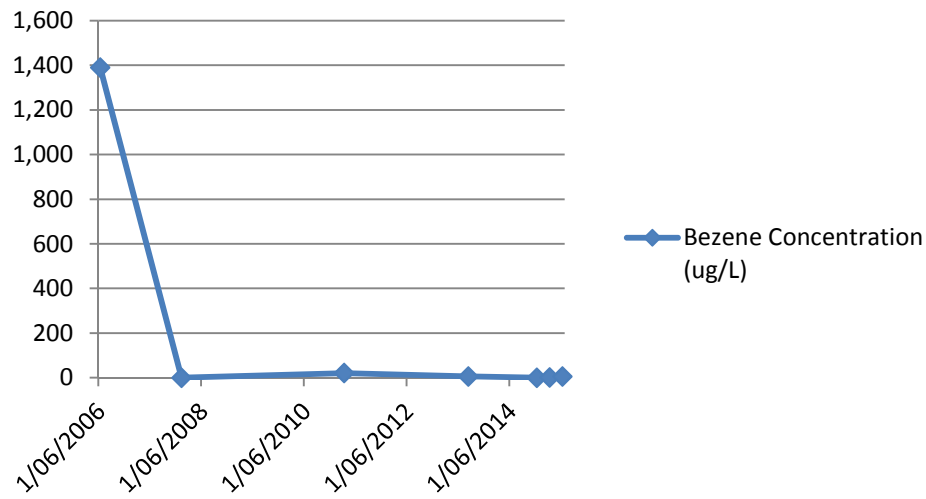
MW18



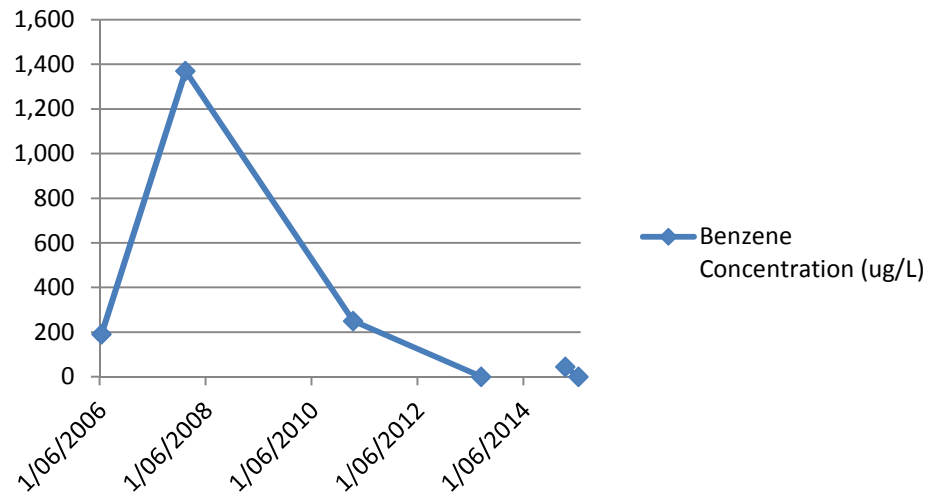
MW19



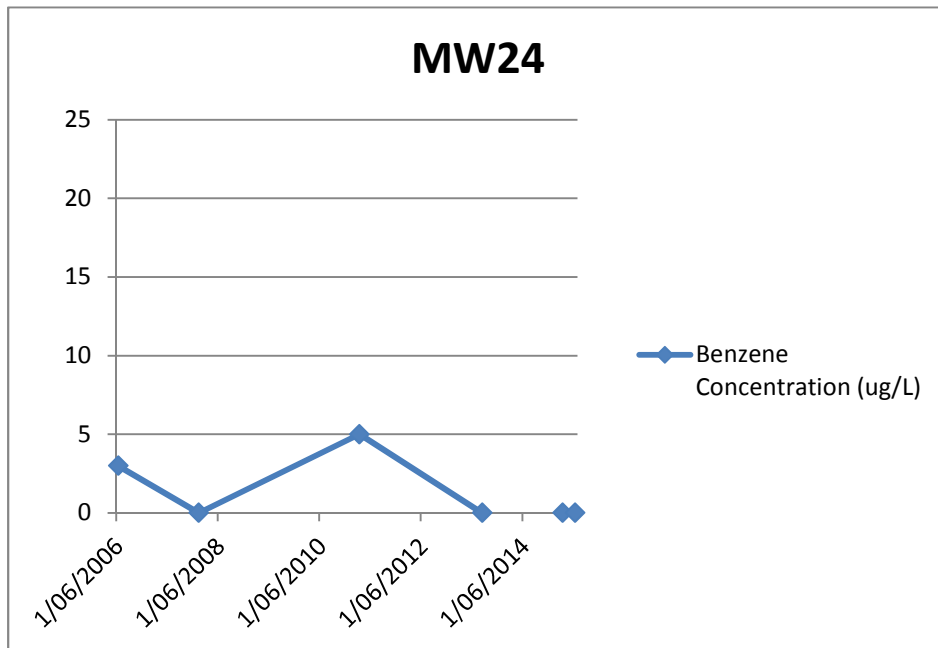
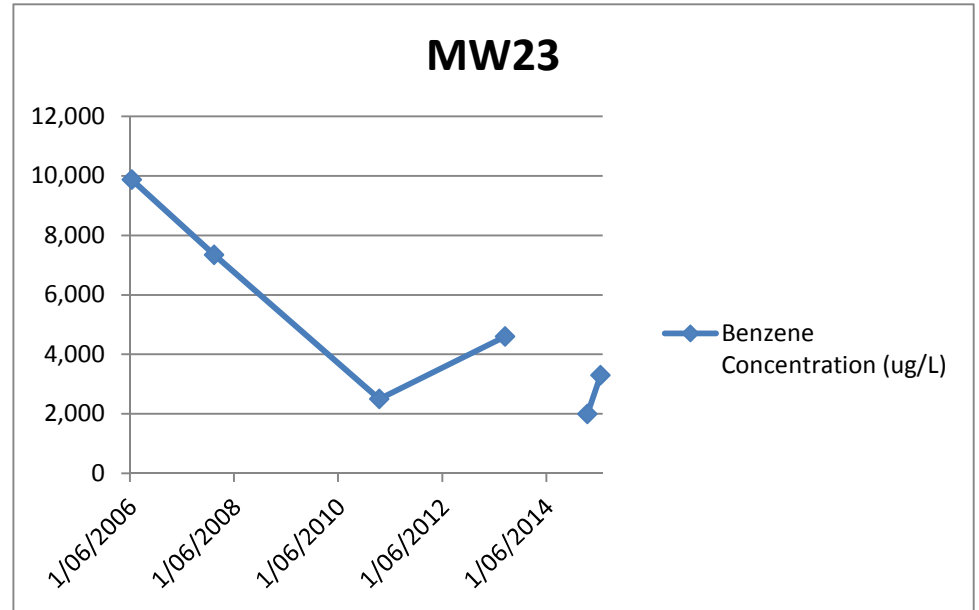
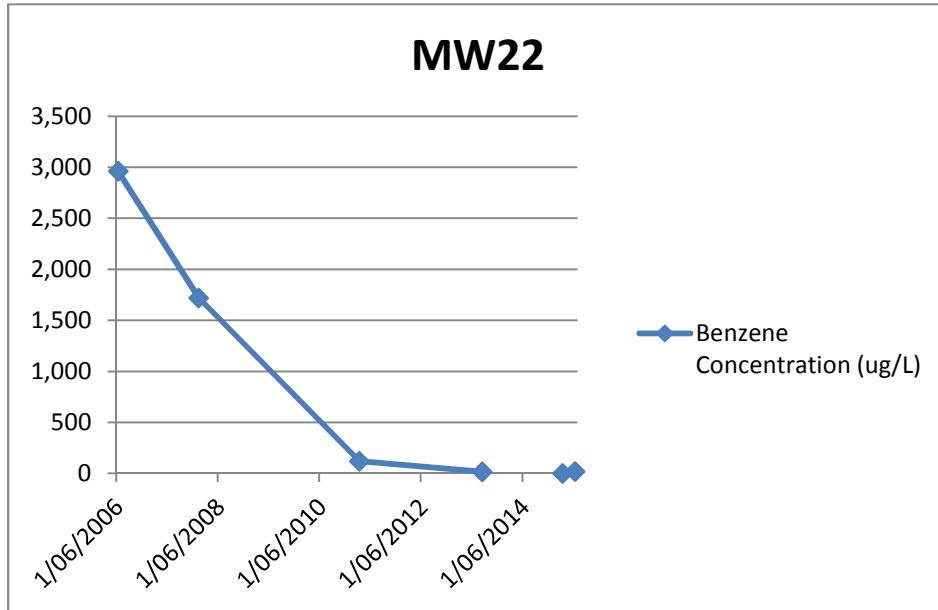
MW20



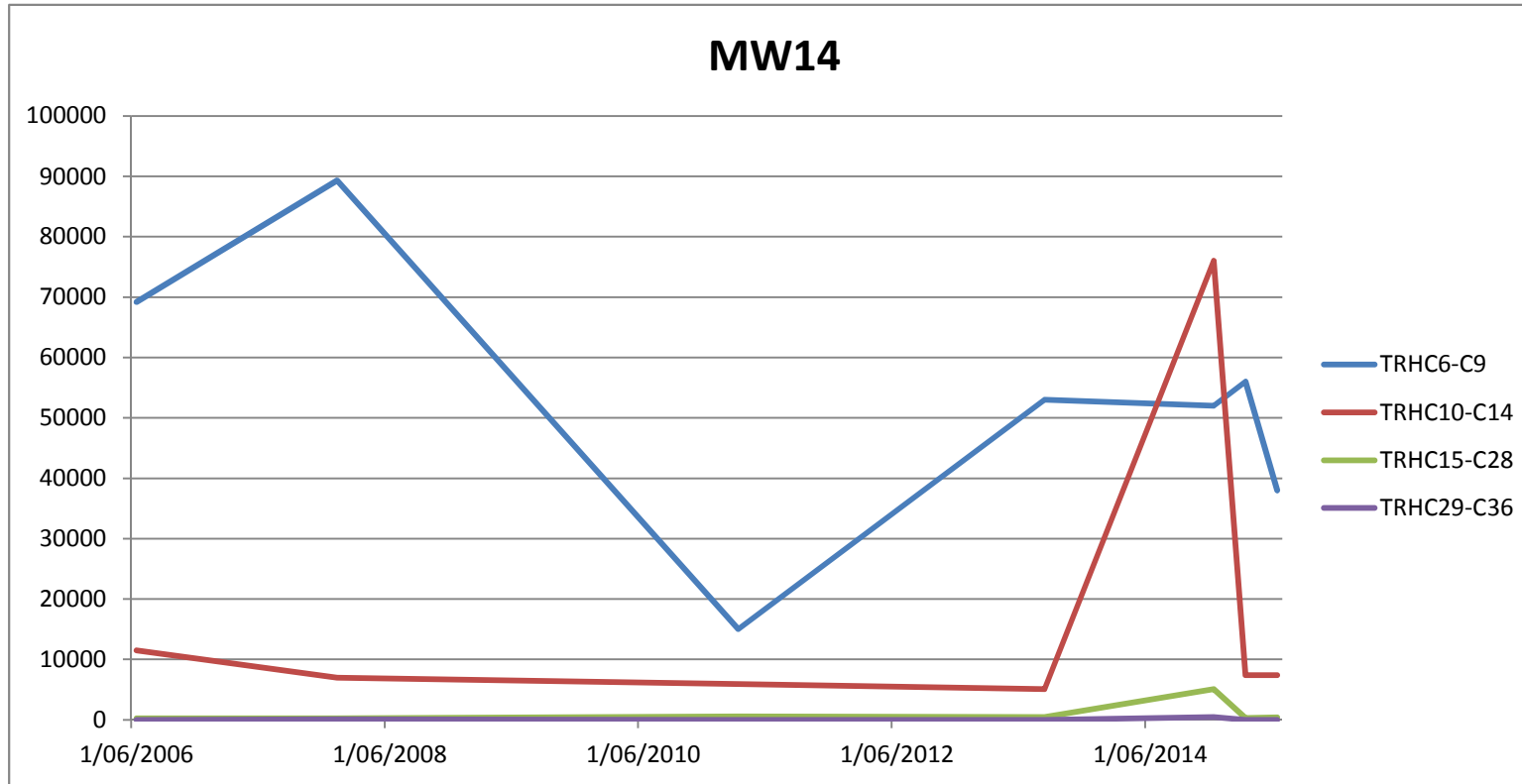
MW21



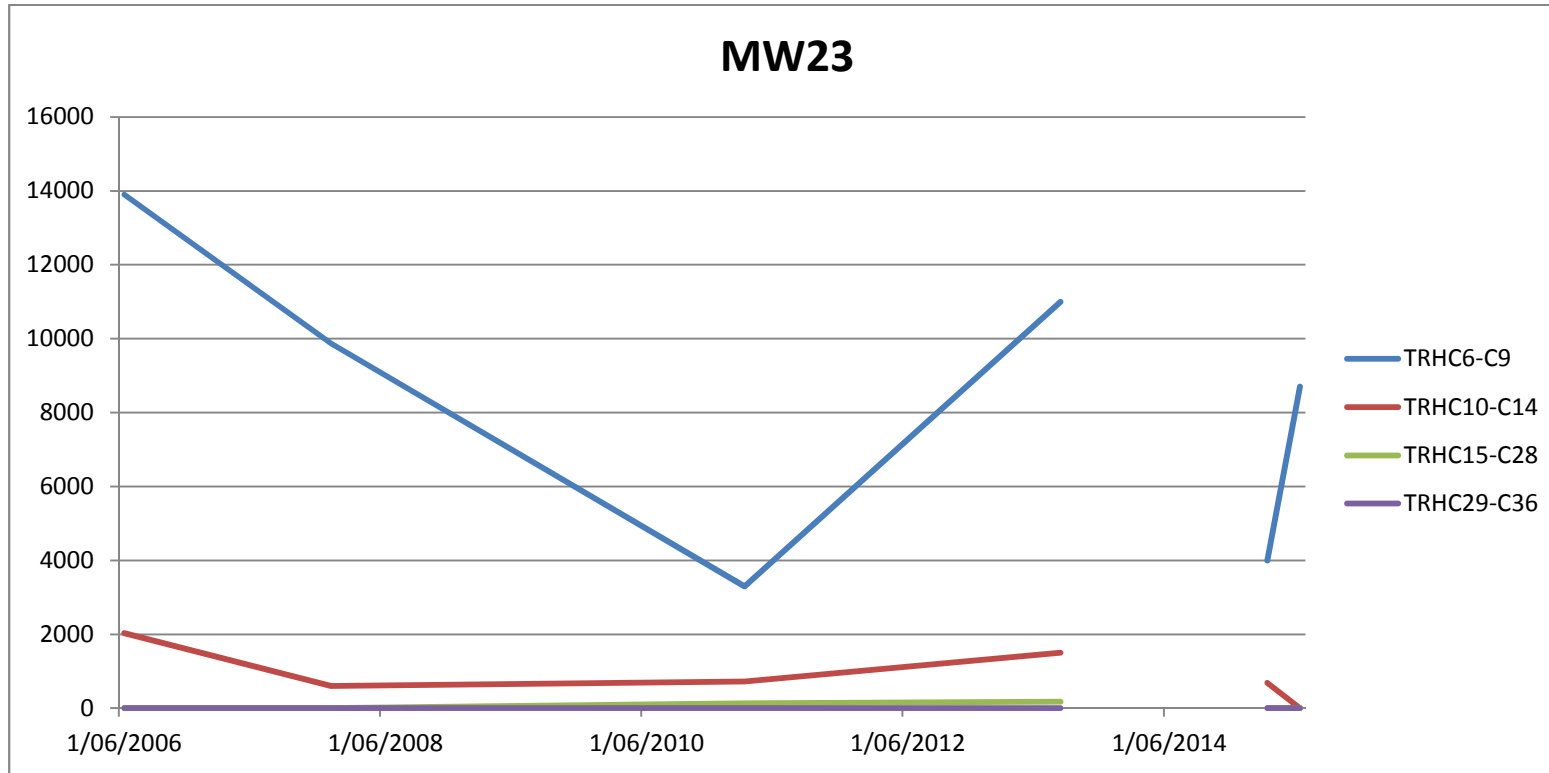
Benzene Trend Analysis (All Wells – 2006 – 2015)



TRH Fractions – Trend Analysis for MW14 and MW23 (2006 – 2015)



TRH Fractions – Trend Analysis for MW14 and MW23 (2006 – 2015)




Appendix D – Laboratory Certificates

CHAIN OF CUSTODY - Client



ENVIROLAB SERVICES

Client: WSP Environmental Pty Ltd	Client Project Name and Number: 27055.03 Coramba GME June 2015	EnviroLab Services 12 Ashley St, Chatswood, NSW, 2067 Phone: 02 9910 6200 Fax: 02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Project Mgr: Peter Moore (peter.moore@wspgroup.com)	PO No.: 27055.03	
Sampler: Aaron Young	EnviroLab Services Quote No. :	
Address: Lev 1, 41 McLaren St North Sydney	Date results required:	
Email: aaron.young@wspgroup.com 89256700,	Or choose <u>standard</u> <i>Note: Inform lab in advance if urgent turnaround is required - surcharge applies</i>	
Phone: mobile: 0448 977 940 Fax: 89070999		

Sample information				Tests Required											Comments				
EnviroLab Sample ID	Client Sample ID	Date sampled	Type of sample	TRH (C6-C9)	TRH (C10-C36)	TRH (C6-C10)	TRH (C10-C40)	BTEX	Ammonia	Major Cations	Major Anions	Ferrous Iron	Free Carbon Dioxide	HOLD					Provide as much information about the sample as you can
1	MW3	10/06/2015	Water	X	X	X	X	X											Sample may have high TRH &/or BTEX
2	MW4B	10/06/2015	Water	X	X	X	X	X											
3	MW6	10/06/2015	Water	X	X	X	X	X	X	X	X	X	X						
4	MW7	10/06/2015	Water	X	X	X	X	X											
5	MW8	11/06/2015	Water	X	X	X	X	X											
6	MW9	10/06/2015	Water	X	X	X	X	X											
7	MW10	10/06/2015	Water	X	X	X	X	X											 EnviroLab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200 Job No: 129468 Date Received: 12.6.2015 Time Received: 12.30 Received by: [Signature] Temp: Cool/Ambient Cooling: Ice/Repack Security: Intact/Broken/None
8	MW11	10/06/2015	Water	X	X	X	X	X	X	X	X	X	X						
9	MW12	10/06/2015	Water	X	X	X	X	X											
10	MW13	11/06/2015	Water	X	X	X	X	X											
11	MW14	11/06/2015	Water	X	X	X	X	X	X	X	X	X	X						
12	MW15	10/06/2015	Water	X	X	X	X	X	X	X	X	X	X						
13	MW16	11/06/2015	Water	X	X	X	X	X											
14	MW17	11/06/2015	Water	X	X	X	X	X											
15	MW18	11/06/2015	Water	X	X	X	X	X											

Relinquished by (company): WSP	Received by (company): ELS	Samples Received: Cool or Ambient (circle one)
Print Name: Aaron Young	Print Name: P. Ray	Temperature Received at: (if applicable)
Date & Time: 12/6/15 3pm	Date & Time: 12.6.15 16:30	Transported by: Hand delivered / courier
Signature: [Signature]	Signature: [Signature]	Page No: 1 of 2

CHAIN OF CUSTODY - Client



ENVIROLAB SERVICES

Client: WSP Environmental Pty Ltd	Client Project Name and Number: 27055.03 Coramba GME June 2015	EnviroLab Services 12 Ashley St, Chatswood, NSW, 2067 Phone: 02 9910 6200 Fax: 02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Project Mgr: Peter Moore (peter.moore@wspgroup.com)	PO No.: 27055.03	
Sampler: Aaron Young	EnviroLab Services Quote No. :	
Address: Lev 1, 41 McLaren St North Sydney	Date results required:	
Email: aaron.young@wspgroup.com	Or choose: <u>standard</u>	
Phone: 89256700, mobile: 0448 977 940 Fax: 89070999	<small>Note: Inform lab in advance if urgent turnaround is required - surcharge applies</small>	

Sample information				Tests Required														Comments	
EnviroLab Sample ID	Client Sample ID	Date sampled	Type of sample	TRH (C6-C9)	TRH (C10-C36)	TRH (C6-C10)	TRH (C10-C40)	BTEX	Ammonia	Major Cations	Major Anions	Ferrous Iron	Free Carbon Dioxide	HOLD					Provide as much information about the sample as you can
16	MW20	10/06/2015	Water	X	X	X	X	X											
17	MW21	11/06/2015	Water	X	X	X	X	X											
18	MW22	11/06/2015	Water	X	X	X	X	X											
19	MW23	11/06/2015	Water	X	X	X	X	X											
20	MW24	11/06/2015	Water	X	X	X	X	X											
21	DUP1	10/06/2015	Water	X	X	X	X	X											
22	TRIP1	10/06/2015	Water											X					
23	TB1	10/06/2015	Water	X		X													
24	TB2	11/06/2015	Water	X		X													

Relinquished by (company): WSP	Received by (company): EUS	Samples Received: Cool or Ambient (circle one) Temperature Recieved at: (if applicable) Transported by: Hand delivered / courier Page No: 1 of 1 2 of 2
Print Name: Aaron Young	Print Name: P. Raj	
Date & Time: 12/6/15 3pm	Date & Time: 12.6.2015 16.30	
Signature: <i>[Signature]</i>	Signature: <i>[Signature]</i>	

SAMPLE RECEIPT ADVICE

Client Details	
Client	WSP Environmental Pty Ltd
Attention	Peter Moore, Aaron Young

Sample Login Details	
Your Reference	27055.03, Coramba GME June 2015
Envirolab Reference	129468
Date Sample Received	12/06/2015
Date Instructions Received	12/06/2015
Date Results Expected to be Reported	19/06/2015

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	25 Waters
Turnaround Time Requested	Standard
Temperature on receipt (°C)	10.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments	
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples	

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

<i>Sample Id</i>	<i>Ammonia as N in water</i>	<i>Ferrous Iron</i>	<i>Free Carbon Dioxide as CO2</i>	<i>Ion Balance</i>	<i>svTRH (C10-C40) in Water</i>	<i>vTRH(C6-C10)/BTEXN in Water</i>	<i>On Hold</i>
MW3					✓	✓	
MW4B					✓	✓	
MW6	✓	✓	✓	✓	✓	✓	
MW7					✓	✓	
MW8					✓	✓	
MW9					✓	✓	
MW10					✓	✓	
MW11	✓	✓	✓	✓	✓	✓	
MW12					✓	✓	
MW13					✓	✓	
MW14	✓	✓	✓	✓	✓	✓	
MW15	✓	✓	✓	✓	✓	✓	
MW16					✓	✓	
MW17					✓	✓	
MW18					✓	✓	
MW20					✓	✓	
MW21					✓	✓	
MW22					✓	✓	
MW23					✓	✓	
MW24					✓	✓	
DUP1					✓	✓	
TRIP1							✓
TB1						✓	
TB2						✓	

CERTIFICATE OF ANALYSIS

129468

Client:

WSP Environmental Pty Ltd
Level 1, 41 McLaren St
North Sydney
NSW 2060

Attention: Peter Moore, Aaron Young

Sample log in details:

Your Reference:	<u>27055.03, Coramba GME June 2015</u>
No. of samples:	25 Waters
Date samples received / completed instructions received	12/06/15 / 12/06/15

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data. Samples were analysed as received from the client. Results relate specifically to the samples as received. Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	19/06/15 / 19/06/15
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:



Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Water	UNITS	129468-1	129468-2	129468-3	129468-4	129468-5
Our Reference:	-----	MW3	MW4B	MW6	MW7	MW8
Your Reference	-----					
Date Sampled	-----	10/06/2015	10/06/2015	10/06/2015	10/06/2015	11/06/2015
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
Date analysed	-	17/06/2015	18/06/2015	18/06/2015	17/06/2015	17/06/2015
TRHC ₆ - C ₉	µg/L	<10	4,800	3,000	<10	<10
TRHC ₆ - C ₁₀	µg/L	<10	6,000	3,600	<10	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	4,300	2,200	<10	<10
Benzene	µg/L	<1	490	750	<1	<1
Toluene	µg/L	2	88	37	<1	<1
Ethylbenzene	µg/L	<1	590	420	<1	<1
m+p-xylene	µg/L	<2	470	200	<2	<2
o-xylene	µg/L	<1	68	35	<1	<1
Naphthalene	µg/L	<1	88	67	<1	<1
Surrogate Dibromofluoromethane	%	101	88	88	102	101
Surrogate toluene-d8	%	103	106	101	103	103
Surrogate 4-BFB	%	102	104	105	102	101

vTRH(C6-C10)/BTEXN in Water	UNITS	129468-6	129468-7	129468-8	129468-9	129468-10
Our Reference:	-----	MW9	MW10	MW11	MW12	MW13
Your Reference	-----					
Date Sampled	-----	10/06/2015	10/06/2015	10/06/2015	10/06/2015	11/06/2015
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
Date analysed	-	17/06/2015	17/06/2015	18/06/2015	18/06/2015	17/06/2015
TRHC ₆ - C ₉	µg/L	<10	<10	2,000	4,300	1,200
TRHC ₆ - C ₁₀	µg/L	<10	<10	2,200	4,900	1,500
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	<10	1,500	2,900	1,200
Benzene	µg/L	<1	<1	640	930	38
Toluene	µg/L	1	<1	5	13	72
Ethylbenzene	µg/L	<1	<1	4	480	61
m+p-xylene	µg/L	<2	<2	31	590	120
o-xylene	µg/L	<1	<1	<1	2	50
Naphthalene	µg/L	<1	<1	57	78	11
Surrogate Dibromofluoromethane	%	103	100	96	95	95
Surrogate toluene-d8	%	103	103	106	107	108
Surrogate 4-BFB	%	101	101	106	106	108

vTRH(C6-C10)/BTEXN in Water						
Our Reference:	UNITS	129468-11	129468-12	129468-13	129468-14	129468-15
Your Reference:	-----	MW14	MW15	MW16	MW17	MW18
Date Sampled	-----	11/06/2015	10/06/2015	11/06/2015	11/06/2015	11/06/2015
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
Date analysed	-	18/06/2015	17/06/2015	18/06/2015	18/06/2015	17/06/2015
TRHC ₆ - C ₉	µg/L	38,000	<10	12,000	720	750
TRHC ₆ - C ₁₀	µg/L	45,000	<10	15,000	820	870
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	20,000	<10	7,100	610	640
Benzene	µg/L	7,000	<1	1,800	140	130
Toluene	µg/L	8,600	<1	2,400	5	4
Ethylbenzene	µg/L	1,600	<1	570	41	59
m+p-xylene	µg/L	5,500	<2	2,200	22	41
o-xylene	µg/L	2,400	<1	930	3	<1
Naphthalene	µg/L	240	<1	70	9.9	9
Surrogate Dibromofluoromethane	%	90	96	88	91	94
Surrogate toluene-d8	%	102	103	101	106	106
Surrogate 4-BFB	%	105	103	107	104	107

vTRH(C6-C10)/BTEXN in Water						
Our Reference:	UNITS	129468-16	129468-17	129468-18	129468-19	129468-20
Your Reference:	-----	MW20	MW21	MW22	MW23	MW24
Date Sampled	-----	10/06/2015	11/06/2015	11/06/2015	11/06/2015	11/06/2015
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
Date analysed	-	18/06/2015	18/06/2015	18/06/2015	18/06/2015	18/06/2015
TRHC ₆ - C ₉	µg/L	130	62	170	8,700	<10
TRHC ₆ - C ₁₀	µg/L	220	85	210	9,400	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	150	85	170	3,500	<10
Benzene	µg/L	6	<1	20	3,300	<1
Toluene	µg/L	<1	<1	<1	1,000	<1
Ethylbenzene	µg/L	10	<1	16	440	<1
m+p-xylene	µg/L	54	<2	3	970	<2
o-xylene	µg/L	<1	<1	<1	190	<1
Naphthalene	µg/L	2	<1	6	50	<1
Surrogate Dibromofluoromethane	%	92	93	87	78	93
Surrogate toluene-d8	%	102	104	102	108	103
Surrogate 4-BFB	%	106	105	106	106	104

vTRH(C6-C10)/BTEXN in Water				
Our Reference:	UNITS	129468-21	129468-23	129468-24
Your Reference:	-----	DUP1	TB1	TB2
Date Sampled	-----	10/06/2015	10/06/2015	11/06/2015
Type of sample		Water	Water	Water
Date extracted	-	17/06/2015	17/06/2015	17/06/2015
Date analysed	-	18/06/2015	17/06/2015	17/06/2015
TRHC ₆ - C ₉	µg/L	4,100	<10	<10
TRHC ₆ - C ₁₀	µg/L	5,100	<10	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	3,400	<10	<10
Benzene	µg/L	480	<1	<1
Toluene	µg/L	84	<1	<1
Ethylbenzene	µg/L	580	<1	<1
m+p-xylene	µg/L	470	<2	<2
o-xylene	µg/L	66	<1	<1
Naphthalene	µg/L	86	<1	<1
Surrogate Dibromofluoromethane	%	81	97	96
Surrogate toluene-d8	%	105	103	103
Surrogate 4-BFB	%	103	102	103

svTRH (C10-C40) in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ----- -----	129468-1 MW3 10/06/2015 Water	129468-2 MW4B 10/06/2015 Water	129468-3 MW6 10/06/2015 Water	129468-4 MW7 10/06/2015 Water	129468-5 MW8 11/06/2015 Water
Date extracted	-	16/06/2015	16/06/2015	16/06/2015	16/06/2015	16/06/2015
Date analysed	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
TRHC ₁₀ - C ₁₄	µg/L	<50	2,600	1,300	<50	<50
TRHC ₁₅ - C ₂₈	µg/L	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	<50	1,300	670	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	1,300	600	<50	<50
TRH>C ₁₆ - C ₃₄	µg/L	<100	<100	<100	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	87	85	90	87	86

svTRH (C10-C40) in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ----- -----	129468-6 MW9 10/06/2015 Water	129468-7 MW10 10/06/2015 Water	129468-8 MW11 10/06/2015 Water	129468-9 MW12 10/06/2015 Water	129468-10 MW13 11/06/2015 Water
Date extracted	-	16/06/2015	16/06/2015	16/06/2015	16/06/2015	16/06/2015
Date analysed	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
TRHC ₁₀ - C ₁₄	µg/L	<50	<50	1,000	2,700	1,100
TRHC ₁₅ - C ₂₈	µg/L	<100	<100	<100	<100	130
TRHC ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	<50	<50	710	1,600	720
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	660	1,500	710
TRH>C ₁₆ - C ₃₄	µg/L	<100	<100	<100	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	94	87	91	93	98

svTRH (C10-C40) in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ----- -----	129468-11 MW14 11/06/2015 Water	129468-12 MW15 10/06/2015 Water	129468-13 MW16 11/06/2015 Water	129468-14 MW17 11/06/2015 Water	129468-15 MW18 11/06/2015 Water
Date extracted	-	16/06/2015	16/06/2015	16/06/2015	16/06/2015	16/06/2015
Date analysed	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
TRHC ₁₀ - C ₁₄	µg/L	7,400	<50	4,000	700	480
TRHC ₁₅ - C ₂₈	µg/L	420	<100	100	<100	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	3,600	<50	2,100	400	300
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	3,300	<50	2,000	390	290
TRH>C ₁₆ - C ₃₄	µg/L	200	<100	<100	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	96	69	95	83	82

svTRH (C10-C40) in Water		129468-16	129468-17	129468-18	129468-19	129468-20
Our Reference:	UNITS	129468-16	129468-17	129468-18	129468-19	129468-20
Your Reference:	-----	MW20	MW21	MW22	MW23	MW24
Date Sampled	-----	10/06/2015	11/06/2015	11/06/2015	11/06/2015	11/06/2015
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	16/06/2015	16/06/2015	16/06/2015	16/06/2015	16/06/2015
Date analysed	-	17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
TRHC ₁₀ - C ₁₄	µg/L	82	<50	160	<50	1,500
TRHC ₁₅ - C ₂₈	µg/L	<100	<100	<100	<100	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	<50	<50	120	<50	760
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	120	<50	760
TRH>C ₁₆ - C ₃₄	µg/L	<100	<100	<100	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	91	86	93	86	81

svTRH (C10-C40) in Water		129468-21
Our Reference:	UNITS	129468-21
Your Reference:	-----	DUP1
Date Sampled	-----	10/06/2015
Type of sample		Water
Date extracted	-	16/06/2015
Date analysed	-	18/06/2015
TRHC ₁₀ - C ₁₄	µg/L	2,600
TRHC ₁₅ - C ₂₈	µg/L	110
TRHC ₂₉ - C ₃₆	µg/L	<100
TRH>C ₁₀ - C ₁₆	µg/L	1,400
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	1,300
TRH>C ₁₆ - C ₃₄	µg/L	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100
Surrogate o-Terphenyl	%	87

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ----- -----	129468-3 MW6 10/06/2015 Water	129468-8 MW11 10/06/2015 Water	129468-11 MW14 11/06/2015 Water	129468-12 MW15 10/06/2015 Water
Date prepared	-	12/06/2015	12/06/2015	12/06/2015	12/06/2015
Date analysed	-	12/06/2015	12/06/2015	12/06/2015	12/06/2015
Calcium - Dissolved	mg/L	1.7	3.7	3.1	7.4
Potassium - Dissolved	mg/L	3.0	3.6	6.5	3.0
Sodium - Dissolved	mg/L	36	17	25	29
Magnesium - Dissolved	mg/L	3.7	8.2	10	1.1
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	76	130	160	27
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	76	130	160	27
Sulphate, SO ₄	mg/L	24	<1	<1	16
Chloride, Cl	mg/L	23	19	26	21
Ionic Balance	%	-14	-32	-26	10

Miscellaneous Inorganics					
Our Reference:	UNITS	129468-3	129468-8	129468-11	129468-12
Your Reference	-----	MW6	MW11	MW14	MW15
Date Sampled	-----	10/06/2015	10/06/2015	11/06/2015	10/06/2015
Type of sample		Water	Water	Water	Water
Date prepared	-	12/06/2015	12/06/2015	12/06/2015	12/06/2015
Date analysed	-	12/06/2015	12/06/2015	12/06/2015	12/06/2015
Ammonia as N in water	mg/L	0.072	2.0	<0.005	0.051
Ferrous Iron	mg/L	6.2	29	9.9	2.0
Free Carbon Dioxide as CO ₂	mg/L	94	130	92	310

MethodID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B.
Inorg-041	Gravimetric determination of the total solids content of water based on APHA latest edition 2540B.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Soils are analysed following a KCl extraction.
Inorg-076	A sample is determined colourimetrically by discrete analyser based on APHA latest edition 3500-Fe B.
APHA 4500-CO2	Dissolved CO ₂ -determined titrimetrically . Based on APHA , 4500-CO ₂ D.

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Water						Base II Duplicate II %RPD		
Date extracted	-			17/06/2015	129468-1	17/06/2015 18/06/2015	LCS-W1	17/06/2015
Date analysed	-			18/06/2015	129468-1	17/06/2015 18/06/2015	LCS-W1	17/06/2015
TRHC ₆ - C ₉	µg/L	10	Org-016	<10	129468-1	<10 <10	LCS-W1	102%
TRHC ₆ - C ₁₀	µg/L	10	Org-016	<10	129468-1	<10 <10	LCS-W1	102%
Benzene	µg/L	1	Org-016	<1	129468-1	<1 <1	LCS-W1	104%
Toluene	µg/L	1	Org-016	<1	129468-1	2 2 RPD: 0	LCS-W1	103%
Ethylbenzene	µg/L	1	Org-016	<1	129468-1	<1 <1	LCS-W1	101%
m+p-xylene	µg/L	2	Org-016	<2	129468-1	<2 <2	LCS-W1	101%
o-xylene	µg/L	1	Org-016	<1	129468-1	<1 <1	LCS-W1	101%
Naphthalene	µg/L	1	Org-013	<1	129468-1	<1 <1	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-016	67	129468-1	101 100 RPD: 1	LCS-W1	92%
Surrogate toluene-d8	%		Org-016	101	129468-1	103 102 RPD: 1	LCS-W1	101%
Surrogate 4-BFB	%		Org-016	105	129468-1	102 105 RPD: 3	LCS-W1	105%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH(C10-C40) in Water						Base II Duplicate II %RPD		
Date extracted	-			17/06/2015	129468-4	16/06/2015 16/06/2015	LCS-W3	16/06/2015
Date analysed	-			18/06/2015	129468-4	17/06/2015 18/06/2015	LCS-W3	17/06/2015
TRHC ₁₀ - C ₁₄	µg/L	50	Org-003	<50	129468-4	<50 <50	LCS-W3	129%
TRHC ₁₅ - C ₂₈	µg/L	100	Org-003	<100	129468-4	<100 <100	LCS-W3	118%
TRHC ₂₉ - C ₃₆	µg/L	100	Org-003	<100	129468-4	<100 <100	LCS-W3	92%
TRH>C ₁₀ - C ₁₆	µg/L	50	Org-003	<50	129468-4	<50 <50	LCS-W3	129%
TRH>C ₁₆ - C ₃₄	µg/L	100	Org-003	<100	129468-4	<100 <100	LCS-W3	118%
TRH>C ₃₄ - C ₄₀	µg/L	100	Org-003	<100	129468-4	<100 <100	LCS-W3	92%
Surrogate o-Terphenyl	%		Org-003	80	129468-4	87 100 RPD: 14	LCS-W3	83%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Ion Balance						Base II Duplicate II %RPD		
Date prepared	-			12/06/2015	129468-3	12/06/2015 12/06/2015	LCS-1	12/06/2015
Date analysed	-			12/06/2015	129468-3	12/06/2015 12/06/2015	LCS-1	12/06/2015
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	129468-3	1.7 [N/T]	LCS-1	95%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	129468-3	3.0 [N/T]	LCS-1	124%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	129468-3	36 [N/T]	LCS-1	113%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	129468-3	3.7 [N/T]	LCS-1	97%
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	129468-3	<5 <5	[NR]	[NR]

Client Reference: 27055.03, Coramba GME June 2015

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Ion Balance						Base Duplicate %RPD		
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	129468-3	76 78 RPD: 3	[NR]	[NR]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	129468-3	<5 <5	[NR]	[NR]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	129468-3	76 78 RPD: 3	LCS-1	98%
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	129468-3	24 23 RPD: 4	LCS-1	118%
Chloride, Cl	mg/L	1	Inorg-081	<1	129468-3	23 23 RPD: 0	LCS-1	113%
Ionic Balance	%		Inorg-041	[NT]	129468-3	-14 [N/T]	[NR]	[NR]
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Miscellaneous Inorganics						Base Duplicate %RPD		
Date prepared	-			12/06/2015	129468-3	12/06/2015 12/06/2015	LCS-W1	12/06/2015
Date analysed	-			12/06/2015	129468-3	12/06/2015 12/06/2015	LCS-W1	12/06/2015
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	129468-3	0.072 0.065 RPD: 10	LCS-W1	108%
Ferrous Iron	mg/L	0.05	Inorg-076	<0.05	129468-3	6.2 6.3 RPD: 2	LCS-W1	119%
Free Carbon Dioxide as CO ₂	mg/L	0	APHA 4500-CO ₂	0	129468-3	94 91 RPD: 3	LCS-W1	91%
QUALITY CONTROL	UNITS	Dup. Sm#		Duplicate Base + Duplicate + %RPD		Spike Sm#	Spike % Recovery	
vTRH(C6-C10)/BTEXN in Water								
Date extracted	-	129468-10		17/06/2015 18/06/2015		LCS-W2	17/06/2015	
Date analysed	-	129468-10		17/06/2015 18/06/2015		LCS-W2	17/06/2015	
TRHC ₆ - C ₉	µg/L	129468-10		1200 1000 RPD: 18		LCS-W2	92%	
TRHC ₆ - C ₁₀	µg/L	129468-10		1500 1300 RPD: 14		LCS-W2	92%	
Benzene	µg/L	129468-10		38 36 RPD: 5		LCS-W2	98%	
Toluene	µg/L	129468-10		72 66 RPD: 9		LCS-W2	95%	
Ethylbenzene	µg/L	129468-10		61 55 RPD: 10		LCS-W2	90%	
m+p-xylene	µg/L	129468-10		120 110 RPD: 9		LCS-W2	89%	
o-xylene	µg/L	129468-10		50 45 RPD: 11		LCS-W2	90%	
Naphthalene	µg/L	129468-10		11 10 RPD: 10		[NR]	[NR]	
Surrogate Dibromofluoromethane	%	129468-10		95 98 RPD: 3		LCS-W2	88%	
Surrogate toluene-d8	%	129468-10		108 106 RPD: 2		LCS-W2	103%	
Surrogate 4-BFB	%	129468-10		108 107 RPD: 1		LCS-W2	104%	

Client Reference: 27055.03, Coramba GME June 2015

QUALITYCONTROL svTRH (C10-C40) in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	129468-17	16/06/2015 18/06/2015	129468-1	16/06/2015
Date analysed	-	129468-17	17/06/2015 19/06/2015	129468-1	18/06/2015
TRHC ₁₀ - C ₁₄	µg/L	129468-17	<50 <50	129468-1	84%
TRHC ₁₅ - C ₂₈	µg/L	129468-17	<100 <100	129468-1	78%
TRHC ₂₉ - C ₃₆	µg/L	129468-17	<100 <100	129468-1	75%
TRH>C ₁₀ - C ₁₆	µg/L	129468-17	<50 <50	129468-1	84%
TRH>C ₁₆ - C ₃₄	µg/L	129468-17	<100 <100	129468-1	78%
TRH>C ₃₄ - C ₄₀	µg/L	129468-17	<100 <100	129468-1	75%
Surrogate o-Terphenyl	%	129468-17	86 84 RPD: 2	129468-1	64%
QUALITYCONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	129468-8	12/06/2015
Date analysed	-	[NT]	[NT]	129468-8	12/06/2015
Calcium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Potassium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Sodium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Magnesium - Dissolved	mg/L	[NT]	[NT]	[NR]	[NR]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	[NT]	[NT]	[NR]	[NR]
Bicarbonate Alkalinity as CaCO ₃	mg/L	[NT]	[NT]	[NR]	[NR]
Carbonate Alkalinity as CaCO ₃	mg/L	[NT]	[NT]	[NR]	[NR]
Total Alkalinity as CaCO ₃	mg/L	[NT]	[NT]	[NR]	[NR]
Sulphate, SO ₄	mg/L	[NT]	[NT]	129468-8	112%
Chloride, Cl	mg/L	[NT]	[NT]	129468-8	107%
Ionic Balance	%	[NT]	[NT]	[NR]	[NR]

Client Reference: 27055.03, Coramba GME June 2015

QUALITYCONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	129468-8	12/06/2015
Date analysed	-	[NT]	[NT]	129468-8	12/06/2015
Ammonia as N in water	mg/L	[NT]	[NT]	129468-8	94%
Ferrous Iron	mg/L	[NT]	[NT]	129468-8	116%
Free Carbon Dioxide as CO ₂	mg/L	[NT]	[NT]	[NR]	[NR]
QUALITYCONTROL vTRH(C6-C10)/BTEXN in Water	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD		
Date extracted	-	129468-16	17/06/2015 18/06/2015		
Date analysed	-	129468-16	18/06/2015 18/06/2015		
TRHC ₆ - C ₉	µg/L	129468-16	130 120 RPD: 8		
TRHC ₆ - C ₁₀	µg/L	129468-16	220 200 RPD: 10		
Benzene	µg/L	129468-16	6 6 RPD: 0		
Toluene	µg/L	129468-16	<1 <1		
Ethylbenzene	µg/L	129468-16	10 9 RPD: 11		
m+p-xylene	µg/L	129468-16	54 50 RPD: 8		
o-xylene	µg/L	129468-16	<1 <1		
Naphthalene	µg/L	129468-16	2 2 RPD: 0		
<i>Surrogate</i> Dibromofluoromethane	%	129468-16	92 97 RPD: 5		
<i>Surrogate</i> toluene-d ₈	%	129468-16	102 101 RPD: 1		
<i>Surrogate</i> 4-BFB	%	129468-16	106 108 RPD: 2		

Report Comments:

The mass imbalance in sample #8 and #11 may be caused by other ions that have not been measured.

Asbestos ID was analysed by Approved Identifier: Not applicable for this job
Asbestos ID was authorised by Approved Signatory: Not applicable for this job

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Appendix E – Field Sheets

Job Information

Date: 10 June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	

Purpose of Visit

+ Deliver drum to shed.
+ Groundwater sampling.

Description of Works and People Met

Sampling Details

Sampling Conducted:	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	MW10, MW20, MW11, MW19, MW3, MW2, MW15, MW12
Matrix:	<input type="radio"/> S	<input checked="" type="radio"/> W	<input type="radio"/> O	MW6, MW5, MW4B, MW7, MW8
COC Form Submitted:	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	
COC Number:	TB1			
Primary Lab:				
Secondary Lab:				

Field Equipment Used

	Y	N	Calibrated / tested:	Y	N	NA
PID:						
FID:						
IP:	<input checked="" type="radio"/> Y	<input type="radio"/> N	Calibrated / tested:	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Water Quality Metre:	<input checked="" type="radio"/> Y	<input type="radio"/> N	Calibrated / tested:	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Pump: <i>Micropump</i>	<input checked="" type="radio"/> Y	<input type="radio"/> N	Calibrated / tested:	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Other: <i>Peristaltic</i>	<input checked="" type="radio"/> Y	<input type="radio"/> N	Calibrated / tested:	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Other:	<input type="radio"/> Y	<input type="radio"/> N	Calibrated / tested:	<input type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA

Other Outstanding Action Items

Unable to locate MW1 & MW19

Job Information

Date: 11 June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	

Purpose of Visit

**Groundwater Sampling*

Description of Works and People Met

Sampling Details

Sampling Conducted:	Y	N	NA	MW8, MW21
Matrix:	S	W	O	MW17, MW16, MW14, MW13, MW23
COC Form Submitted:	Y	N	NA	MW18, MW22, MW24.
COC Number:				
Primary Lab:				
Secondary Lab:				

Field Equipment Used

	Y	N	Calibrated / tested:	Y	N	NA
PID:						
FID:						
IP:						
Water Quality Metre:						
Pump:						
Other:						
Other:						

Other Outstanding Action Items

WSP Groundwater - Well Sampling Data Form

Job Information

Date: 10 June 2015

Project Name: Groundwater Monitoring

Site Location: Martin St, Coramba NSW

Well ID: MW3

Time: arrive _____ depart _____

Project Number: 27055

Operator: AY

Weather: _____

Equipment

Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 YSI

Interface probe number (please circle): Dipper PRO Herron IP Geotech IP

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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	

Total Well Depth (-) 4.97 m (-) 4.97 m (=) _____ m

Water level (=) _____ m

Water Column _____ m

Depth to Product (if present) ND m

Water Column (x) Conversion Factor (=) Litres per 1 Well Volume _____ m (x) _____ (=) _____ L

Water Quality Parameters

Beginning purge time: _____ Ending purge time: _____

Litres	Time	pH	Temp C	Cond $\mu S/cm$	DO ppm	Redox mV	Comments
<u>1</u>		<u>5.30</u>	<u>18.9</u>	<u>160.3</u>	<u>1.61</u>	<u>103</u>	<u>Dark brown. Turbid.</u>
<u>2</u>							
<u>3</u>							

Insufficient volume of water to continue using micro-purge.

Stabilisation Criteria: +/- 0.05, +/- 10%, +/- 3%, +/- 10%, +/- 10%

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour

Total Well Volume: 3

Actual amount of water prior to sampling: _____

*pH, temp, cond readings not necessary if well is purged dry

Did field parameters stabilise? Y N NA

Was the well dry purged? Y N

Field QC Checks

Was pre-cleaning 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: _____

GPS Coordinates (UTM/MGA system) _____

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>10</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW4B</u>	Weather: _____

Equipment	
Water quality equipment description (please circle): <u>TPS90FLMV</u> Hanna HI9828 <u>YSI</u>	
Interface probe number (please circle): <u>Dipper PRO</u> Herron IP Geotech IP	
Purging equipment: (please circle) Bailer type: <u>Plastic</u> Teflon	
Pump type: <u>Peristaltic</u> Submersible <u>Micro-purge</u> Amazon Other: _____	

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column					Depth to Product (if present)				
<u>10.00</u> m (-) <u>7.38</u> m (=) _____ m					<u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume									
_____ m (x) _____ (=) _____ L									

Water Quality Parameters										
Beginning purge time:					Ending purge time:					
Litres	Time	pH	Temp C	Cond ^{us} mS/cm	DO ppm	Redox mV	Comments			
<u>2</u>		<u>6.56</u>	<u>20.5</u>	<u>337.7</u>	<u>0.93</u>	<u>-123</u>	<u>Clear, HC odour.</u>			
<u>4</u>		<u>6.56</u>	<u>20.5</u>	<u>344.0</u>	<u>0.80</u>	<u>-111</u>				
<u>6</u>		<u>6.55</u>	<u>20.5</u>	<u>345.1</u>	<u>0.66</u>	<u>-109</u>				
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
<u>6</u>		Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise?					<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N		

Field QC Checks	
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y <input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y <input checked="" type="radio"/> N

DUP 1, TRIP 1

TRIP 1, BTBX

Duplicate sample ID _____

GPS Coordinates (UTM/MGA system): _____

WSP Groundwater - Well Sampling Data Form

Job Information

Date: 10 June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: MWS	Weather: _____

Equipment

Water quality equipment description (please circle):				TPS90FLMV	Hanna HI9828	YSI
Interface probe number (please circle):				Dipper PRO	Herron IP	Geotech IP
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column			Depth to Product (if present)						
6.6 m (-) 7.45 m (=) _____ m			_____ m						
Dry			Water Column (x) Conversion Factor (=) Litres per 1 Well Volume						
_____ m (x) _____ (=) _____ L									

Water Quality Parameters

Beginning purge time: _____							Ending purge time: _____		
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments		
							Dry.		
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
Total Well Volume	Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise?							<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> NA
Was the well dry purged?							<input type="checkbox"/> Y	<input type="checkbox"/> N	

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input type="checkbox"/> Y	<input type="checkbox"/> N	
Was pre-cleaning sampling equipment properly protected from contamination?	<input type="checkbox"/> Y	<input type="checkbox"/> N	
Was documentation of equipment conducted?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> NA
Were air bubbles present in vials at time of collection?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> NA
Was sample for metals field filtered prior to preservations?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> NA
Duplicate sample collected?	<input type="checkbox"/> Y	<input type="checkbox"/> N	Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information

Date: <u>10</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW6</u>	Weather: _____

Equipment

Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 <u>YSI</u>
Interface probe number (please circle): <u>Dipper PRO</u> Herron IP Geotech IP
Purging equipment: (please circle) Bailer type: Plastic Teflon
Pump type: Peristaltic Submersible <u>Micro-purge</u> Amazon Other: _____

Well Gauging and Purge Volume Calculations

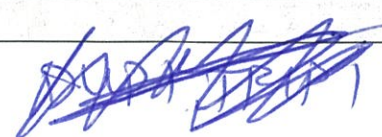
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm	
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3		
Total Well Depth (-) Water level (=) Water Column	_____ m (-) <u>6.52</u> m (=) _____ m				Depth to Product (if present)				_____ m	
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume				_____ m (x) _____ (=) _____ L						

Water Quality Parameters

Beginning purge time: <u>NS</u>							Ending purge time: _____			
Litres	Time	pH	Temp C	Cond $\mu S/cm$	DO ppm	Redox mV	Comments			
<u>2</u>		<u>5.77</u>	<u>20.9</u>	<u>222</u>	<u>0.23</u>	<u>-117</u>	<u>Clear. No odour.</u>			
<u>4</u>		<u>5.76</u>	<u>20.9</u>	<u>230</u>	<u>0.18</u>	<u>-121</u>				
<u>6</u>		<u>5.76</u>	<u>20.9</u>	<u>234</u>	<u>0.16</u>	<u>-124</u>				
							<u>Dedicated tubing (Sanabel 1/4 x 3/8) in well, tied to cap.</u>			
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour				
<u>6</u>	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry				
Did field parameters stabilise? <input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA							Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N			

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Duplicate sample collected?	<input checked="" type="radio"/> Y	<input type="radio"/> N	


 TRM, BTEX & MNA

Duplicate sample ID _____

WSP Groundwater - Well Sampling Data Form

Job Information

Date: June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	
Well ID: MW7	Weather:	

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	YSI
Interface probe number (please circle):	Dipper PRO	Herron IP	Geotech IP
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	16.1 m (-) 8.73 m (=) _____ m				Depth to Product (if present) _____ m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume		_____ m (x) _____ (=) _____ L							

Water Quality Parameters

Beginning purge time: _____					Ending purge time: _____				
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments		
2		5.85	19.8	187.5	0.92	109	Clear. No odour.		
4		5.63	19.6	188.0	0.90	105			
6		5.82	19.6	189.1	0.82	104			
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour		
8	Total Well Volume Actual amount of water prior to sampling						*pH, temp, cond readings not necessary if well is purged dry		
Did field parameters stabilise?					Y N NA		Was the well dry purged? Y N		

Field QC Checks

Was pre-cleaning 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 _____

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>11</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MWS</u>	Weather: _____

Equipment	
Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 <u>YSI</u>	
Interface probe number (please circle): <u>Dipper PRO</u> Herron IP Geotech IP	
Purging equipment: (please circle) Bailer type: Plastic Teflon	
Pump type: Peristaltic Submersible <u>Micro-purge</u> Amazon Other: _____	

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	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
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column					Depth to Product (if present)				
<u>14.37</u> m (-) <u>9.57</u> m (=) _____ m					<u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume					_____ m (x) _____ (=) _____ L				

Water Quality Parameters										
Beginning purge time: _____					Ending purge time: _____					
Litres	Time	pH	Temp C	Cond ^{µS} mS/cm	DO ppm	Redox mV	Comments			
<u>2</u>		<u>5.47</u>	<u>20.6</u>	<u>211.9</u>	<u>0.40</u>	<u>151.7</u>	<u>Clear. No odour.</u>			
<u>4</u>		<u>5.46</u>	<u>20.5</u>	<u>193.2</u>	<u>0.30</u>	<u>153.8</u>				
<u>8</u>		<u>5.46</u>	<u>20.5</u>	<u>191.8</u>	<u>0.28</u>	<u>153.3</u>				
							<u>Dedicated tubing in well (Banded & fixed to cap.</u>			
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour				
<u>8</u>	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry				
Did field parameters stabilise?					<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	Was the well dry purged?		<input type="radio"/> Y <input checked="" type="radio"/> N

Field QC Checks	
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y <input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y <input checked="" type="radio"/> N Duplicate sample ID _____

WSP Groundwater - Well Sampling Data Form

Job Information

Date: 10 June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	
Well ID: MW9	Weather:	

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	YSI
Interface probe number (please circle):	Dipper PRO	Herron IP	Geotech IP
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm	
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3		
Total Well Depth (-) Water level (=) Water Column	_____ m (-) 5.79 m (=) _____ m				Depth to Product (if present) _____ m					
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume				_____ m (x) _____ (=) _____ L						

Water Quality Parameters

Beginning purge time: _____							Ending purge time: _____		
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments		
2		5.01	19.3	136.7	2.13	198	Pale brown. Cloudy.		
43		5.01	19.3	136.5	2.05	199			
48		5.02	19.3	136.8	2.10	201			
							Dedicated tubing in well (Borehole 1/2-3/8")		
							Handwritten notes and scribbles		
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
9	Total Well Volume					*pH, temp, cond readings not necessary if well is purged dry			
Actual amount of water prior to sampling									
Did field parameters stabilise?							Y <input checked="" type="radio"/> N <input type="radio"/> NA <input type="radio"/>		
Was the well dry purged?							Y <input type="radio"/> N <input checked="" type="radio"/>		

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N		TPH, BTEX.
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N		
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> NA	
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA	
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N		Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: 10 June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: MW10	Weather: _____

Equipment	
Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 YSI	
Interface probe number (please circle): Dipper PRO Herron IP Geotech IP	
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column					Depth to Product (if present)				
_____ m (-) 1.27 m (=) _____ m					ND m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume					_____ m (x) _____ (=) _____ L				

Water Quality Parameters									
Beginning purge time: 1.5					Ending purge time: _____				
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments		
2		6.62	15.4	82.4	0.65	-56	Dark brown. Turbid. No odour.		
4		6.72	15.4	82.0	0.42	-66	Becomes clear.		
6		6.75	15.4	81.3	0.39	-75			
							Dedicated tubing (3/8") in well (tried to cap). Locked envirocap. Well located in asphalt area S of MW20.		
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
6	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise? <input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA					Was the well dry purged? <input checked="" type="radio"/> Y <input type="radio"/> N				

Field QC Checks		
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N
		Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>10</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW12</u>	Weather: _____

Equipment	
Water quality equipment description (please circle):	TPS90FLMV Hanna HI9828 <u>YSI</u>
Interface probe number (please circle):	<u>Dipper PRO</u> Herron IP Geotech IP
Purging equipment: (please circle)	Bailer type: Plastic Teflon Pump type: Peristaltic Submersible <u>Micro-purge</u> Amazon Other:

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column				Depth to Product (if present)					
<u>6.60</u> m (-) <u>4.64</u> m (=) _____ m				<u>ND</u> m					
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume				_____ m (x) _____ (=) _____ L					

Water Quality Parameters							
Beginning purge time:				Ending purge time:			
Litres	Time	pH	Temp C	Cond ^{MS} mS/cm	DO ppm	Redox mV	Comments
<u>2</u>		<u>6.47</u>	<u>21.5</u>	<u>342</u>	<u>0.98</u>	<u>-132</u>	<u>Clear. Hydrocarbon odour.</u>
<u>4</u>		<u>6.46</u>	<u>21.6</u>	<u>351.2</u>	<u>0.77</u>	<u>-138</u>	
<u>6</u>		<u>6.44</u>	<u>21.5</u>	<u>352.9</u>	<u>0.69</u>	<u>-138</u>	
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour
<u>6</u>	Total Well Volume Actual amount of water prior to sampling						*pH, temp, cond readings not necessary if well is purged dry
Did field parameters stabilise?				<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	Was the well dry purged?
				<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> NA	

Field QC Checks	
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y <input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y <input checked="" type="radio"/> N
Duplicate sample ID	

WSP Groundwater - Well Sampling Data Form

Job Information

Date: 11 June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	
Well ID: MW13	Weather:	

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	YSI
Interface probe number (please circle):	Dipper PRO	Herron IP	Geotech IP
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	19.40 m (-) 13.22 m (=) _____ m				Depth to Product (if present) _____ m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume		_____ m (x) _____ (=) _____ L							

Water Quality Parameters

Beginning purge time: _____							Ending purge time: _____		
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments		
2		5.61	20.6	335.0	0.78	-79	Clear. He odour.		
4									
6									
							Dedicated tubing in well.		
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
6	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> NA							Was the well dry purged? <input type="checkbox"/> Y <input checked="" type="checkbox"/> N		

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	
Was documentation of equipment conducted?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> NA
Were air bubbles present in vials at time of collection?	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N	<input type="checkbox"/> NA
Was sample for metals field filtered prior to preservations?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> NA
Duplicate sample collected?	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N	

Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information

Date: 11 June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	
Well ID: MW14	Weather:	

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	YSI
Interface probe number (please circle):	Dipper PRO	Herron IP	Geotech IP
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	17.30 m (-) _____ m (=) _____ m				Depth to Product (if present) _____ m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume	_____ m (x) _____ (=) _____ L								

Water Quality Parameters

Beginning purge time:					Ending purge time:					
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments			
1		6.63	20.2	343.7	1.29	-134	Cloudy. HC above.			
3		6.47	20.7	347.3	0.29	-131				
6		6.45	20.7	348.0	0.25	-141				
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
6	Total Well Volume					Actual amount of water prior to sampling				*pH, temp, cond readings not necessary if well is purged dry
Did field parameters stabilise?					Y	N	NA	Was the well dry purged? Y N		

Field QC Checks

Was pre-cleaning 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

GPS Coordinates (UTM/MGA system):

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>10</u> June 2015	Time: arrive depart
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW15</u>	Weather:

Equipment	
Water quality equipment description (please circle):	TPS90FLMV Hanna HI9828 <u>YSI</u>
Interface probe number (please circle):	<u>Dipper PRO</u> Herron IP Geotech IP
Purging equipment: (please circle)	Bailer type: <u>Plastic</u> Teflon
	Pump type: <u>Peristaltic</u> Submersible <u>Micro-purge</u> Amazon Other:

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	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
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column					Depth to Product (if present)				
<u>7.60</u> m (-) _____ m (=) _____ m					<u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume					_____ m (x) _____ (=) _____ L				

Water Quality Parameters										
Beginning purge time: <u>NS</u>					Ending purge time:					
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments			
<u>2</u>		<u>5.54</u>	<u>17.8</u>	<u>208</u>	<u>1.97</u>	<u>146</u>	<u>Brown. Turbid. No odour.</u>			
<u>4</u>		<u>5.53</u>	<u>17.9</u>	<u>199</u>	<u>1.33</u>	<u>130</u>				
<u>6</u>		<u>5.52</u>	<u>17.9</u>	<u>193</u>	<u>1.21</u>	<u>132</u>				
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
<u>6</u>	Total Well Volume Actual amount of water prior to sampling						*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise?					<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> NA	Was the well dry purged?		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N

Field QC Checks	
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Was documentation of equipment conducted?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> NA
Were air bubbles present in vials at time of collection?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N <input type="checkbox"/> NA
Was sample for metals field filtered prior to preservations?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> NA
Duplicate sample collected?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Duplicate sample ID	

TPH, BTEX, MVA

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>10</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>mw16</u>	Weather: _____

Equipment	
Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 <u>YSI</u>	
Interface probe number (please circle): <u>Dipper PRO</u> Herron IP Geotech IP	
Purging equipment: (please circle) Bailer type: <u>Plastic</u> Teflon	
Pump type: <u>Peristaltic</u> Submersible <u>Micro-purge</u> Amazon Other: _____	

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $V = Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) <u>18.00</u> m	Water level (=) <u>14.40</u> m	Water Column (=) _____ m	Depth to Product (if present) <u>ND</u> m						
Water Column (x) _____ m (x) _____ (x) _____ (=) _____ L									

Water Quality Parameters									
Beginning purge time: _____					Ending purge time: _____				
Litres	Time	pH	Temp C	Cond <u>ns</u> mS/cm	DO ppm	Redox mV	Comments		
<u>2</u>		<u>6.43</u>	<u>19.2</u>	<u>254.1</u>	<u>2.18</u>	<u>-96</u>	<u>Pale brown. Cloudy. HC odour.</u>		
<u>4</u>		<u>6.43</u>	<u>20.3</u>	<u>298.1</u>	<u>0.28</u>	<u>-144</u>			
<u>6</u>		<u>6.42</u>	<u>20.4</u>	<u>303.2</u>	<u>0.21</u>	<u>-154</u>			
							<u>Dedicated testing in well.</u>		
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
<u>6</u>	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise? <input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA					Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N				

Field QC Checks		
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N <input type="radio"/> NA
Duplicate sample ID		

WSP Groundwater - Well Sampling Data Form

Job Information

Date: <u>11</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW17</u>	Weather: _____

Equipment

Water quality equipment description (please circle): <u>TPS90FLMV</u> Hanna HI9828 <u>YSI</u>
Interface probe number (please circle): <u>Dipper PRO</u> Herron IP Geotech IP
Purging equipment: (please circle) Bailer type: <u>Plastic</u> Teflon
Pump type: <u>Peristaltic</u> Submersible <u>Micro-purge</u> Amazon Other: _____

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column					Depth to Product (if present)				
<u>17.1</u> m (-) <u>15.1</u> m (=) _____ m					<u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume		_____ m (x) _____ (=) _____ L							

Water Quality Parameters

Beginning purge time: _____							Ending purge time: _____	
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments	
<u>1</u>		<u>6.36</u>	<u>19.7</u>	<u>252.0</u>	<u>0.27</u>	<u>-155</u>	<u>Pale brown, Turbid. HC odour</u>	
<u>2</u>		<u>6.34</u>	<u>19.9</u>	<u>257.1</u>	<u>0.25</u>	<u>-148</u>		
<u>4</u>		<u>6.34</u>	<u>20.0</u>	<u>258.3</u>	<u>0.25</u>	<u>+151</u>		
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour	
<u>4</u>	Total Well Volume Actual amount of water prior to sampling						*pH, temp, cond readings not necessary if well is purged dry	
Did field parameters stabilise? <input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA							Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N	

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N <input type="radio"/> NA

Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: 11 June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: MW18	Weather: _____

Equipment	
Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 YSI	
Interface probe number (please circle): Dipper PRO Herron IP Geotech IP	
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	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column			Depth to Product (if present)						
8.90 m (-) 6.60 m (=) _____ m			ND m						
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume			_____ m (x) _____ (=) _____ L						

Water Quality Parameters										
Beginning purge time: _____					Ending purge time: _____					
Litres	Time	pH	Temp C	Copd mS/cm	DO ppm	Redox mV	Comments			
2		6.29	21.4	260.7	0.48	-72	Clear. ^{HC} No odour.			
4		6.28	21.3	266.0	0.42	-73				
6		6.28	21.3	268.1	0.28	-74				
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
6		Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry			
Did field parameters stabilise?					Y <input checked="" type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>			Was the well dry purged?		
					Y <input type="checkbox"/> N <input checked="" type="checkbox"/>					

Field QC Checks			
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="checkbox"/>	N	
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="checkbox"/>	N	
Was documentation of equipment conducted?	<input checked="" type="checkbox"/>	N	NA
Were air bubbles present in vials at time of collection?	Y	<input checked="" type="checkbox"/>	NA
Was sample for metals field filtered prior to preservations?	Y	N	<input checked="" type="checkbox"/>
Duplicate sample collected?	Y	<input checked="" type="checkbox"/>	
		Duplicate sample ID	

WSP Groundwater - Well Sampling Data Form

Job Information

Date: 10 June 2015	Time: arrive	depart
Project Name: Groundwater Monitoring	Project Number: 27055	
Site Location: Martin St, Coramba NSW	Operator: AY	
Well ID: MW20	Weather:	

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	YSI
Interface probe number (please circle):	Dipper PRO	Herron IP	Geotech IP
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	Volume of water in well / V $= P \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column				Depth to Product (if present)					
_____ m (-) 3.15 m (=) _____ m				_____ m (W.D)					
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume				_____ m (x) _____ (=) _____ L					

Water Quality Parameters

Beginning purge time: NS							Ending purge time:	
Litres	Time	pH	Temp C	Cond $\mu S/cm$	DO ppm	Redox mV	Comments	
2		5.64	19.5	122.10	0.43	-15	Clear. No odour.	
4		5.61	19.8	122.7	0.39	-34		
6		5.61	19.8	122.7	0.37	-36		
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour	
6	Total Well Volume						*pH, temp, cond readings not necessary if well is purged dry	
Actual amount of water prior to sampling						Did field parameters stabilise? <input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA		
						Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N		

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N	TPH, BTEX.
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N <input type="radio"/> NA	
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N <input type="radio"/> NA	
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N <input checked="" type="radio"/> NA	
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N	Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information

Date: <u>11</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW21</u>	Weather: _____

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	<u>YSI</u>
Interface probe number (please circle):	Dipper PRO	Herron IP	Geotech IP
Purging equipment: (please circle)	Bailer type: <u>Plastic</u>	Teflon	
	Pump type: <u>Peristaltic</u>	Submersible	Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	<u>6.90</u> m (-) <u>5.72</u> m (=) _____ m				Depth to Product (if present) <u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume									
_____ m (x) _____ (=) _____ L									

Water Quality Parameters

Beginning purge time:					Ending purge time:						
Litres	Time	pH	Temp C	Cond ^{MS} mg /cm	DO ppm	Redox mV	Comments				
<u>2</u>		<u>5.47</u>	<u>19.9</u>	<u>139.0</u>	<u>0.81</u>	<u>118</u>	<u>Clear. No odour</u>				
<u>4</u>		<u>5.47</u>	<u>19.9</u>	<u>138.5</u>	<u>0.60</u>	<u>105</u>					
<u>6</u>		<u>5.46</u>	<u>19.9</u>	<u>134.6</u>	<u>0.57</u>	<u>101</u>					
							<u>Locked eurocap</u>				
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour					
<u>6</u>	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry					
Did field parameters stabilise?					<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	Was the well dry purged?		<input type="radio"/> Y	<input checked="" type="radio"/> N

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N	
			Duplicate sample ID

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>11</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW22</u>	Weather: _____

Equipment	
Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 <u>YSI</u>	
Interface probe number (please circle): <u>Dipper PRO</u> Herron.IP Geotech IP	
Purging equipment: (please circle) Bailer type: <u>Plastic</u> Teflon	
Pump type: <u>Peristaltic</u> Submersible <u>Micro-purge</u> Amazon Other:	

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres P = 3.14159 r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	<u>13.00</u> m (-) <u>9.72</u> m (=) _____ m			Depth to Product (if present) <u>ND</u> m					
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume	_____ m (x) _____ (=) _____ L								

Water Quality Parameters										
Beginning purge time:					Ending purge time:					
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments			
<u>2</u>		<u>6.27</u>	<u>19.9</u>	<u>219.1</u>	<u>1.12</u>	<u>-84</u>	<u>Clear. No odour.</u>			
<u>4</u>		<u>6.27</u>	<u>19.9</u>	<u>215.0</u>	<u>0.80</u>	<u>-89</u>				
<u>8</u>		<u>6.27</u>	<u>19.9</u>	<u>214.1</u>	<u>0.67</u>	<u>-93</u>				
Stabilisation Criteria		+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour			
<u>8</u>		Total Well Volume				Actual amount of water prior to sampling				*pH, temp, cond readings not necessary if well is purged dry
Did field parameters stabilise?					<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N		

Field QC Checks	
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y <input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y <input type="radio"/> N <input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y <input checked="" type="radio"/> N
Duplicate sample ID	

GPS Coordinates (UTM/MGA system) :

WSP Groundwater - Well Sampling Data Form

Job Information	
Date: <u>11</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW23</u>	Weather: _____

Equipment	
Water quality equipment description (please circle): TPS90FLMV Hanna HI9828 <u>YSI</u>	
Interface probe number (please circle): <u>Dipper PRO</u> Herron IP Geotech IP	
Purging equipment: (please circle) Bailer type: <u>Plastic</u> Teflon	
Pump type: <u>Peristaltic</u> Submersible <u>Micro-purge</u> Amazon Other: _____	

Well Gauging and Purge Volume Calculations									
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	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
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	_____ m				Depth to Product (if present) _____ m				
<u>17.91</u> m (-) <u>12.67</u> m (=) _____ m					<u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume									
_____ m (x) _____ (=) _____ L									

Water Quality Parameters								
Beginning purge time: _____				Ending purge time: _____				
Litres	Time	pH	Temp C	Cond mS/cm	DO ppm	Redox mV	Comments	
<u>2</u>		<u>6.65</u>	<u>20.5</u>	<u>351.3</u>	<u>1.12</u>	<u>-89</u>	<u>Brown, Turbid. HC odour.</u>	
<u>4</u>		<u>6.66</u>	<u>20.5</u>	<u>351.2</u>	<u>0.29</u>	<u>-91</u>		
<u>6</u>		<u>6.68</u>	<u>20.5</u>	<u>353.1</u>	<u>0.23</u>	<u>-92</u>		
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour		
<u>6</u>	Total Well Volume Actual amount of water prior to sampling						*pH, temp, cond readings not necessary if well is purged dry	
Did field parameters stabilise? <input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA				Was the well dry purged? <input type="radio"/> Y <input checked="" type="radio"/> N				

Field QC Checks	
Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y <input type="radio"/> N
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y <input type="radio"/> N <input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y <input checked="" type="radio"/> N <input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y <input checked="" type="radio"/> N <input type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y <input checked="" type="radio"/> N
Duplicate sample ID <u>TPW, BTB</u>	

WSP Groundwater - Well Sampling Data Form

Job Information

Date: <u>10</u> June 2015	Time: arrive _____ depart _____
Project Name: Groundwater Monitoring	Project Number: 27055
Site Location: Martin St, Coramba NSW	Operator: AY
Well ID: <u>MW24</u>	Weather: _____

Equipment

Water quality equipment description (please circle):	TPS90FLMV	Hanna HI9828	<u>YSI</u>
Interface probe number (please circle):	<u>Dipper PRO</u>	Herron IP	Geotech IP
Purging equipment: (please circle)	Bailer type: <u>Plastic</u>	Teflon	
	Pump type: <u>Peristaltic</u>	Submersible	Micro-purge Amazon Other:

Well Gauging and Purge Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm	Volume of water in well / V $= Pr \times r \times h$ V = volume in litres $P = 3.14159$ r = radius in cm h = height of water column in cm
Conversion Factor (volume in factor L/m)	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3	
Total Well Depth (-) Water level (=) Water Column	<u>6.92</u> m (-) <u>6.44</u> m (=) _____ m				Depth to Product (if present) <u>ND</u> m				
Water Column (x) Conversion Factor (=) Litres per 1 Well Volume _____ m (x) _____ (=) _____ L									

Water Quality Parameters

Beginning purge time:							Ending purge time:					
Litres	Time	pH	Temp C	Cond ^{us} mS/cm	DO ppm	Redox mV	Comments					
<u>2</u>		<u>6.57</u>	<u>20.8</u>	<u>219.8</u>	<u>1.58</u>	<u>39</u>	<u>Cloudy. No odour.</u>					
<u>4</u>		<u>6.44</u>	<u>20.8</u>	<u>220.0</u>	<u>0.40</u>	<u>35</u>						
<u>8</u>		<u>6.41</u>	<u>20.8</u>	<u>220.5</u>	<u>0.32</u>	<u>37</u>						
							<u>Original tubing lost down well prior to work (no chance in tubing to ground).</u>					
							<u>New set dedicated tubing left in well (died to exp)</u>					
Stabilisation Criteria	+/- 0.05	+/- 10%	+/- 3%	+/- 10%	+/- 10%	Example Comments: clear / slightly cloudy / turbid / very turbid / no odour / slight odour / odour / strong odour						
<u>8</u>	Total Well Volume Actual amount of water prior to sampling					*pH, temp, cond readings not necessary if well is purged dry						
Did field parameters stabilise?							<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA	Was the well dry purged?	<input type="radio"/> Y	<input checked="" type="radio"/> N

Field QC Checks

Was pre-cleaning sampling equipment used for these samples?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was pre-cleaning sampling equipment properly protected from contamination?	<input checked="" type="radio"/> Y	<input type="radio"/> N	
Was documentation of equipment conducted?	<input checked="" type="radio"/> Y	<input type="radio"/> N	<input type="radio"/> NA
Were air bubbles present in vials at time of collection?	<input type="radio"/> Y	<input checked="" type="radio"/> N	<input type="radio"/> NA
Was sample for metals field filtered prior to preservations?	<input type="radio"/> Y	<input type="radio"/> N	<input checked="" type="radio"/> NA
Duplicate sample collected?	<input type="radio"/> Y	<input checked="" type="radio"/> N	
			Duplicate sample ID

GPS Coordinates (UTM/MGA system):

Multi Parameter Water Meter



airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. 11C100753

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. Specific conductance	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		LE1048	pH 7.01
2. pH 4.00		pH 4.00		MD1859	pH 3.98
3. pH 10.00		pH 10.00		MH1685	pH 9.90
3. mV		231.8mV		MC2156/MG1081	234.0mV
4. EC		2.76 mS		LK2419	2.76mS
5. D.O		0ppm		2810	0.00ppm
6. Temp		21.5°C		MultiTherm	21.1°C

Calibrated by:

Joanna Wong

Calibration date:

2/06/2015

Next calibration due:

2/07/2015

WSP Environment & Energy
41 McLaren Street
North Sydney NSW 2060

