Veolia Environmental Services (Australia) Pty Ltd.

Re: EPL- Annual Assessment of Woodlawn Bioreactor & Intermodal Facility Monitoring Data.

Report – 8 December 2010. **(Ref: E2W-083 R001)**

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1.0 INTRODUCTION

Earth2Water Pty Ltd (E2W) was engaged by Veolia Environmental Services Pty Ltd (Veolia) to review and assess monitoring data for the 2009/2010 reporting period for the Woodlawn Bioreactor and Intermodal Facility sites in relation to Environmental Protection Licence (EPL) requirements.

Veolia operates the Woodlawn Bioreactor site (WB) under EPL number 11436, while the Intermodal Facility (IMF) is separate and under EPL number 11455. These EPLs are combined in this annual report (2009-10), which documents the results of the fourth annual monitoring period for the WB and IMF EPL's.

The WB site occupies approximately 3,000 hectares (ha) and encompasses the Woodlawn Mine Lease, which is governed and reported separately by E2W for the Site Mine Lease (SML 20, Figures 1 and 2).

This EPL report provides a review and assessment of the air (dust, landfill gas), leachate, surface and groundwater monitoring data obtained from Veolia's Bioreactor and IMF from 6 September 2009 to 5 September 2010[1]. The report includes historic and recent monitoring data, conceptual models, data assessment, conclusions and where required, recommendations to improve future monitoring.

2.0 BACKGROUND

The NSW Department of Environment, Climate Change and Water (DECCW) regulates numerous waste management and disposal facilities in NSW. The DECCW issues licenses which both permit and regulate waste disposal activities. Licence conditions typically include requirements to monitor air, leachate, surface and groundwater quality in and around landfill sites. Licence conditions also place controls on the licence holder with respect to noise generation.

This report provides Veolia with an independent technical review of the monitoring data and results obtained to date (2004 to 2010).

E2W's scope of work included the review of available technical reports, historic and current monitoring data (air and water), well monitoring networks, surface water storages, hydrogeology and other related environmental information. This scope of work has enabled an assessment of the monitoring data from both the Woodlawn Bioreactor and IMF.

In November 2007, E2W provided Veolia with a comprehensive assessment of the site's water monitoring systems, entitled *Status of Water Monitoring Systems at the Woodlawn Bioreactor Site*. This report sub-divided the site into ten 'systems' or sub-sites to simplify the large and complex site (e.g. mine void, South, North and West Tailing Dams, Evaporation Dams 1, 2 and 3, Waste Rock Dump, Plant Area and IMF) based on local landform aspects (Figure 1).

[1] Note EPL 11436 and 11455 require noise monitoring in the event of noise impacts for residential but no noise monitoring has been undertaken during operation of the WB as there have been no noise complaints.

3.0 LANDFILL DESIGN, OPERATIONS AND HISTORY

The Woodlawn Mine was a typical large-scale open cut and underground mine operation. The mine infrastructure included the construction, operation and maintenance of the following:

- Waste Rock Dump (WRD)
- Tailings Dams
- On-site ore processing facilities (Plant Area)
- Evaporation Dams (ED1, 2 and 3)
- Underground operations
- Open-pit operations

The former mining components at Woodlawn still exist and are illustrated on Figures 1 and 2. A summary of the site history is outlined in Table 3.1.

The Woodlawn Bioreactor occupies the mine void (to 200 metres below ground level (mbgl)) and comprises approximately 25 million cubic metres of landfill space. Landfilling and gas collection commenced in late 2004.

Table 3.1 Milestones and History

Date	Event
1978	Woodlawn open cut mine activities commence.
22.12.1982 (aerial)	Plant Area and dams present. North and South Tailings are constructed and used for tailings/water storage. West Tailings Dam is under construction, together with the Waste Rock Dump. Plant Collection Dam/Lagoon is full of water - irregular area.
9.06.1987 (aerial)	North, South Tailings Dams full of water, tailings comprising ~20% of avail. area. ED1 under construction, with Waste Rock Dam being raised (several benches visible) and includes leachate sump. Dolerite stockpile is visible on west side of mine void. Bunding structure visible at Plant Collection Dam with minor water. Raw Water Dam has been constructed and is full of water. The ED3 area comprises a series of small dams.
1989	Expansion and development of plant infrastructure. Open cut mine workings reach ~ 200 m depth, underground mining commenced.
15.07.1989 (aerial)	ED1 construction complete and full of water. Construction of ED3 South is a work in progress. Dolerite stockpile is increasing in size. West Tailings Dam has been constructed and is full of water. Plant Collection Dam is full of water.
11.09.1990 (aerial)	West Tailings Dam larger, full of water, tailings occupy approx. 10% of avail. area. ED2 has been constructed and now full of water. ED3 construction practically completed (dry). Plant Collection Dam is enlarged and full of water.
30.09.1991	Tailings in the North and South Tailings Dams cover approx. 50% of the available surface area. A new section is being added to the SW corner of the West Tailings Dam. Lower benches of Waste Rock Dam appear revegetated. ED3 North is being constructed and nearly completed (dry).
(cont. over page)	

Date	Event
11.09.1994 (aerial)	ED3 North and South are complete and full of water. New SW addition to West Tailings Dam is complete and full of water. North Tailings Dam is subdivided in smaller cells on west side and through centre. ED2 has a defined internal bund on the NW corner (visible from 1990). Waste Rock Dump is being rehabilitated and revegetated. Water visible at the bottom of the mine void.
5.10.1995 (aerial)	Rehabilitation/revegetation of Waste Rock Dump is nearing completion.
11.11.1996 (aerial)	ED1 and 2 have high water levels. ED3 is also full.
March 1998	Administrators appointed to Denehurst Ltd.
17.09.2004 (aerial)	Water in ED1, 2 and 3 at low levels. Tailings in North, South and West Tailings Dams have consolidated.
October 1999	Commission of Inquiry - Woodlawn Waste Management Facility.
November 2000	Minister grants consent for Woodlawn.
February 2002	Revised EIS prepared.
August 2002	Minister grants Development Approval for Clyde Transfer Terminal.
February 2003	Land and Environment Court Hearing into Clyde Transfer Terminal.
September 2003	Construction of Bioreactor and Intermodal Facility complete.
December 2003	Clyde Waste Transfer Terminal (Special Provisions) Act (2003) passed by State Government.
Jan - June 2004	Construction of the Clyde Transfer Terminal.
October 2004	Wind Farm DA and EIS lodged.
September 2004	**Landfill gas collection system installed at base of void.** **First waste load delivered to site.**
February 2005	Mining operations plan (MOP) approved.
May 2005	Planning focus meeting held on the Alternative Waste Technology proposal.
June 2005	First stage of gas extraction system and flaring initiated.
October 2005	Wind Farm DA approved.
November 2005	Mixing of acid mine drainage and landfill leachate in the void sump, discharged to ED3 North and South.
January 2006	Construction of first power generator hub commenced.
April 2006	Environment, Safety and Quality accreditation gained.
August 2006	Power generator hub completed.
July 2007	Application for temporary storage of leachate in ED3 from void. Construction of segregated dams (ED3 lagoons) within ED3 for temporary storage. Bioreactor has received 970,000 tonnes of waste since commencement.
September 2007	Approximately 40 m of waste placed in landfill since commencement. (pit base from 200 to 160 m below perimeter). Leachate level of approximately 10 - 15 m below waste level.
November 2007	Comprehensive assessment of water monitoring programs submitted by E2W. AWT DA Approved. Gold medal - WMAA National Landfill Excellence Awards.
February 2008	Commissioning of first landfill gas generator - power generation commenced.
April 2008	Woodlawn Bioreactor Energy official opening.
November 2008	Commissioning of second landfill gas generator.
June 2009	Sealing of the northern portal.
August 2009	Woodlawn Bioreactor presented the Society of Chemical Industry Australia 2009 Plant of the Year.
March 2010	Commissioning of the Third Landfill Gas Generator

Note: aerial = historical information sourced from an aerial photograph.

4.0 ENVIRONMENTAL SETTING

The environmental setting of the site, including topography, soils, hydrology, geology and hydrogeology are described in the following sub-sections.

The main site features and hydrogeology are also included in Figures 1, 2, 3A, 4 and 5.

4.1 Site Location

Woodlawn Bioreactor is located approximately 7 kilometres (km) west of Tarago, approximately 8.5 km south-west of Lake Bathurst and around 7.5 km east of Lake George. Situated 250 km south-west of Sydney, the mine site is approximately midway between Goulburn and Canberra. The land is situated within the Mulwaree Local Government Area (Woodward-Clyde, February 1999).

The Woodlawn Bioreactor is situated on a property formerly owned by Denehurst Pty Ltd, which has a land area of approximately 3,000 hectares. The property includes the mine void, waste rock dump, tailings dams, evaporation ponds, disused mining infrastructure and surrounding rural land and pine forest. The area surrounding the property is characterised by large rural holdings which are lightly timbered with stands of woodland. A sewage treatment plant is located on Collector Road adjacent to the site.

The closest township to the mine site is Tarago. It is a small rural service centre consisting of a railway station, school, hotel, small commercial centre and a number of residences.

4.2 Climate

The long-term climatic data at Woodlawn indicates that evaporation exceeds rainfall on an annual basis. The total rainfall recorded between July 2009 and June 2010 was 659.5 mm; which is higher than the 23 year (1986-2009) average for the July to June period of 627.2 mm. The total rainfall for 2009 (January – December) was 482 mm.

The average evaporation (17 year average) at the site is 1420 mm/year (AEMR, 2003). The evaporation rates significantly exceed annual rainfall, making evaporation processes very effective for onsite water management.

4.3 Topography

The natural ground surface surrounding the mine void lies at an elevation of approximately 800 m AHD, with the base elevation of the mine void at approximately 630 m AHD. The landfill site is situated on a ridge which forms part of the Great Dividing Range (GDR). The topography of the surrounding area comprises rounded hills that rise up to approximately 1,000 m AHD, particularly to the north and south of the landfill site (Figures 1 and 3A).

The Woodlawn Mine property lies at the head of the Allianoyonyiga and Crisps Creek catchments. Allianoyonyiga Creek is upstream of the Lake George catchment, while Crisps Creek connects to the Mulwaree River.

4.4 The Landfill/Void Area

The Bioreactor lies within the former Woodlawn Mine site and is located ~500 m south of Collector Road on top of a ridge line which forms part of the GDR (Figure 1 and Figure 3B).

The landfill site occupies an area of approximately 38 ha of Woodlawn's 3,000 ha. The landfill site comprises the open cut mine void, the access road into the site and an area to the north-east of the void where the associated site facilities (i.e. weighbridge and site office) are located. A waste rock dump and a number of tailings dams are located to the south and south-east of the landfill site. Hickory's Paddock lies to the east and disused mine facilities are located to the north-east. Evaporation ponds are located to the north-west of the landfill site (Figure 1).

The open cut mine void, where land filling has commenced, has an approximate volume of 25 million cubic metres and a depth of approximately 200 m. The void consists of several benches, a haul road and sediment ponds. The base of the void contains highly acidic sulphate-rich water.

The base of the void is at approximately 630 m relative to the Australian Height Datum (AHD), while the lowest point of the void rim is around 800 m AHD (Woodward-Clyde, February 1999).

4.5 Geology and Hydrogeology

The hydrogeology of the site is dominated by the hard rock geology and mine/landfill activities. The regional groundwater flow regime has been altered by the mine void, which induces large inward hydraulic gradients. The various water storages (i.e. Tailings and Evaporation Dams) also influence the flow regime by recharging and mounding the water table.

The inferred groundwater flow regime for the site is presented in Figure 1 and Figure 3B. The geology and inferred hydrogeology is presented in Figures 1, 4 and 5.

The regional geological setting comprises volcanic rocks which form part of the Lachlan Fold Belt of south-eastern NSW. The geological sequence of the site itself includes Ordovician and Siluro-Devonian lithified volcanogenics, volcanoclastics, as well as sedimentary shales and sandstones. These units are regionally faulted and jointed with a synclinorial-anticlinorial fold pattern, which results in a significant lack of continuity in the horizontal plane (URS, November 2004).

The hydrogeology of the mine void and surrounding area is largely dominated by volcanic rocks within which the mineralised zone occurs. The rock mass is generally of low permeability but fractures and joints, where interconnected, create minor storage areas and some secondary permeability. These provide a modest water supply to horizontal drains drilled around the mine void and some exploration drill holes. Pre-mining regional groundwater gradients were not established, but investigations show the regional water table to be a subdued reflection of surface topography with gradients away from the GDR towards Crisps Creek and Lake George (Woodward-Clyde, February 1999).

The basement rocks generally exhibit low hydraulic conductivity. Rock permeability is due almost entirely to fractures. The low bedrock surrounding the mine void exhibits low bulk permeability due to the action of metamorphism and hydrothermal fluids, which have sealed the primary porosity of the bedrock. It has been observed that seepages from the base of the open cut primarily occur through two fault/fracture zones (the 690 etc.) located on opposite ends of the pit. Seepage is also known to occur via old exploration drill holes and horizontal drain holes, which were designed to relive hydraulic pressures from the pit walls.

Secondary permeability potentially exists where the rocks have been sheared by faulting, or where the rock exhibits cooling fractures (dolerites). However, the secondary porosity has been largely sealed by clays formed during the weathering of mineral compounds in the basement rocks.

Aquifer tests have been carried out in selected horizontal bores, piezometers and monitoring bores within the void and surrounding area to determine the permeability and transmissivity of the bedrock. The results indicate low to extremely low values of transmissivity, with some of the monitoring bores taking a week or more to fully recover after purging of a single bore volume (Woodward-Clyde, February 1999).

Despite the fact that the mine void is over 180 m deep and extends for at least 160 m below the natural water table, the total groundwater inflow into the mine void is approximately 1 - 2 L/sec, seasonally fluctuating. The main seepage locations are shown in Figure 1, together with the location of the fault zones through the void (i.e. 760 and 750/790).

The inferred directions of groundwater flow in the bedrock aquifer are presented in Figure 1. Dewatering associated with mining operations has created a steep cone of depression in the void area (Woodward-Clyde, February 1999). The steep hydraulic gradients into the void are indicative of the impervious bedrock and slow seepage velocities into it (Figure 5).

Overlying the basement fractured rock aquifer on some hill-sides, are recent deposits of hillwash (colluvium) sediments, which grade laterally into alluvial sediments in the valleys. This alluvial aquifer may form a conduit through which groundwater discharges to the downstream environment.

Figure 1 shows the inferred direction of groundwater flow within the alluvial aquifer in the Crisps and Allianoyonyiga Creek catchments, based on the surface water flow system. The approximate extent of the alluvial aquifer is also presented in Figure 1.

The sedimentary deposits show highly variable permeability and generally have confined conditions at the head of the catchment. Down catchment the aquifer becomes unconfined, with discharge to the creek surface water system and boggy areas adjacent to the streams. Relatively high permeability aquifers exist where sediments occur in valley bases, and to a lesser degree, on the slopes.

Figure 4 provides a schematic view of the aquifer units present at the site. At present, the void acts as a hydraulic trap due to the steep inward hydraulic gradients (Figure 5). As the void is filled with waste, there will be a reduction to the steepness of the inward hydraulic gradients.

4.6 Groundwater Recharge and Discharge Areas

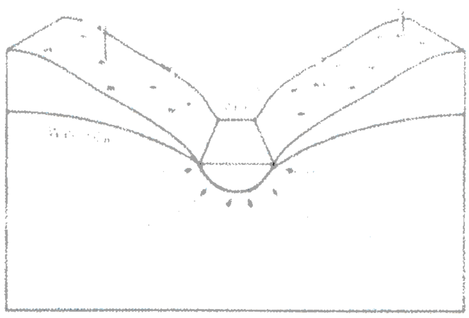
Groundwater recharge to the bedrock primarily occurs through direct rainfall infiltration to open fractures and joints in areas where bedrock is exposed at the ground surface. Enhanced recharge has been observed immediately south of the mine void (adjacent to the waste rock dump) and seeps after rainfall in the southern portal (Woodward-Clyde, February 1999).

Evidence of recharge in the void is illustrated with groundwater level changes in existing piezometers located on the batters and perimeter of the void. Several piezometers (i.e. 44A and 110A) are potentially located on a fault zone and show moderate fluctuations (~10 m) during rainfall recharge. These piezometers are also in proximity to seepage locations (Figure 1, Appendix D).

The low bulk permeability of the bedrock in the mine area means significant groundwater discharge will only occur where open fracture conduits exist and permeability is sufficient to produce a significant flow rate in the context of local catchment vegetation and hydrology.

E2W interpret that Crisps Creek (one of two primary receptors) is ephemeral and generally a losing stream (in text Figure 4.6b) during dry seasons. The stream would revert to a gaining stream (in text Figure 4.6a) during wet seasons. The type of creek system will determine the discharge regime, fate and transport of groundwater pollution.

a)



b)

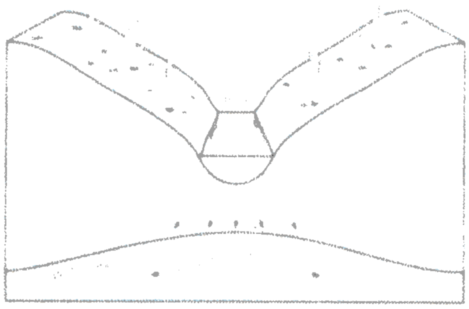


Figure 4.6: Gaining (a) and losing streams (b) typically associated with wet and dry seasons.

4.7 Hydrology

Allianoyonyiga and Crisps Creek are considered to be the primary receptors for discharges occurring from the Woodlawn site. The Great Dividing Range (GDR) bisects the void and diverts flows to south (via Allianoyonyiga Creek) to Lake George catchment and north (via Crisps Creek) to Wollondilly catchment (Figure 1 and in text Figure 4.7).

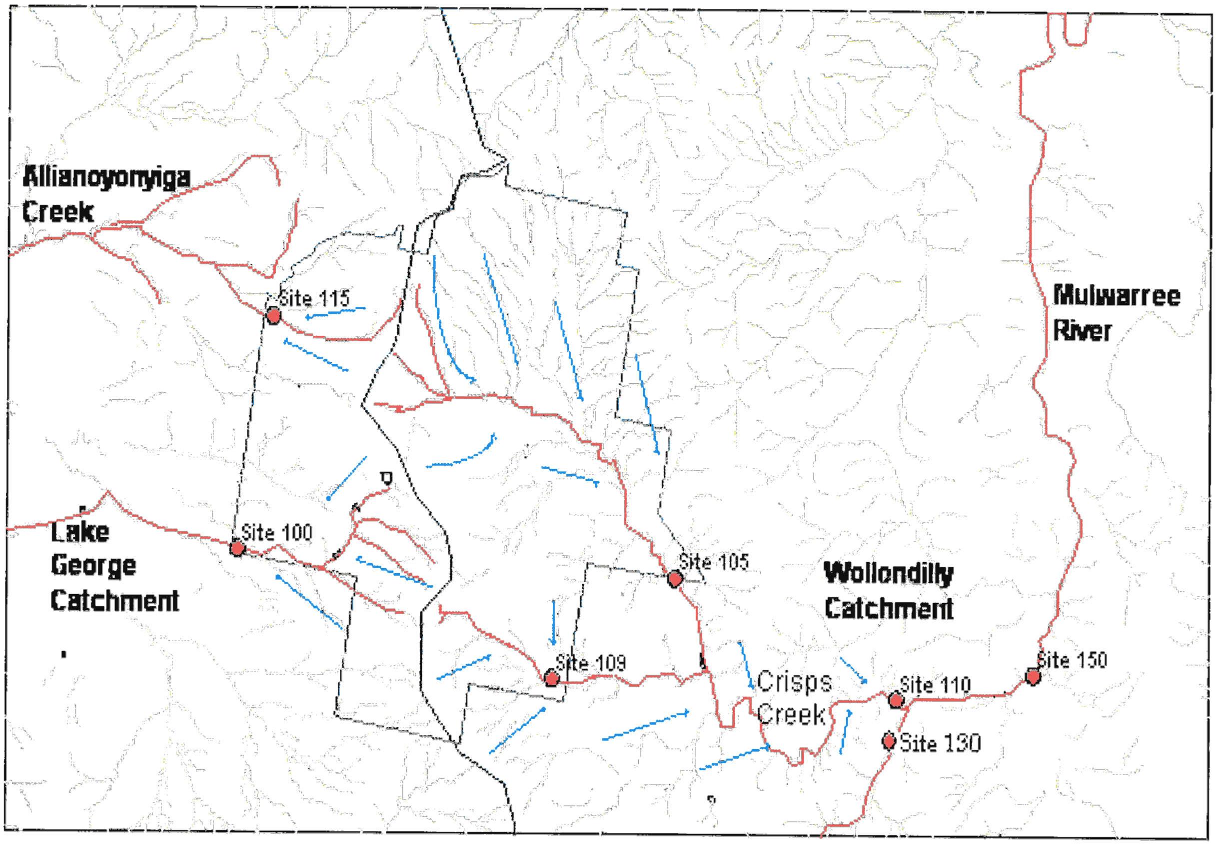


Figure 4.7: Hydrology at Woodlawn. Arrows indicate flow directions, while the light green line represents the GDR and the dark green line the site boundary. *Source: Veolia AEMR, 2006/07.*

Surface water management strategies are implemented by Veolia to proactively manage any adverse impacts on the receiving waters of the Lake George and Wollondilly catchments. Routine monitoring of surface waters is undertaken to measure the effectiveness of water management systems. Six locations are monitored (flow, water quality) along Crisps Creek as summarised below and in Figure 3B.

- Site 100: Woodlawn/Willeroo boundary south,
- Site 105: Crisps Creek/Pylara Boundary (Bioreactor EPL requirement),
- Site 109: Pylara boundary below South Tailings Dam,
- Site 110: Crisps Creek, downstream at bridge (Intermodal EPL requirement),
- Site 115: Woodlawn/Willeroo boundary north (Bioreactor EPL requirement); and
- Site 150: Crisps Creek, downstream (Intermodal EPL requirement).

5.0 AVAILABLE MONITORING DATA AND REPORTS

Monitoring data for the site is comprised of laboratory analysis and field measurements. The majority of the laboratory data is from Ecowise Pty Ltd (Ecowise)/Australian Laboratory Services (ALS). The remaining water data (e.g. pH and electrical conductivity) is obtained from field measurements. Veolia staff undertook the monitoring and sampling activities in the 2009/2010 reporting period.

Some early monitoring data is available from the late 1980s when the site was an operational mine. The availability of data has expanded through to present. Additional locations have been installed and added to the monitoring program when required or deemed appropriate. Additional monitoring locations were added when landfill activities commenced (e.g. mine void, IMF), while some locations were decommissioned and/or sampling frequencies reduced due to the cessation of mining activities.

5.1 Available Water Monitoring Data and Assessment Strategy

A review and statistical analyses of the available data was undertaken. It included the following:

- Calculation of minimums, maximums, averages and standard deviations of key indicator laboratory[2] and field[3] results from each monitoring location. The statistics were designed to highlight trends and anomalies, as well as to characterise the data population and range of results. The statistics (e.g. standard deviation) were aimed to support the water quality criteria adopted for the site (i.e. no significant change to water quality, nil discharge). The statistics were provided for mining conditions (late 1970s to 2004) and landfilling activities (2005 to date) to assess water quality changes before and after landfill operations (where possible).
- Statistics (minimum, maximum, average and standard deviations) were calculated for the data collected in the 2009/2010 reporting period (6 September 2009 - 5 September 2010). The statistics will continue to be undertaken in the following reporting periods to allow comparison between years, and enable rapid identification of anomalies and trends developing from year to year.

The water and trend analyses are outlined below.

Based on the statistical and data analyses, selected parameters for selected monitoring locations were transferred onto time-series graphs using Microsoft Excel.

Analyte concentrations are graphically presented in order to assess water quality trends over time. Consistent rising trends of some parameters (i.e. Zn and Cd) are considered to reflect expanding plume(s) and/or mobilisation of polluted water. It is considered the locations exhibiting decreasing trends (e.g. salinity, neutralising pH, lower heavy metals) result from the diminishing effects associated with the cessation of mining activities (e.g. storage of water in the tailings or evaporation dams).

The key analytes included in the graphs are pH, sulphate, iron, EC, ammonia, zinc and TOC. Where water quality parameters show a rising trend (e.g. Zn, Cl and conductivity) it is interpreted evapo-concentration processes are occurring, reflecting natural salinisation of the water body due to containment (i.e. water storage). TOC and ammonia are good indicators of landfill leachate.

5.2 Assessment of Noise and Air Monitoring Data

Laboratory testing of dust samples is carried out by ALS. Gas monitoring is conducted onsite by Veolia Environmental Services (VES). The dust results are presented in Appendix G and gas monitoring data are presented in Appendix H.

Noise monitoring is currently not undertaken at the Woodlawn Bioreactor or IMF because no noise complaints have been received. If and when a complaint is lodged, Veolia will implement the relevant controls and/or monitoring program.

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[2] Major ions, metals, nutrients.

[3] pH, EC, water level.

5.3 Information Review

The information reviewed by E2W for the Woodlawn Bioreactor site included numerous reports and investigations by other consultants:

- Woodward Clyde Pty Ltd, July 1997. *Site Hydrogeological Evaluation, Woodlawn Mines, NSW* (included in Volume 3).
- Woodward Clyde Pty Ltd, February 1999. *Woodlawn Waste Management Facility Environmental Impact Statement* (Volume 1 - Main Report) (included in Volume 3).
- Woodward Clyde Pty Ltd, February 1999. *Woodlawn Waste Management Facility Environmental Impact Statement* (included in Volume 3).
- Douglas Partners Pty Ltd, September 1999. *Report on Quarterly Water Quality Monitoring.*
- Woodward Clyde Pty Ltd, January 2000. *Water Management Plan Woodlawn Waste Facility* (included in Volume 3).
- Woodlawn Mines Pty Ltd, 2 August 2001. *Annual Environmental Management Report for the Year Ending 30 June 2001.*
- Collex Pty Ltd, April 2003. *Woodlawn Bioreactor Alliance Report, 08/04/2003.*
- Woodlawn Mines Pty Ltd, 2004. *Annual Environmental Management Report for the Year Ending 30 June 2004.*
- Collex Pty Ltd, November 2005. *Annual Environmental Management Report (SML20) 2004-2005.*
- Golder Associates Pty Ltd, August 2006. *Phase I Environmental Site Assessment Former Woodlawn* (included in Volume 3).
- Veolia Environmental Services Pty Ltd, 2006. *Annual Environmental Management Report (SML20) 2005-2006.*
- Eath2Water Pty Ltd, January 2008. *EPL - Annual Assessment of Monitoring Data at the Woodlawn Bioreactor and Intermodal Facility, 2006/07.*
- Earth2Water Pty Ltd, November 2007. *Status of Water Monitoring Systems at the Woodlawn Bioreactor Site.*
- Earth2Water Pty Ltd and Veolia Environmental Service Pty Ltd, September 2008. *Annual Environmental Management Report SML20, 2007/08.*

A summary of the monitoring locations, frequency and laboratory testing suite is provided in the EPL (summarised in Appendix A and C).

6.0 LICENSING AND MONITORING OBJECTIVES - WOODLAWN BIOREACTOR

The Woodlawn Bioreactor is controlled by EPL 11436, which applies to Lots 5 - 6, DP 830765, Lots 8 - 9 in DP 534616, Lots 19 in DP 827588 and Lots 14, 25, 30, 70, 86, 88, 91 and 92 in DP 754919. The monitoring locations (water, leachate, air) are presented in Appendix A and Figures 3A and 3B.

The key parts of Veolia's monitoring activities for the Woodlawn Bioreactor (WB) are summarised below.

6.1 Surface and Groundwater Monitoring

The objective of water monitoring is to ascertain if there are any changes occurring in groundwater or surface waters that may indicate contamination which can be directly attributed to the site.

As the site is located in a mineralised area (i.e. a massive sulphide ore body), naturally elevated concentrations of heavy metals and acidic water are likely in the surface and groundwater systems. Therefore, establishment of water quality trends over time is fundamental to assess compliance with the criteria (i.e. no change, nil discharge).

L1.2 of EPL 11436 states 'there is to be no pollution of surface water or groundwater'. Thus, the objective of the Woodlawn Bioreactor water monitoring program is to monitor any change, rather than individual levels/concentrations against set limits.

Thirty-three groundwater monitoring points and nine surface water monitoring points are registered on the EPL. These are listed below.

Groundwater:

- MB1 - MB8, MB10 - MB17
- ED3B
- WM1, WM3 - WM7
- P38, P44, P45, P58, P59, P100
- MW8S, MW8D, MW9S, MW10S

Surface Water:

- Site 115, Site 105
- Spring 2
- WM200 to WM203
- Pond 2, Pond 3

Over the past 6 years monitoring has taken place as outlined in the Landfill Environmental Management Plan (LEMP) and EPLs for Woodlawn and Crisps Creek. Veolia's environmental monitoring schedule for the two licensed sites is attached in Appendix C.

According to the EPLs, the Annual Return is to include a graphical representation of all monitoring data as well as an analysis of the data to determine whether activities at the premises are impacting on the environment. Groundwater quality graphs are presented in Appendix D and surface water quality graphs in Appendix E.

6.2 Leachate Management

The mine void must be managed to ensure the groundwater gradient directs groundwater flows toward the mine void, unless otherwise approved in writing by the DECCW.

Veolia is permitted to transfer up to 40 megalitres (ML) of acid mine drainage (AMD) and leachate mixture from the landfilled waste for storage in the purpose-built dams named ED3N-1, ED3N-2 and ED3N-3 (O5.6). 14.6 ML of AMD/leachate has been extracted from the void and has been stored in the ED3 North lagoon system during the 2009/2010 reporting period.

In accordance with O6.1, water from the west ridge catchment does not drain into the landfill void and is diverted into the Allianoyonyiga Creek catchment (Figure 1).

Other aspects of leachate management detailed in the EPL include:

- O6.2: ED3 must not receive water stored in the Waste Rock Dam (WRD).
- O6.3: Stormwater in the mine void must only be discharged into ED3, or used for operational purposes within the landfill, such as Bioreactor water and dust suppression as approved in writing by the DECCW.

6.2.1 Volumes in ED3

Whenever the volume of water stored in ED3 exceeds 323 ML, the licensee must notify the DECCW in accordance with condition R2 of EPL 11436 and provide a written report to the DECCW within 1 month (R6.1). This has not occurred since operations began in 2004. The stored volumes in the ED3 system are presented in Appendix J.

6.3 Air Monitoring

Condition M2.1 of EPL 11436 requires three sub-surface gas monitoring points and one surface gas monitoring point are to be monitored quarterly (methane, % by volume). Two air discharge monitoring points (landfill gas flare and landfill gas engine) are also required. The results are attached in Appendix H (surface and sub-surface gas) and Appendix I (flare and gas engine).

The first landfill gas engine was commissioned in February 2008 and full operation did not commence until June 2008. Two further engines have been installed with the most recent in March 2010. The pollutants specified in condition O11.3 of EPL 11436 are monitored on an annual basis.

Condition M2.1 requires monthly dust monitoring at three monitoring points. Results are provided in Appendix G.

6.4 Landfill Gas Collection and Monitoring

It is the responsibility of the licensee (Veolia) to ensure that as much landfill gas as is practicable is collected and treated by flaring, or beneficially used in the landfill gas-fired power station.

- O11.2: The flare system must provide a destruction efficiency of volatile organic compounds, air toxics and odours of no less than 98%. The flare must be at ground-level and shrouded. The flare must be provided with automatic combustion air control, automatic shut-off gas valve and an automatic restart system.
- O11.3: The landfill gas-fired power station must provide a minimum destruction efficiency of 98% for volatile organic compounds, air toxics and odour, and the discharge point(s) must be designed (i.e. stack height, diameter, discharge velocity etc.) to ensure that the design ground-level concentration criteria are not exceeded at any location at or beyond the boundary of the premises.

All conditions have been complied with by Veolia. To ensure minimum destruction requirements specified in the EPL, operation of the landfill gas flare and engines are permanently within design specifications.

6.5 Noise Monitoring

The noise limits for the Woodlawn Bioreactor are as follows:

- L6.1: Noise from the premises must not exceed 35 dB(A) L_{Aeq} $_{(15\ minute)}$ at the most affected residential receiver. Where L_{Aeq} means the equivalent continuous noise level - the level of noise equivalent to the energy-average of noise levels occurring over a measurement period.

Since commissioning of the Woodlawn Bioreactor noise monitoring has not been conducted, and no complaints have been received. If a complaint were to be lodged, Veolia would perform noise monitoring at the locations specified in the EPL.

6.6 Metereological Monitoring

Condition M7 of EPL 11436 required meteorological monitoring (wind speed and direction, sigma theta, temperature, solar radiation and rainfall) to be undertaken continuously for the reporting period. The site's meteorological station is situated adjacent to the main administration building. Meteorological data for the 2009/2010 reporting period is available upon request.

This condition has been complied with by Veolia.

7.0 LICENSING AND MONITORING OBJECTIVES - INTERMODAL FACILITY

The Crisps Creek IMF is controlled by EPL 11455, which applies to Part Lot 10 in DP 703260 and Part Lot 3 in DP 754894. The monitoring locations (surface water, air) are presented in Appendix A and Figure 3B.

The key parts of Veolia's monitoring activities for the IMF are summarised below.

7.1 Surface Water Monitoring

Surface water monitoring is conducted at three locations, 2 upstream and 1 downstream of the IMF (i.e. Site 110, Site 130 and Site 150). Some of the surface water control measures for the site are as follows:

- O4.1: Paved and sealed areas must be provided with a first flush stormwater management system designed to capture the first 15 millimetres of stormwater for each square metre of catchment area. The paved and sealed areas must also extend to include any rail unloading areas.
- O4.2: All areas that involve the handling of containerised waste including container transfer and handling areas, clean container storage areas and internal roadways must be sealed.
- O4.3: Contaminated storm water and any sludges collected at the premises must be disposed of at the Woodlawn Bioreactor Facility (EPL 11436).
- O4.4: There must be no vehicle or container wash down at the premises.
- O4.5: All sewage generated on the premises must be disposed of into the sewerage system at the Woodlawn Bioreactor Facility (EPL 11436).
- O4.6: Uncontaminated storm water collected by the first flush system may be applied to vegetated areas at the premises in a manner that does not exceed the capacity of the areas to effectively utilise the storm water.

All conditions were incorporated into the design of the IMF and have been complied with by Veolia in the 2009/2010 reporting period.

7.2 Air

Dust monitoring is required at the nearest sensitive residential receptor to the premises, which is a residential property. No dust limits are provided in EPL 11455, however any changes are to be investigated. The dust monitoring locations are presented in Figure 3B.

With respect to dust control, EPL 11455 requires that:

- O3.1: All operations and activities occurring at the premises must be carried out in a manner that minimise dust at the boundary of the premises.
- O3.2 Trucks entering or leaving the premises and carrying excavated dusty materials including clays, sands and soils must be covered at all times, except during loading and unloading.
- O3.3 All sealed and unsealed surfaces must be managed to minimise the quantity of wind blown dust emissions.

All conditions relating to dust control have been complied with by Veolia in the 2009/2010 reporting period. All operations at the IMF are completed on sealed surfaces, including all access roads. All containers received at the IMF are transferred directly to the Woodlawn Bioreactor and are enclosed. No import or export of clay, sand or soil was undertaken during the 2009/2010 reporting period.

L8.1 specifies that the licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises. No odour complaints were received regarding the IMF during the reporting period.

7.3 Waste

- L5.1: The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.
- L5.2: This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.

All conditions relating to waste have been complied with by Veolia in the 2009/2010 reporting period.

7.4 Noise Limits

- L6.1: Except as provided in condition L6.2, noise from the premises must not exceed an $L_{Aeq\ (15\ minute)}$ noise emission criterion of 35 dB(A) at the most affected residential receiver.
- L6.2: Noise emissions from freight trains entering and leaving the premises must not exceed the noise limit of 45 dB(A) $L_{Aeq\ (15\ minutes)}$ prior to 7:00 am and 50 dB(A) $L_{Aeq\ (15\ minutes)}$ after 7:00 am. These limits apply only where there are no more than two freight trains entering and leaving the premises per day, otherwise the limit in condition L6.1 applies.

No noise monitoring has been conducted as no complaints have been received. If a complaint were to be lodged, the appropriate monitoring and actions would be undertaken to identify the noise source. Noise monitoring locations are shown in Figure 3B.

8.0 WATER MANAGEMENT - WOODLAWN BIOREACTOR

Woodlawn is a 'zero discharge site', which means that water in contact with disturbed areas such as the mine void and plant area is captured and contained onsite. A detailed description of the water management system is contained in the LEMP for the Woodlawn Bioreactor (Collex, 2004).

Within the Woodlawn site there are two areas requiring water management - the area under the Site Mine Lease (SML20) and the area governed by the Environment Protection Licence (EPL 11436). Water within these areas can be split into three main types:

1. Acid mine drainage (AMD) - Low pH with high salinity and metals
2. Landfill leachate - High organics and nutrients
3. Clean water - Comprises rain and fresh bore water

Within the area under the SML20, clean water is directed offsite, while waters from contaminated areas are stored onsite prior to being evaporated. The long term climatic data for Woodlawn indicates evaporation (~1400 mm) annually exceeds rainfall (~600 mm). Thus, the climate at Woodlawn supports the evaporation strategy implemented at the site.

Rainfall flowing down the walls of the void that becomes contaminated with AMD is pumped to one of two holding ponds (Ponds 2 and 3, part of EPL requirement) constructed on the haul road in the void. AMD is then pumped out of the ponds to ED3. In 2005, the water contained in ED3 inadvertently became contaminated with landfill leachate. Since the contamination event, ED3 has been split into three sections: ED3N, which contains leachate contaminated AMD; ED3S, which now contains stormwater AMD from the walls of the void; and ED3N Lagoon 1, which is temporarily storing AMD leachate from within the waste.

The onsite surface water storage volumes are summarised in Table 8.1 (from 2009/2010 AEMR).

Table 8.1: Onsite Water Storage Volumes

Water Storage	Quality	Volumes held (ML)		
		June 2009	June 2010	Storage Capacity
Plant Collection Dam	Varying quality (contaminated)	7.36	<2	60
Evaporation Dam 1	Contaminated	<200	<200	1345
Evaporation Dam 2	Contaminated	<150	<150	846
Evaporation Dam 3 (N)	Contaminated	40.6	54.6	183
Evaporation Dam 3 (S)	Contaminated	50	50	183

Reference: AEMR 2009/10. Storage in ED3 was below the 323 ML EPL requirement from 2004 to 2009.

8.1 Void

Water management within the mine void has changed due to the construction of the Bioreactor in 2004.

Inflows into the void include incident rainfall, landfill materials and groundwater seepage. Seepage monitoring undertaken by Veolia indicate approximately 1 - 2 L/sec of inflows consistently occurs at two primary locations (Figure 1). The location of the seeps is interpreted to correlate with fault zones identified during former mining activities.

Outflows from the mine void include evaporation and frequent pumping of stormwater to ED3. Recirculation and management of leachate from the landfill/void is required to lower water levels and maximise gas production.

Stormwater collection within the void is a key aspect of Bioreactor operations, as acid rock drainage is prevalent within the mine void due to exposed sulfides. The contact of this low pH (<3) water with the waste in the Bioreactor can be detrimental to Bioreactor performance.

Two large ponds (Ponds 2 and 3) provide temporary storage for short duration high intensity storm events, while pumps are used for longer duration rainfall events. Additional smaller interception sumps and pumping systems are located below Pond 2. The LEMP contains a full description of the mine void water management system.

Water collected in Ponds 2 and 3 is automatically pumped to ED3.

9.0 THE WOODLAWN BIOREACTOR SYSTEM AND MONITORING NETWORKS

The monitoring locations (air, noise, leachate, surface water and groundwater) are shown on Figures 3A and 3B. The details of the void and ED3 area are presented in the sub-sections below and in Figures 1 and 5.

9.1 Void

The landfill void is a distinctive large scale open cut mine with unique hydrogeological conditions (i.e. inward hydraulic gradients, Figures 3A and 5).

The mine void acts as a hydraulic trap (or groundwater sink) for groundwater due to the depth of the void (200 m). The surrounding discharge creek systems are much shallower (~100 m). Flow into the void is primarily through fractures/faults and seepage ports (horizontal bores through the slopes).

Once the void is filled with waste and leachate extraction ceases, the groundwater flow system will recover and merge with the prevailing regional flow regime. Rehabilitation of the void (in ~50 years time) and subsequent leachate management measures (e.g. pumping) will determine the extent of groundwater migration from the void.

9.1.2 Monitoring Well Network

Four deep groundwater monitoring wells (WM1, WM3, WM4 and WM7) were installed within the mine void perimeter in order to assess groundwater quality and water levels prior to (August 2003) and during Bioreactor operations. WM5 and WM6 were installed outside the void. These wells are sampled quarterly as per EPL conditions to determine baseline water quality data and monitor impacts from landfilling operations.

Sampling of the four wells began in August 2003. The analytical suite is presented in EPL 11436. Well construction details are summarised in Appendix B for all EPL wells (where available).

Water levels of twelve piezometers are also monitored in the void:

- P100A/B, P44A/B, P45A/B, P38A/B, P58A/B and P59A/B (where A = shallow, B = deep);

(no borelogs are available for the piezometers).

9.1.3 Surface Water (Void)

Catch drains run either side of the length of the haul road. During a rainfall event, water collects in these drains and is carried to Pond 2, Pond 3 or a constructed clay pond at the northern end of the void. Water is then progressively pumped via Pond 2/Pond 3 to a holding tank and then on to ED3 (Collex, April 2003).

9.2 Evaporation Dam 3 (ED3)

ED3 was created around 1991 with the construction of several low embankments and diversion drains around the perimeter of an area which had been used to source clay for the capping of the Woodlawn spoil piles (URS, November 2001).

The storage at ED3 is subdivided into three cells (northern cell - 7 ha, central cell - 8 ha, southern cell - 2.8 ha). The total storage capacity of the three cells is 366 ML (as of 2001, Figure 3A).

Veolia modified the extraction system (landfill leachate and acid mine drainage) from the landfill void to improve Bioreactor performance and gas generation from the waste. This included the additional storage lagoons within the ED3 System (i.e. the ED3N Lagoons), which were constructed mid to late 2007.

The 3 lagoons are approximately 0.5 ha, and located on the eastern side of ED3N. Each of the lagoons are used for additional storage potential, and all are clay lined. An updated leachate treatment system (aeration and chemical treatment) was developed for the long term leachate and AMD management (late 2007).

9.2.1 Monitoring Well Network

Wells located in the vicinity of ED3 are:

- Shallow wells (<6 m): MB10, MW6, MW7, ED3B
- Deep wells (~25 m): MB1, MB4, MB6, MB7

MW6 was damaged and replaced in November 2007 (i.e. MW-6R). An additional four wells (MW8S/MW8D, MW9S and MW10S) were installed down-gradient of ED3N during October and November 2007 by E2W.

9.2.2 Surface Water Monitoring Locations

Surface water monitoring is undertaken at two locations within ED3:

- ED3 North (WM203)
- ED3 South (WM202)

Surface water is monitored down-gradient of ED3 South and dolerite stockpile, and west of the rehabilitated waste rock dump at location WM200 (i.e. Raw Water Dam). ED1 is the surface water receptor downstream of ED3.

Surface water samples are routinely collected from two locations at the (disused) Plant Area (i.e. WM201), which reflect modified drainage systems. The Plant Area comprises the demolished remains of the former plant area (i.e. mine processing equipment and associated infrastructure).

- Location 'Spring 2' is upstream of the Bioreactor and opposite Crisps Creek, and flows during wet weather.

Surface water sample locations which may receive discharges from the void or ED3 (and part of EPL requirements) are:

- Site 105 - Crisps Creek/Pylara Boundary, which is downstream of the void and tailings impoundments.
- Site 115 - Woodlawn/Willeroo boundary to the north, is situated downstream of ED2 and part of ED1 and ED3N water storage systems.

9.3 Air and Noise Monitoring Locations

The air and noise monitoring locations are presented on Figures 3A and 3B.

- Dust monitoring is performed at two locations (DG22, DG24) onsite (i.e. east and west of the void respectively) and one offsite location (DG28) at nearby Pylara Farm.
- Surface gas monitoring is conducted on the landfill surface within the mine void.
- Sub-surface gas monitoring is conducted at three locations around the perimeter of the void. GMBH1 is located on the northern side of the void, GMBH2 on the eastern side of the mine void and GMBH4 on the western side of the void (Figure 3A).
- Noise monitoring locations are not situated within the Woodlawn Bioreactor site (i.e. only required near neighbouring residences).
- The Landfill Gas Flare is situated at the edge of the disused Plant Area, adjacent to the current Power Generation Hub. This flare destroys landfill gas generated by the Bioreactor.
- The three Landfill Gas Engines are situated at the edge of the disused Plant Area, within the Power Generation Hub.

10.0 INTERMODAL FACILITY SYSTEM AND MONITORING NETWORK

The IMF is designed to receive containers of waste (27 tonnes per container) from Clyde Transfer Terminal and transfer from rail to road. Trucks transport the containers from the IMF to the Woodlawn Bioreactor. All containers (54 per day) are shifted by container handler forklift onto the trucks and back onto the rail when they have been emptied.

The IMF covers a length of approximately 500 m along an existing railway. The surface water, noise and air monitoring locations are shown on Figure 3B and in the sub-sections below. Monitoring wells are not available at the IMF and are not a requirement of the EPL 11455.

10.1 Surface Water

The site is well downstream of the mine and is influenced by many general factors. The hill slopes surrounding Crisps Creek feed a confined alluvial aquifer, which further downstream becomes unconfined, with discharges to the creek surface water system and boggy areas adjacent to the creek.

Surface water samples are routinely collected from three downstream locations (i.e. Sites 110, 130 and 150).

- Site 110 is situated on Crisps Creek, approximately eight kilometres downstream of the mine and immediately upstream from the Crisps Creek/Mulwaree River confluence and IMF.
- Sites 110 and 130 are identified as upstream monitoring points for the IMF.
- Site 150 is situated on the Mulwaree River, approximately 2.5 km down-gradient of the IMF (Figure 3B).

10.2 Dust

Dust monitoring was formerly performed at one location (DG18). It was situated at the nearest residential building to the IMF. Due to the low dust deposition results recorded at the site and as construction of the IMF has been completed, the DECCW determined DG18 was no longer a licence requirement. As of February 2007, the gauge was removed from the monitoring schedule.

10.3 Noise

Noise monitoring is assessed when required at the nearest residential receptor, which is situated north of the IMF. Noise monitoring is only performed if complaints are received; and none were received in the 2009/2010 reporting period.

11.0 ASSESSMENT OF WOODLAWN BIOREACTOR MONITORING RESULTS

11.1 Woodlawn Bioreactor

The Woodlawn Bioreactor is assessed with regard to the pollutant source, pollution migration and adequacy of associated monitoring activities. The location of the void and associated monitoring network is presented on Figures 1, 3A and 5. Assessment of the monitoring data is summarised in Appendix D (time-series graphs) to Appendix K, and in the sub-sections below.

11.2 Review of Current Groundwater Monitoring Data

The groundwater monitoring wells WM1, WM3 to WM7, MB1, MB4, MB6 and ED3B are monitored by Veolia on a quarterly basis to assess baseline water quality data and levels in the void. Four of the monitoring wells (WM1, WM3, WM4 and WM7) are located within the void and target the floor area (~200 m depth) containing landfill waste (approximately 60 m thick in 2010).

The wells (MW9S, MW-8S, MW-8D, MW-10S[4], and WM5, WM6, MB6 and ED3B) are located in the vicinity of ED3. Peripheral down-gradient wells MB1 and MB4 are located between the void and Crisps Creek (Figures 3 and 6, Appendix D).

11.2.1 Hydraulics and Flow Regime

Wells in the void are interpreted to be down-gradient locations given they are in an (artificial) regional discharge area which is below the surrounding creek levels.

[4] dry well

The depth to water (mbgl and Reduced Level (RL)) measured in the piezometers and wells are graphically presented in Appendix D and Tables 1A and 1B. Selected water level time-series trends for MB wells are also presented in Appendix D. The reduced water levels and inferred groundwater contours are presented in Figure 3A.

It is noted that perched groundwater and/or mounded groundwater levels are likely to be present in the vicinity of the water storages (e.g. ED3 and ED2) where high recharge rates would be expected, or where wells are screened within the weathered regolith or alluvium due to the creation of preferential flow paths.

Differences in water depth are apparent in the 12 piezometers (piezo) and selected MB wells (MB5, MB7, MB8, MB15 to MB17). The depths reflect well location and position on the steep drawdown halo surrounding the void (Figure 5). The water levels are hosted in variable bedrock formations which may be stratified and/or slightly fractured/faulted, which causes a higher secondary permeability and greater connection with dewatering activities in the void.

The 12 piezometer and 6 monitoring wells show variable water level fluctuations, but generally a slight response to rainfall recharge. The time-series graphs are indicative of the (tight) bedrock geology and generally low groundwater recharge conditions.

The piezometers P44A and P58B show a pronounced (>10 m over time, Appendix D) water level change from rainfall recharge and are interpreted to intersect localised faulting/fracturing. Fault planes and increased rainfall recharge are interpreted to cause the fluctuating water levels in the wells and piezometers (Figure 1).

The water table RL in the 12 piezometers located in the void range from 700 m AHD (P100B) to 790 m AHD (P59A). The water level in piezometers is approximately 20 to 100 m above the waste (680 m AHD) and elevation of leachate (~670 m AHD).

The location of seepage points (from the base of the void and through horizontal conduits) and depth to water (piezometers/wells) shows hydraulic containment and an inward cone of depression centered around the floor of the void (Figures 1 and 5).

The water levels in the 12 piezometers and surrounding wells indicate the pumping from the base of void and/or fluctuating leachate levels (waste ~60 m thick) have no obvious effect on the local water levels. The current data supports the impervious nature of the bedrock and limited hydraulic connection of local groundwater and landfill leachate levels.

The inferred groundwater flow regime at the void is presented in Figures 1 and 5. The flow regime is based on a previous assessment by URS (1999) and E2W's 2007 review of current (average) water levels from existing piezometers and monitoring wells (Tables 1A and 1B).

The groundwater levels measured in wells outside of the void (e.g. MB1 - MB8, MB10 - MB17) show variable trends, ranging from relatively stable (MB15, MB16) to variable and fluctuating (MB3, MB4). However, most wells show an overall increased depth to water (deepening of the water table), reflecting the prevailing rainfall patterns and recharge.

The deepening of the water at some locations (MB10, MB2, MB5) are interpreted to relate to the depletion of water storages (ED1 or WRD), and/or mine cessation/rehabilitation works. The drought conditions in the past few years would generally deepen the water table on a regional scale.

11.2.2 Groundwater Quality and Trends

Multi-parameter time-series graphs for the four wells in the void (WM1, WM3, WM4 and WM7) are presented in Appendix D. The hydrochemical fingerprint from each well is generally different, indicating the contrasting geology in the void (i.e. tuff, dolerite, schist, sulfide ore body).

A summary of groundwater chemistry from 2005 to present (i.e. post mining operations and during landfilling operations) is summarised as follows[5] (Table 1A):

- WM1: Ca-SO_4 water type, brackish (2.0 mS/cm), near-neutral pH (7.20),
- WM3: Ca/Mg-SO_4 water type and relatively acidic (pH = 4.26) and brackish (6.8 mS/cm),
- WM4: Ca-SO_4 water type, fresh - brackish (1.7 mS/cm) and slightly acidic (pH = 6.95),
- WM5: Na-Cl water type, brackish (6.0 mS/cm) and pH 7.05,
- WM6: Na-Cl water type, brackish (11.5 mS/cm) and pH 6.22,
- WM7: Ca-SO_4 water type, brackish (4.2 mS/cm) and slightly acidic (6.80),
- MB1: Ca-SO_4 water type, fresh (1.1 mS/cm) and pH 7.46,
- MB2: Ca/Mg-SO_4 water type, brackish (6.3 mS/cm) and pH 6.91,
- MB3: Ca/Mg-Cl water type, brackish (2.2 mS/cm) and pH 7.08,
- MB4: Na-Cl water type, fresh (1.2 mS/cm) and pH 6.31,
- MB5: Mg-SO_4 water type, brackish (8.1 mS/cm) and acidic pH (3.99),
- MB6: Na-Cl water type, brackish (4.0 mS/cm) and pH 6.25,
- MB7: Na-Cl water type, brackish (7.6 mS/cm) and pH 6.93,
- MB8: Na-Cl water type, brackish (4.0 mS/cm) and pH neutral (7.09),
- MB10: Mg-SO_4 water type, brackish (6.7 mS/cm) and neutral (pH = 7.10),
- MB11: Mg-SO_4 water type, brackish to nearly saline (25.9 mS/cm) and pH 5.03,
- MB12: Mg-SO_4 water type, brackish to nearly saline (29.7 mS/cm) and pH 4.27,
- MB13: Na-Cl water type, brackish (2.9 mS/cm) and pH 6.78,
- MB14: Ca/Mg-SO_4 water type, brackish (4.7 mS/cm) and pH 7.40,
- MB15: Mg-SO_4 water type, brackish (6.5 mS/cm) and pH 6.56,
- MB16: Mg-SO_4 water type, brackish to nearly saline (26.4 mS/cm) and acidic pH (3.94),
- MB17: Mg-SO_4 water type, brackish (10.7 mS/cm) and pH 6.45,
- ED3B: Na-Cl water type, brackish (7.4 mS/cm) and pH 6.79,
- MW-8S: MW-8S: magnesium sulphate water type, brackish (EC = 12.5 mS/cm) , neutral pH (6.60),
- MW-8D: magnesium sulphate water type, brackish (EC = 11.0 mS/cm) and near neutral pH (6.58),
- MW-9S: sodium chloride water type, brackish (EC = 8.0 mS/cm) and near neutral pH (6.52),
- MW-10S: no data as well continually dry.

Discussion of Results and Trends

One well (MW7) shows a larger scatter of data (i.e. EC, zinc and iron levels, Appendix D), indicating potential mixing of water types (e.g. run-off, leachate, AMD). The data may also indicate the ingress of surface water around the well head works and influence from storm water. An inspection of the well head-works and local drainage issues is recommended.

Groundwater quality from the MB wells (MB1 - MB8, MB10 - MB17) is generally variable. While sulphate levels are consistently elevated they are considered to reflect background or seasonal variation. Evaporation and precipitation/dissolution of surface salts (Na-Cl, sulfur) is likely to influence recharge

[5] pH and EC measurements are averages from 2005 to the end of the current licence period.

waters and affect sulphate and conductivity trends in the groundwater. Groundwater quality from the WM wells (WM1, WM3 - WM7) is generally variable over the monitoring period.

The water quality trends presented in the time-series graphs indicate various trends and fluctuations, with the significant water quality changes described below:

- MB1: Iron is fluctuating and during the reporting period decreased to pre-2004 concentrations, reversing a previously increasing trend. EC is stable. The borelog for MB1 indicates that a fracture within dolerite bedrock was encountered at 21.5 mbgl.
- MB2: Iron is variable and declined during the reporting period to pre-2002 concentrations. Zinc and ammonia concentrations were monitored more frequently than in previous reporting periods and are generally stable. EC and sulphate levels are stable.
- MB3: Iron is variable and decreased during the reporting period to pre-2002 concentrations. Zinc concentrations are variable while sulphate concentrations are stable around 35 mg/L. EC is stable.
- MB4: Iron is variable and decreased during the reporting period back to pre-2002 concentrations. Ammonia concentrations are variable. EC is decreasing
- MB6: Sulphate, iron, ammonia and conductivity levels are variable but generally increasing, while zinc and total organic carbon concentrations are fluctuating.
- MB7: EC and zinc are fluctuating. Iron is variable and decreased during the reporting period to pre-2002 concentrations.
- MB8: Zinc concentrations are variable but generally decreasing. Iron concentrations are variable. EC is decreasing.
- MB10: Zinc concentrations are variable but generally decreasing. Iron concentrations are variable.
- MB11 EC is increasing. Sulphate and iron concentrations are higher than during mining but are not increasing. Zinc is also higher than during mining and concentrations fluctuate (eg. Ranging from 220 to 4380 mg/L during reporting period).
- MB12: EC is increasing. Sulphate and iron concentrations are increasing. Zinc concentrations are fluctuating (range of 230 to 6180 mg/L in reporting period).
- MB13: Iron, zinc and EC levels are variable. In the last sample collected during the reporting period (18/06/2010) all three analytes showed a marked increase in concentration (e.g. zinc was reported as 26 mg/L compared with post mining average of 3.8 mg/L).
- MB14: Zinc and EC levels are variable. Iron concentrations are decreasing.
- MB15 and MB17: Zinc concentrations are variable and lower than during the mining period. Iron levels had previously been increasing but decreased markedly during the reporting period. EC is variable.
- MB16: Zinc and iron levels are fluctuating but generally decreasing while sulphate levels appear to be slightly increasing. EC is increasing.
- WM3: In late 2005, a change occurred in the water quality as evidenced by a rise in sulphate, conductivity and ammonia levels. The water quality trends pre-and-post 2005 monitoring are generally more stable, however decreasing trends are noted for conductivity, iron, zinc with increasing alkalinity (rising pH). The late 2005 water data may relate to earthworks in the void and leachate dispersion. The removal of the waste rock also affected the water level in MW3 during 2006.
- WM7: Also in late 2005, the water quality trend changed with a decrease in sulphate and a sharp rise in conductivity, and a slight (temporary) rise in zinc. The water quality trends pre-and-post 2005 monitoring are generally more stable, however decreasing trends are noted for zinc, and TOC.
- WM1: Ammonia concentrations have gradually increased since monitoring commenced in 2004 (WM1 is located in the void, with trends reflecting potentially dispersion of leachate). The pH and conductivity levels of groundwater collected from WM1 have been stable since October 2006.

The depth to water in groundwater wells (MB wells) has increased over time (Appendix D).

Slight variations observed in key analytes (ammonia, iron, zinc, sulphate, pH, EC) shown in the time-series graphs is interpreted to relate to the precision of the sampling procedures, difficulty in purging deep wells, low yield wells and/or collecting unstable anaerobic groundwater from the void. Other similar variations in water quality are also anticipated from seasonal changes and rainfall recharge effects.

The water quality trends from MB11 and MB12 indicate that a leachate plume (zinc, sulphate, increasing conductivity) is migrating from ED-2. The plume has the potential to impact water quality in the downgradient creek. The results from MB19[6] (with rising Zn and sulphate, located 50 m downgradient of MB-11/12), and surface water quality in the downstream Allianoyonyiga creek sample (115) shows elevated and fluctuating parameters (Zn, EC, sulphate) which may reflect plume discharges via baseflow (e.g. 115 results for Zn concentrations ranges from 0.01 mg/L to almost 1mg/L).

The latest results from MB13 in the reporting period (showing markedly higher sulphate, zinc and EC on 18/06/2010) support the interpretation of a leachate plume from ED2 (MB13 is approximately 500 m downgradient of ED2, near surface water monitoring point 115). However the results may be anomalous, as samples collected from MB13 before and after 18 June 2010 show concentrations of sulphate, zinc and EC at much lower levels that are consistent with the data set. A review of sampling processes, an assessment of monitoring well condition (eg. damage pipework, ingress or drainage) and future results from MB13 is recommended.

Based on the water quality trends (time-series graphs of TDS, K, BOD, TOC, ammonia, SWL) in surface water and available groundwater wells at ED3 area, E2W interpret that groundwater pollution has not occurred from landfill leachate to areas to the south, north and east of the ED3 evaporation dams.

The status of groundwater conditions and trends down-gradient of ED-3N is in progress given that monitoring wells were only recently installed (November 2007). The data from MW9S indicates an increasing trend for sulphate and conductivity while iron decreased markedly during the reporting period (from 17 mg/L in July 2009 to <0.01 mg/L in March 2010). Iron also decreased markedly in MW8D, which is downgradient of ED-3N (Appendix D). Previously TOC concentrations in MW8D and MW9S showed an increasing trend but were lower in this 2009/2010 reporting period. The trends in MW9S and MW8D may indicate the potential for leachate breakthrough at those locations, however natural attenuation may minimise the increasing trends for other pollutants such as ammonia, zinc or iron.

All pesticide results (OC/OP) from the surface and groundwater water monitoring locations were reported below laboratory detection limits.

11.2.3 Well Construction Issues

Construction details for the monitoring wells are presented in Appendix B (where available). It is noted that the floor of the mine is at 640 m AHD (240 mbgl), while the depth of waste is approximately 700 m AHD (60 m deep). The void monitoring wells are generally terminated at 85 - 115 m depth and target the base of the mine void.

[6] MB-19 and MB20 are located downgradient of MB11 and MB12 however are not part of the EPL requirements.

The bore depths and well construction designs are considered suitable for the early stages of Bioreactor monitoring (e.g. 60 m of waste). However, as the void is progressively filled with waste and above (e.g. 30 m) the existing well screen intervals, additional stratigraphic (intermediate wells) may be proposed for monitoring potential or actual groundwater pollution migrating from the void. However, it is well recognised that the potential for leachate escape from the void with the existing inward hydraulic gradient is very low (Figure 5).

11.2.4 Adequacy of the Groundwater Monitoring Network

The monitoring of water quality within the void system is considered to be adequate (Figure 5). This interpretation is based on the void invert being below the water table. The hydraulic pressure differential between the leachate and groundwater system induces a steep inward hydraulic gradient that produces a hydraulic trap (i.e. no escape of landfill leachate from the void). As the flow is inwards, the wells need to demonstrate that the inward gradient exists, which is very clear based on the water level graphs, survey waste levels and inferred flow regime (Figures 3A).

The monitoring network within the void demonstrates the inward hydraulic gradient (i.e. a hydraulic trap) and containment of leachate within the void (Figures; 3A, 5).

The monitoring network outside of the void and ED3 is considered adequate, given that an additional 4 wells (MW8S/8D, MW9S, MW10S and a replacement for WM6) were installed down-gradient of ED3N in November 2007. Refer to E2W's June 2007 report entitled *Woodlawn Evaporation Dam 3 and Monitoring Issues*.

11.2.5 Analytical Testing and Monitoring Issues

The analytical and field testing procedures are considered appropriate for the wells and surface water in the landfill. Some technical issues for future monitoring include:

- Calibration of field instruments. Address the pH variations between field and lab measurements (up to 1 unit difference). Due to the anaerobic, aggressive and reduced nature of the deep groundwater in and around the void, the short holding times for pH are difficult to overcome when laboratories are located offsite. Priority should be given to use of calibrated field instruments and measurements.
- Any anomalous results (eg. MB13) or LOR issues should be addressed as part of a quarterly data review process.
- A quality control program (sampling protocol) should be implemented to check the laboratory data, which is to include re-analyses of anomalous data (as appropriate). The inclusion of blind field duplicates (1 per 20 samples or per batch) and decontamination procedures would be beneficial to assess laboratory performance.

EPL Non-Compliances in the 2009/10 Reporting Period

Veolia are discussing the monitoring requirements for monitoring points MB1 – MB8 and MB10 – MB17 with DECCW, and aim to reduce the number of analyses. Thus, it is noted the full suite of parameters listed in the EPL for MB1 – MB8 and MB10 – MB17 were not consistently analysed in the past two reporting periods. This non-compliance is planned to be resolved by the end of the next reporting period once discussion with the DECCW are finalised.

The 2009/2010 non-compliances for the EPL are summarised in Appendix K.

BTEX/PAH analysis was not completed on at monitoring points at eleven locations (25, 28, 30, 41, 42, 43, 44, 45, 46, 56, 57) during this reporting period due to failure of the laboratory to carry out requested analysis. Notification of failure to complete the requested analysis has been addressed with the NATA accredited laboratory.

Monitoring location 47 was decommissioned due to waste placement operations and did not achieve the required sampling frequency. DECCW was notified of the intention to decommission the well. A replacement program is intended to be submitted during the next reporting period.

Monitoring location 48 was deemed unsafe to complete monitoring due to unstable access on the mine void bench. A replacement location for this well may be included in the replacement program if further analysis indicates access to the sites remains unsafe.

Monitoring location 55 & 58 did not meet the sample frequency due to insufficient liquid to obtain samples for analysis. VES will continue to monitor standing water levels to ensure sampling recommences once sufficient flows return.

11.2.6 Recommendations (Groundwater)

The existing well network and analytical program is generally satisfactory for groundwater monitoring at the Woodlawn Bioreactor, however further investigations are recommended at MB11/MB12/MB19 (and possibly MB13) where an expanding leachate plume (Zn, sulphate) is inferred. The polluted groundwater has potential to impact on surface water (115) systems.

A review of the water storage practices is proposed at ED2 as the dam is underlain by alluvial sediments (some sands) with possible leakage of leachate.

As the landfill waste level rises over time, additional stratigraphic wells (e.g. intermediate depth) are required to monitor water quality with regard to the prevailing waste level. Intermediate wells to monitor the groundwater at the void are proposed when the tip face is greater than ~30 m above the existing wells screens intervals.

E2W offer the following suggestions for improving the monitoring and laboratory results for the site:

- Low pH (WM3, MB5, MB11, MB12) - include all carbon species (carbonic acid is dominant at pH <4) for acidic groundwater conditions. Alkalinity, carbonate and bicarbonate species are not present in acidic pH.
- Field filtering and preserving of heavy metal samples in the field is required to ensure representative dissolved metal concentrations (i.e. metals precipitate rapidly in deep anaerobic groundwater). Appropriate containers should be provided by the laboratory, which includes preservatives for unstable analytes (heavy metals and nutrients).
- Monitoring wells should be purged of 3 bore volumes (if possible) or when field measurements (pH, EC etc.) are stable before sampling. Low flow purging techniques may improve the consistency of the monitoring results with the deep, low yielding wells and or well development procedures to remove any accumulated silt or precipitates in the well bottom/sump.
- Veolia to obtain documentation from Ecowise that all analytical testing meets the required standards, analytical methodology according to NATA registration, EPL conditions, and NEPM (1999) protocols.

- The condition of well (MB13) should be inspected to assess if recent sample results are due to ingress of surface water. A review of sampling processes, well depth (silt accumulation at bottom of the well), including decontamination of sampling equipment and purging of wells prior to sample collection is recommended prior to the collection of further samples from MB13.

11.3 Assessment of Surface Water Monitoring Data

The requirements for the surface water monitoring are outlined in Appendix C (Environmental Monitoring Schedule) and shown on Figures 3A, 3B and Appendix E. Surface water is collected from within the void and surrounding water bodies and creeks:

- Site 115 (Allianoyonyiga Creek)
- Spring 2 and Site 105 (Crisps Creek)
- WM200 (surface water collected from the Raw Water Dam, which is located west of the rehabilitated waste rock dump)
- WM201 (existing mine building)
- ED3 South (WM202, ponded water in ED3S)
- ED3 North (WM203, ponded water in ED3N)
- Ponds 2 and 3 (lined sediment ponds capturing runoff entering the void)

Two water bodies require monitoring for leachate quality:

- Leachate Dam (used to collect and treat leachate at the top of the void)
- Leachate Recirculation System

11.3.1 Surface Water Quality Results

A summary of the surface water chemistry is as follows[7] (Table 2 and Table 3):

- Site 115: Na-Cl water type, fresh (1.2 mS/cm) and pH 7.22,
- Spring 2: Ca-SO_4 water type, fresh (1.2 mS/cm), pH 5.48,
- Site 105: Na/Mg-Cl water type, brackish (1.6 mS/cm) and pH near-neutral (7.20),
- WM200: Na/Mg-Cl/SO_4 water type, brackish (2.5 mS/cm) and pH 6.93,
- WM201: Na-SO_4/Cl water type, fresh (0.5 mS/cm) and pH 6.74,
- ED3S (WM202): Mg-SO_4 water type, brackish (9.8 mS/cm), acidic at pH 3.98,
- ED3N (WM203): Mg-SO_4 water type, brackish (16.6 mS/cm), acidic at pH 4.42,
- Pond 2: Mg-SO_4 water type, brackish (9.0 mS/cm) and acidic pH (4.21),
- Pond 3: Mg-SO_4 water type, brackish (10.3 mS/cm) and acidic pH (4.24).

The surface water monitoring data and statistics (minimum, maximum, average, standard deviation) are presented in Tables 2 and 3 and on time-series graphs in Appendix E.

11.3.2 Discussion of Results

Similar to the groundwater trends at the Woodlawn Bioreactor, the surface water quality is variable (Appendix E) reflecting seasonal changes. All pesticide results (OC/OP) from the surface water monitoring locations were reported below laboratory detection limits.

[7] pH and EC measurements are averages from 2005 to end of current licence period.

- Water quality in Ponds 2 and 3 show variable but generally stable trends for ammonia, pH, iron, zinc and sulphate levels over time. The variations may reflect runoff from waste/weathered rock (containing pyrite) is entering the void and holding ponds.
- Site 115 (surface water at downstream area) results also show a fluctuating trend for EC, zinc, sulphate, iron and ammonia. The trend is interpreted to reflect variable flow conditions due to climate. The creek system is ephemeral and primarily considered to be a losing stream. Impacted groundwater may be migrating from the base of ED-2 (as indicated from groundwater data from MB11, MB12, MB13, MB19) and influencing surface water quality due to baseflow contributions.
- All graphed parameters for Spring 2 exhibit an overall declining trend (pH, EC, ammonia, sulphate, zinc, iron, TOC). The water has become slightly acidic (~1 pH unit) over time. As Spring 2 is upstream of the dams and void, it is likely to represent background changes due to drought.
- The time-series graph for Site 105 indicates levels of key parameters are fluctuating (but generally stable), reflecting the contribution of runoff, evaporation processes and groundwater baseflow.
- E2W understand the discharge into ED3N and ED3S from 2005 represent a combination of acid mine drainage (AMD) and landfill leachate. Generally, the two water types are separated in the evaporation dams, however it is understood that the programmed pumping from the under liner drainage sump in the landfill void resulted in the mixing of leachate and AMD, which was inadvertently pumped into the ED3 system. The mixing of AMD/leachate (high nutrients/TOC) is indicated in ED3S (early 2005) and ED3N (late 2005, Appendix E).

The time-series graph for location WM200 indicates rising sulphate and zinc trends from 2004 to mid-late 2007, however since 2007, concentrations have stabilised and/or decreased.

The dolerite stockpile drainage lines drain into ED1 (Figure 1). A breach was discovered in this drain during the 2005/2006 reporting period and it is likely some acidic water entered the Raw Water Dam (WM200) as a result (refer to the 2007/08 SML20 report). The breach has since been repaired, which is reflected by the decreasing iron, zinc and sulphate concentrations and trends at WM200 in 2008.

Leachate quality monitoring is undertaken yearly on the leachate pond and leachate recirculation system (see Appendix E for graphs). Since mid-2008, the concentrations of TOC, ammonia, iron and sulphate have fluctuated but generally declined in the leachate pond, while EC continued to increase. Zinc is following an increasing trend. In the recirculation system, EC, sulphate and zinc are increasing.

11.3.3 Adequacy of the surface water monitoring network

The monitoring network is considered to be generally satisfactory, however associated environmental data (e.g. flow, water colour, odour) is required to compliment testing location, sample type and results achieved.

Due to the dynamic and large scale nature of the surface water monitoring the site specific details are required for all the sampling events (climate, flow rates, turbidity, springs flows). The sampling locations are generally considered satisfactory, however timing of the sampling events should be coordinated with representative dry and wet periods to better characterise the nature of potential pollutant source(s).

EPL Non-Compliances in the 2009/10 Reporting Period

There were no surface water non-compliances for the 2009/10 reporting period.

11.3.4 Recommendations (Surface Water)

- The sampling staff to include additional sampling details regarding the climate and flow regime at time of surface water sampling.
- Increased iron, zinc and sulphate concentrations in WM200 were most likely associated with the breach in the drainage line linking the dolerite stockpile with ED1 (identified in 2006). Continued monitoring of WM200 water quality trends is recommended.

11.4 Dust

- DG24 is on the western side of the mine void and in close proximity to where earthworks have occurred during previous reporting periods. The average total solids concentration for the 2009-10 reporting period (6.40 g/m^2/mth) is higher than that reported in 2008-09 (4.88 g/m^2/mth). This slight increase in dust is associated with the exposed soil, periods of low rainfall and regional dust storm events. A major dust storm affected NSW between September 22 and September 24, 2009 which significantly affected average dust deposition during this monitoring period. In September 2009, 30.1 g/m^2/mth was measured, which is the highest reported result at this monitoring point since monitoring began in 2001 (next highest 14.3 g/m^2/mth in September 2008).
- DG22 is downwind of DG24, situated on the eastern side of the mine void. This gauge had slightly lower readings than DG24 during the 2009-10 period (average = 5.94 g/m^2/mth), indicating dust originating from the earthworks is also heading downwind. Dust levels were higher than in 2008-09 (5.25 g/m^2/mth) period. Dust deposition of 29.9 g/m^2/mth was reported at DG22 in September 2009 (next highest reported September 2008, 13.8 g/m^2/mth), showing that the dust storms had a significant impact on average dust deposition results in the reporting period.
- The offsite sampling location (Pylara, DG28) 2009-10 average of 4.05 g/m^2/mth was slightly lower than that reported in 2008-09 (5.1 g/m^2/mth). This may indicate that dust emissions have been contained on site. Dust deposition of 21.3 g/m^2/mth was reported in September 2009 (next highest reported January 2009, 16.5 g/m^2/mth)

Dust levels at DG24 and DG22 were reported at their highest levels since Veolia undertook monitoring in 2002, similar to the results in 2008-09 when dust levels were reported at their (then) highest (DG22) or second highest average (DG24, DG28). While it is interpreted this is associated with exposed soils, low rainfall and/or regional dust storm events, dust levels will be closely monitored in the next reporting period and the appropriate actions undertaken if levels continue to rise.

11.5 Landfill Gas Management

A key aspect to the Woodlawn Bioreactor is the control and utilisation of landfill gas. Landfill gas is produced as a by-product of the decomposition of organic matter in waste. Methane production typically begins 6 to 12 months after waste placement and may last for decades.

Landfill gas generally contains methane, carbon dioxide, nitrogen and trace elements of hydrogen sulphide and oxygen. Landfill gas migration and emissions are assessed by Veolia at varying locations to determine the correct method of control and ensure that emissions do not pose adverse risks to public health and safety (Collex, August 2004).

Gas extraction infrastructure developed at Woodlawn is used to extract landfill gas from the Bioreactor for energy generation and to mitigate the effect of gas emissions into the surrounding environment. Monitoring locations around the site are used to determine the effectiveness of the extraction system.

11.5.1 Sub-surface Gas

Sub-surface gas monitoring is conducted at 3 locations around the perimeter of the void, and is used to assess if landfill gas is migrating through the soil and rock profile beyond the mine void. As methane is the main constituent of landfill gas, concentrations of this gas are monitored and recorded. Monitoring is conducted quarterly as per the published guidelines for sampling and analysis of air pollutants in NSW (DECCW 2007).

Methane concentrations achieved this reporting period show minimal landfill gas has been detected prior to purging (GMBH1 30/10/09 methane = 0.1%) and no methane detected after purging (Appendix H1).. These results indicate that gas migration is not occurring and that the gas collection network is working effectively.

11.5.2 Surface Gas

Surface gas monitoring at the Woodlawn Bioreactor is used to assess gas emissions from the waste surface into the surrounding environment. Monitoring is conducted quarterly as per the guidelines specified in the published guidelines for sampling and analysis of air pollutants in NSW (DECCW 2007).

Similar to sub-surface gas monitoring, methane is the measurable pollutant, as determined by the DECCW. Results achieved after purging are below the notifiable level of 1.25% by volume. The highest reading recorded was 0.6% (Appendix H2) during this reporting period.

During the 2006/07 reporting period, an independent analysis was conducted by GHD to assess the level of gas extraction and efforts to mitigate the migration of methane into the atmosphere. GHD calculated that 92% of the methane is captured, which is considered a good outcome considering that a conventional landfill gas capture is 70 - 75% (Inside Waste, WMAA, Sept/Oct 2007, page 23).

11.5.3 Landfill Gas Flare

The landfill gas is collected by active extraction and combusted through an enclosed high temperature flare. The flare system provides a means of destroying the landfill gas compounds. Gas flow and temperature are recorded in accordance with the approved methods specified by the DECCW.

With the increase in gas production from the Bioreactor, the ability to burn more landfill gas through the flare has been possible. Additional burners have been progressively installed in the flare to increase the operational potential. A gas flow meter was installed in August 2007, to accurately measure gas flow volumes delivered to the flare, which at full operational capacity is designed to burn 1,500 m^3/hr of landfill gas.

Landfill gas production from the bioreactor reached a suitable volume for power generation in February 2008. The data recorded during the reporting period has shown that use of the flare has been minimal, as the utilisation of the landfill gas for power generation has become the main focus for the site. The flare is operated periodically when the generators are offline for maintenance activities.

11.5.4 Landfill Gas Fired Generator

The Woodlawn Bioreactor is designed to encourage the decomposition of waste, which in turn promotes the development of landfill gas production. Landfill gas is extracted from the waste via a network of installed gas extraction wells which are under vacuum. The gas is passed through a gas conditioning unit to filter contaminants from the gas, such as siloxanes and Hydrogen Sulfide. A constant supply of landfill gas is delivered to the generators by a positive displacement blower to maintain continuous power generation.

During the 2007/08 reporting period, the first landfill gas generator was commissioned to generate electricity to export to the grid. This commissioning process occurred in February 2008, with full operational capacity beginning in June 2008. Veolia officially launched the Woodlawn Bioreactor Energy project on the 14th of April 2008. The second landfill gas generator was commissioned in November 2008 and a third in March 2010.

The monitoring results for these generators indicate that the oxidisation process of the methane during the combustion process is performing as per the manufacturer's specifications. On a regular basis the generators are tuned to ensure maximum generation potential and combustion efficiencies are within the EPL limits.

12.0 ASSESSMENT OF THE INTERMODAL FACILITY MONITORING RESULTS

The IMF is assessed with regard to the pollutant source, pollution migration and adequacy of associated monitoring activities. The location of the IMF is presented on Figure 3B. The monitoring data is limited to three surface water monitoring locations (Sites 110, 130 and 150) on Crisps Creek. The monitoring data and graphs are presented in Appendix F, Table 4 (statistics) and in the sub-sections below.

12.1 Review of Current Surface Water Monitoring Data

Monitoring wells are not available at the IMF. The surface water monitoring locations were each sampled six times in 2009/10 for a wide range of parameters. The locations are as follows:

- Site 130 was commissioned in 2002 to assess water quality upstream from the IMF in the Mulwaree River, before the confluence at Crisps Creek.
- Site 150 is located on the Mulwaree River, approximately 2 km downstream of the IMF. Quarterly monitoring has been undertaken since 1998 for a broad range of analyses.
- Site 110 is located on Crisps Creek, downstream of the IMF, at the bridge crossing on Bungendore Road. Quarterly monitoring has been undertaken since 1993 for a broad range of analyses.
- The IMF First Flush system is situated at the Crisp Creek IMF and is designed to intercept rainfall runoff from the hardstand prior to discharge to the Mulwaree River.

12.1.1 Water Quality and Trends (Surface Water)

The statistics and time-series graphs for the IMF monitoring data are presented in Table 4 and Appendix F. The water chemistry for the surface water locations is summarised below[8]:

- Site 150: Na-Cl water type, fresh (0.8 mS/cm) and pH 7.36. The water monitoring data indicate EC, sulphate, iron, ammonia, zinc and TOC are fluctuating. The highest ammonia concentration (0.84 mg/L) was recorded in January 2007.

[8] pH and EC measurements are averages from 2005 to present.

- Site 110: Na-Cl water type, fresh (0.9 mS/cm) and pH 7.22. Key parameters are variable and the highest ammonia concentration (0.82 mg/L) was recorded in January 2007.
- Site 130: Na-Cl water type, fresh (0.4 mS/cm) and pH 7.44. The monitoring data indicates slightly overall decreasing yet variable trends for zinc, ammonia, iron and TOC.
- IMF First Flush: Na-Cl water type, fresh (0.4 mS/cm) and pH 7.44. The monitoring data indicates fluctuating results around relatively stable trends for all monitoring parameters (pH, EC, zinc, sulphate, ammonia, iron, TOC).

Past surface water monitoring data indicate potential nutrient pollution from the IMF. The highest ammonia concentration (but still below 0.9 mg/L) recorded from Sites 110 and 150 (both downstream of the IMF) was not matched with an elevated reading at the upstream sampling location (Site 130).

Other sources of nutrients however, may arise from the agricultural catchment (farming activities) and evaporation processes. The monitoring data should be observed closely in the near future to assess the nutrient sources in the catchment (e.g. fertiliser application). The first flush monitoring results from the IMF indicate that nutrient levels (ammonia, TOC) are low with relatively stable trends.

12.1.2 Adequacy of the Monitoring (IMF)

The monitoring at the IMF is generally adequate due to the nature of the sampling locations (i.e. up and down-gradient of the IMF). However, the downstream location (Site 150) could be situated closer to the IMF site (e.g. 200 m downstream) to minimise nutrient contribution by the surrounding agricultural areas[9].

Monitoring at the IMF should be undertaken during dry and wet periods to assess potential impacts to the aquatic environment. Potential leakage from the waste containers would be picked up in the first flush system, however is so far not evident in water quality testing (Appendix F).

12.1.3 Analytical Testing and Monitoring Issues (IMF)

Analytical and field testing suites are provided for the IMF from the 1990s to 2007 for Sites 110 and 150, while monitoring at Site 130 commenced in 2004. The monitoring program currently includes major ions, metals, nutrients, pH and EC, which are appropriate parameters for the IMF.

E2W offer the following suggestions for improving the monitoring and laboratory results for the site:

- Provide QA for pH and EC field measurements by VES staff (calibration records, instrument models etc.).
- Recording of flow, and prevailing climate and water conditions (algae, turbidity etc.) at each location.
- Include total metal concentrations for surface water analyses (dissolved metals are for groundwater).

EPL Non-Compliances in the 2009/10 Reporting Period

Three monitoring locations (1, 2 & 3) stipulated for monitoring in the EPL 11455 were not tested for in the six rounds (oil and grease, phosphorous, total suspended solids and total Kjeldahl nitrogen); these were last analysed in March 2007. This was due to a monitoring schedule review to coincide all monitoring of sample pollutants of the IMF EPL with the Bioreactor EPL as directed by DECCW. This

[9] VES is in discussion about potential changes to surface water monitoring at the IMF.

meant the sampling frequencies for these scheduled pollutants were not met during this reporting period. To date VES is awaiting a licence modification from DECCW.

12.2 Noise and Dust

Dust monitoring was formerly undertaken at one location (DG18). It was situated at the nearest residential building to the IMF. Due to the low dust depositions recorded and as construction of the IMF has been completed, the DECCW determined DG18 is no longer a licence requirement. As of February 2007, the gauge was removed from the monitoring schedule (Appendix G).

Monitoring location 4 did not achieve the required sampling frequency due to the monitoring schedule review to coincide monitoring of sample pollutants of the IMF EPL with the Bioreactor EPL as directed by DECCW.

Noise measurements were not undertaken during the operation stage given that there were no registered noise complaints from neighbours. However, should any construction occur at the facility, noise monitoring would be conducted as per the LEMP and conditions of consent.

As Veolia has not received any noise complaints during this reporting period, no monitoring has occurred, showing that IMF operations are having minimal impact on the surrounding community.

12.3 Recommendations (IMF)

The recommendations for the IMF are as follows:

- Samples should be collected according to climate (dry/wet) as much as possible with details recorded regarding the nature of flows and any observations (algae, odour, turbidity, debris content).
- It is recommended that the monitoring location Site 150 is moved closer to the IMF (i.e. 200 m downstream of the IMF) to minimise nutrient contribution by the surrounding agricultural areas.

13.0 COMPLAINTS

Nine complaints were received regarding the Woodlawn Bioreactor during the 2009/10 reporting period, however no complaints were reported for the IMF. All complaints received were for odour being detected locally. Meteorological data was used to establish prevailing wind conditions to assess the Bioreactor's potential to have impinged upon the local ambient air quality.

Table 13.1: Complaints Register 2009/10

Date:	Time:	Complaint	Location:	Veolia response
26/10/2009	10.45am	Odour	Taylors Creek Road	Phoned complainant
6/11/2009	8.50am	Odour	Taylors Creek Road	Phoned complainant
18/06/2010	8.30pm	Odour	Tarago - Village	Phoned complainant
8/07/2010	10.00am	Odour	Taylors Creek Road	Phoned complainant
29/07/2010	9.10am	Odour	Tarago - Village	Phoned complainant
9/08/2010	9.30am	Odour	Taylors Creek Road	Phoned complainant
10/08/2010	9.45am	Odour	Taylors Creek Road	Phoned complainant
13/08/2010	1.00pm	Odour	Tarago - Village	Phoned complainant
14/08/2010	1.00pm	Odour	Tarago - Village	Phone complaint to council

In light of the odour incidents recorded in previous reporting periods, Veolia is still working with local residents in identifying when an odour is detected and types of odour. Veolia is encouraging locals to visit or call the Bioreactor directly, or voice their concerns to the Community Liaison Committee, which regularly meet to discuss various operations. Each complaint was investigated and details were formally recorded on the complaints register and Hippo Station, and followed up in accordance with the pollution complaints procedure, both of which are part of VES' National Integrated Management System.

With the development of the leachate treatment system Veolia will continue with open communications with the local community. Improved communications with local residents will occur by placing articles in the local paper, keeping them informed of site activities.

14.0 POLLUTION STUDIES AND REDUCTION PROGRAMS

With reference to the conditions outlined in the *Pollution Studies and Reduction Programs for the Woodlawn Bioreactor*, EPL 11436, the following provides an update for the reporting period:

- U1 - Barrier System for the Adits/Portals
  - U1.1 - VES submitted design and construction program to the DECCW
  - U1.2 - VES completed the sealing of the northern portal within the mine void. CQA report submitted June 2009 upon completion of sealing works.

No further construction or design works were completed for Adit/Portal barrier systems during this reporting period.

- U2 - Groundwater Monitoring
  - U2.1 - Submission due on the 1st of December 2008 or once filling reaches the upper height of these bores

Monitoring bore replacement program to be submitted to DECCW within the 2010/2011 reporting period. It is expected that the waste level will reach the upper height of these bores in 2011.

- U3 - Trial of Alternative Daily Cover (ADC)
  - U3.1 - Trial completed from January – December 2008
  - U3.2 - Trial concluded on the 31st December 2008
  - U3.3 - VES completed an ADC trial using Concover
  - U3.4 – Submission to maintain operational use of Concover provided to DECCW in March 2010. VES still awaiting feedback/approval from DECCW on submission.

- U4 - Acid Mine Drainage (AMD) and Leachate Mixture Management Works
  - U4.1 - Completed November 2007
  - U4.2 - Completed November 2007
  - U4.3 - Completed February 2008
  - U4.4 - Completed January 2008
  - U4.5 - Submission in January 2008, treatment and storage trial continuing with the scope of original objectives. VES received confirmation from DECCW that the submissions have been received and awaiting further response and decision on the Leachate/AMD management system. VES submitted a Leachate Management Plan as part of a Development Application to DECCW during the reporting period. No formal document has been submitted detailing the objectives of the site.

15.0 LIMITATIONS

Earth2Water Pty Ltd has prepared this report with assistance and for Veolia in accordance to the standard terms and conditions of the consulting profession. This report is prepared with regard to Veolia's agreed scope of work. The methodology adopted and sources of information used by E2W are outlined in this report.

E2W has made no independent verification of the monitoring or technical information provided by the laboratory or client. E2W assumes no responsibility for any inaccuracies or omissions in the data.

This report was prepared by E2W from October to 7 December 2010 and is based on the information reviewed at the time of preparation. This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

The precision with which site conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of conditions as constrained by the project budget limitations. The behaviour of surface water and groundwater and some aspects of the contaminants in the environment are complex. Our professional interpretation and conclusions of the data and technical information are based upon experience and review of available reports.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, E2W should be notified of any such findings and be provided with an opportunity to review our assessment.

16.0 REFERENCES

Woodward-Clyde (1999), *Woodlawn Waste Management Facility Environmental Impact Statement*, February 1999.

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TABLES

Table 1A: Summary Statistics for Groundwater Wells on EPL 11436

		MB1		MB2		MB3		MB4		MB5		MB6	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	Min	5.07	6.76	5.76	5.94	5.39	5.95	3.68	4.90	2.74	2.72	4.74	4.77
	Max	7.36	8.00	7.23	7.91	7.15	7.78	6.77	7.83	4.92	5.98	6.08	7.53
	Ave	6.77	7.46	6.61	6.91	6.58	7.08	5.43	6.31	4.19	3.99	5.58	6.25
	StdDev	0.51	0.26	0.23	0.49	0.30	0.53	0.47	0.87	0.34	0.88	0.22	0.71
EC (uS/cm)	Min	1010	882	5060	5050	1679	1679	1220	404	5240	6150	1210	593
	Max	2490	1300	7190	6870	2441	2441	1790	1581	8960	12300	2980	7270
	Ave	1463	1060	6278	6266	2176	2176	1527	1180	7759	8099	2054	3951
	StdDev	362	103	548	525	186	186	172	336	952	1193	491	1261
SWL (mtoc)	Min	25.95	27.28	0.00	2.16	0.15	1.65	0.00	11.47	2.53	4.50	0.00	7.75
	Max	30.60	30.01	3.49	4.60	1.84	5.95	11.57	20.80	5.55	6.62	13.24	12.03
	Ave	28.94	28.22	2.08	3.65	0.96	2.69	9.61	12.34	3.78	5.94	10.73	9.46
	StdDev	1.16	0.84	0.85	0.63	0.46	0.91	2.85	1.81	0.93	0.55	3.39	1.11
Sulphate (mg/L)	Min	152	136	661	4100	29	33	178	150	4970	5220	215	300
	Max	1130	498	5062	4520	50	43	515	309	7660	6000	490	967
	Ave	302	222	4046	4203	38	37	213	198	5847	5774	327	571
	StdDev	197	110	790	148	5	3	53	29	611	262	76	175
Ammonia (mg/L)	Min	0.21	0.01	0.03	0.02		0.01	0.01	0.01		0.20	0.02	0.01
	Max	1.75	1.20	0.03	0.08		0.02	0.76	0.80		0.47	0.23	0.65
	Ave	0.98	0.16	0.03	0.05		0.01	0.13	0.08		0.27	0.09	0.15
	StdDev	1.09	0.31	#DIV/0!	0.02		0.01	0.28	0.19		0.11	0.08	0.18
Iron (mg/L)	Min	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	189	120	0.01	0.04
	Max	1.79	4.90	4.00	1.40	0.08	0.42	0.60	2.70	382	310	1.10	2.00
	Ave	0.16	1.08	0.34	0.29	0.03	0.12	0.13	0.60	337	230	0.18	0.58
	StdDev	0.34	1.17	0.96	0.50	0.02	0.18	0.16	0.85	41	91	0.25	0.55
Zinc (mg/L)	Min	0.01	0.04	0.12	0.05	0.01	0.01	0.46	0.57	121	90	0.10	0.20
	Max	1.04	1.90	1.00	0.16	0.60	0.16	2.30	1.10	582	240	11.10	9.20
	Ave	0.29	0.39	0.51	0.08	0.17	0.05	0.82	0.84	283	194	5.08	6.03
	StdDev	0.26	0.43	0.21	0.04	0.14	0.06	0.29	0.14	80	55	1.60	2.44

		MB7		MB8		MB10		MB11		MB12		MB13		MB14	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	Min	6.09	6.24	6.18	5.86	5.60	6.22	4.78	3.40	3.70	3.78	6.36	5.99	6.03	7.10
	Max	7.50	7.55	7.00	7.79	7.44	7.74	6.50	5.60	5.67	4.93	7.47	7.44	7.44	8.00
	Ave	6.70	6.93	6.75	7.09	6.68	7.10	5.94	5.03	4.71	4.27	7.00	6.78	6.97	7.40
	StdDev	0.26	0.38	0.22	0.41	0.30	0.39	0.42	0.58	0.40	0.34	0.22	0.45	0.27	0.26
EC (uS/cm)	Min	6340	1590	3390	2990	5360	5330	5990	16190	9860	18300	2440	1610	2500	3560
	Max	11600	9610	5180	4680	7420	7310	14900	33800	20500	36800	3690	3660	6520	5640
	Ave	8975	7618	4489	3969	6678	6715	9867	25871	14112	29701	3188	2883	4971	4691
	StdDev	1153	1596	425	448	525	506	2914	5882	3152	5503	299	418	980	707
SWL (mtoc)	Min	1.82	3.68	2.00	3.05	0.60	3.41	0.03	1.10	0.09	2.05	1.72	2.41	5.48	8.57
	Max	6.67	10.70	5.45	5.50	3.36	5.18	2.27	3.40	3.46	3.70	3.95	3.95	9.71	10.64
	Ave	3.18	4.86	3.91	4.22	1.58	4.20	1.21	2.13	1.43	2.75	2.72	3.00	7.74	9.86
	StdDev	0.94	1.49	0.82	0.71	0.72	0.56	0.62	0.44	0.76	0.41	0.50	0.41	1.15	0.54
Sulphate (mg/L)	Min	136	150	45	130	3710	3800	1000	39000	9950	0.4	56	56	1440	2100
	Max	294	210	166	140	5210	4100	11600	46000	21000	53000	5600	300	5610	3400
	Ave	181	169	114	131	4525	3900	6484	43000	13977	42814	327	101	3025	2911
	StdDev	34	23	24	4	414	120	2363	2915	3208	19196	1178	88	908	491
Ammonia (mg/L)	Min		0.01		0.01		0.03		0.08		0.22		0.01		0.01
	Max		0.08		0.05		0.33		1.10		0.38		0.06		0.05
	Ave		0.04		0.02		0.10		0.36		0.31		0.03		0.02
	StdDev		0.03		0.02		0.13		0.42		0.06		0.02		0.02
Iron (mg/L)	Min	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.17	0.01	0.16	0.01	0.01		0.01
	Max	1.46	5.30	0.21	0.30	0.60	0.71	6.81	0.78	3.62	4.90	121.00	0.48		1.60
	Ave	0.18	1.50	0.05	0.15	0.06	0.20	0.32	0.39	0.29	2.94	5.83	0.10		0.34
	StdDev	0.35	2.12	0.06	0.12	0.11	0.27	1.31	0.25	0.66	1.50	26.4	0.17		0.59
Zinc (mg/L)	Min	0.24	0.29	0.01	0.01	0.23	0.01	9.3	210	650	220	0.010	0.052	0.14	0.014
	Max	9.00	2.70	1.00	0.09	1.33	0.64	618	4380	2450	6360	152	26	207	0.7
	Ave	1.20	0.95	0.19	0.03	0.56	0.10	168	1656	1360	2379	7	4	12	0.11
	StdDev	2.08	1.07	0.19	0.03	0.23	0.22	196	1834	548	2711	32	10	45	0.22

Notes:
^ Statistics during mining (1978 to 2004)
^^ Statistics post mining (from 2005 to present)
* = no samples collected - well dry
NA = not available
— = established post mining operations

The '<' was removed from <LOR values and negative values were adjusted to positive values

All measurements are from laboratory analyses, with the exception of SWL from all wells, and pH and EC from MB2, MB3, MB4 landfill, MB5, MB6 landfill, MB7 landfill, MB8 landfill, MB10 landfill, MB11 landfill, MB12 landfill, MB13 landfill, MB14 mine (EC only), MB14 landfill, MB15 landfill, MB16 landfill, MB17 landfill, ED3B landfill, WM1-WM7 landfill, which are field measurements

Table 1A: Summary Statistics for Groundwater Wells on EPL 11436 (cont.)

		MB15		MB16		MB17		ED3B		WM1		WM3	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	Min	6.26	5.44	3.15	2.47	5.30	5.43	6.17	6.18	6.84	6.37	3.40	2.62
	Max	6.90	7.37	3.86	6.11	6.81	7.39	7.73	7.38	8.00	7.98	3.72	5.86
	Ave	6.68	6.56	3.41	3.94	6.16	6.45	6.85	6.79	7.27	7.20	3.53	4.26
	StdDev	0.17	0.49	0.13	0.78	0.29	0.57	0.27	0.32	0.42	0.43	0.11	0.89
EC (uS/cm)	Min	4500	4183	29700	17690	7080	8280	685	4230	1815	1500	9360	3500
	Max	9650	7910	42800	31000	12500	11930	8870	9000	2464	2470	21000	11380
	Ave	7162	6548	37014	26405	10924	10667	7673	7433	2080	1978	15568	6792
	StdDev	1104	926	3724	3434	1241	922	1085	973	300	226	3721	2723
SWL (mtoc)	Min	0.00	0.00	2.40	2.46	3.39	3.80	2.20	2.41	48.79	47.30	27.41	13.86
	Max	0.48	2.25	2.85	2.61	4.46	5.39	3.64	3.96	49.30	49.45	30.10	29.75
	Ave	0.29	0.21	2.56	2.54	3.86	4.22	2.60	2.87	49.08	48.46	29.30	24.46
	StdDev	0.25	0.64	0.10	0.05	0.25	0.38	0.25	0.38	0.21	0.61	0.97	5.16
Sulphate (mg/L)	Min	3720	3700	29700	0	3670	7800	36	471	592	580	1	1430
	Max	9692	5000	42800	54000	10800	8600	992	930	933	1030	21300	17100
	Ave	5290	4289	37014	40857	8598	8071	671	754	691	696	11972	6135
	StdDev	1722	520	3724	18443	1673	250	116	105	137	99	10384	3607
Ammonia (mg/L)	Min		0.01		7.10		0.03	0.02	0.01	0.01	0.02	0.49	0.16
	Max		0.07		9.80		0.07	0.25	0.19	0.14	0.87	1.84	5.20
	Ave		0.04		8.90		0.05	0.12	0.05	0.06	0.50	1.15	1.45
	StdDev		0.03		1.06		0.02	0.09	0.04	0.06	0.24	0.58	1.30
Iron (mg/L)	Min	0.01	0.01	23	33	0.04	0.04	0.01	0.01	0.09	0.05	102	12
	Max	1.05	9.80	129	63	1.80	0.44	4.40	9.10	0.90	6.54	767	680
	Ave	0.22	3.44	81	44	0.33	0.22	0.35	1.31	0.35	1.06	475	183
	StdDev	0.3	3.63	25	10	0.40	0.16	0.74	2.10	0.35	1.85	335	231
Zinc (mg/L)	Min	0.30	0.079	2820	180	14.0	2.8	0.01	0.01	0.01	0.01	2110	70
	Max	2.60	0.8	6670	1400	210.0	17.0	1.50	0.76	1.33	2.10	3310	2300
	Ave	1.48	0.27	5499	517	59.0	6.8	0.38	0.13	0.31	0.27	2622	710
	StdDev	0.65	0.24	923	509	55.4	5.0	0.28	0.25	0.57	0.50	438	760

		WM4		WM5		WM6		WM7		P38A		P38B		P44A		P44B	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	Min	6.04	5.80	5.99	6.57	6.05	5.40	3.60	5.95								
	Max	7.20	7.78	7.35	7.67	6.40	6.87	4.34	7.74								
	Ave	6.70	6.95	6.64	7.05	6.26	6.22	4.01	6.80								
	StdDev	0.45	0.63	0.45	0.30	0.14	0.37	0.31	0.48								
EC (uS/cm)	Min	1640	1410	4670	2300	8280	3560	2922	1197								
	Max	5520	1810	8920	9530	13700	14090	7250	12220								
	Ave	2519	1733	6610	6001	10935	11544	4823	4243								
	StdDev	1492	97	1660	1924	1750	2510	1905	2114								
SWL (mtoc)	Min	97.90	101.87	1.48	1.58	3.62	2.00	4.73	2.82	–	38.97	–	40.19	–	15.07	–	20.57
	Max	102.40	102.95	3.07	3.91	4.40	5.47	5.17	8.42	–	39.64	–	55.33	–	26.32	–	24.62
	Ave	101.26	102.23	2.29	2.80	4.04	4.75	4.95	5.63	–	39.24	–	44.81	–	19.69	–	22.89
	StdDev	1.72	0.27	0.72	0.50	0.29	0.75	0.23	1.47	–	0.16	–	3.18	–	3.59	–	0.97
Sulphate (mg/L)	Min	801	144	120	40	420	52	1420	381								
	Max	1590	1000	179	370	478	3300	8550	5820								
	Ave	1015	774	147	192	449	512	4353	2653								
	StdDev	334	162	25	84	21	637	3729	1097								
Ammonia (mg/L)	Min	0.01	0.00	0.04	0.04	0.50	0.01	0.14	0.01								
	Max	0.30	0.21	0.35	0.35	0.68	0.66	0.60	0.46								
	Ave	0.17	0.07	0.21	0.13	0.60	0.17	0.41	0.09								
	StdDev	0.12	0.07	0.13	0.08	0.08	0.17	0.24	0.11								
Iron (mg/L)	Min	1.30	0.01	2.00	0.01	0.07	0.01	150	0.01								
	Max	3.20	30.00	6.05	30.00	0.12	23.50	290	14								
	Ave	2.53	4.71	3.87	7.60	0.10	3.24	215	2.7								
	StdDev	0.76	8.46	1.76	8.43	0.02	5.96	70	4.2								
Zinc (mg/L)	Min	0.03	0.07	0.04	0.01	0.07	0.15	166	0.11								
	Max	2.28	2.80	0.33	0.33	4.58	0.95	1060	14								
	Ave	1.37	0.96	0.13	0.11	1.13	0.30	510	2.0								
	StdDev	0.91	0.85	0.12	0.10	1.94	0.22	482	3.5								

Notes:

^ Statistics during mining (1978 to 2004)
^^ Statistics post mining (from 2005 to pr
* = no samples collected - well dry
NA = not available
– = established post mining operations

The '<' was removed from <LOR values and negative values were adjusted to positive values

All measurements are from laboratory analyses, with the exception of SWL from all wells, and pH and EC from MB2, MB3, MB4 landfill, MB5, MB6 landfill, MB7 landfill, MB8 landfill, MB10 landfill, MB11 landfill, MB12 landfill, MB13 landfill, MB14 mine (EC only), MB14 landfill, MB15 landfill, MB16 landfill, MB17 landfill, ED3B landfill, WM1-WM7 landfill, which are field measurements

Table 1A: Summary Statistics for Groundwater Wells on EPL 11436 (cont.)

		P45A		P45B		P58A		P58B		P59A		P59B		P100A		P100B	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	Min																
	Max																
	Ave																
	StdDev																
EC (uS/cm)	Min																
	Max																
	Ave																
	StdDev																
SWL (mtoc)	Min	–	12.89	–	15.44	–	41.57	–	62.78	–	16.25	–	17.66	–	20.61	–	71.13
	Max	–	19.61	–	19.70	–	42.24	–	73.80	–	21.67	–	29.00	–	32.15	–	78.85
	Ave	–	15.29	–	17.56	–	42.02	–	65.72	–	18.77	–	20.14	–	29.89	–	77.82
	StdDev	–	1.75	–	1.10	–	0.12	–	2.22	–	1.39	–	2.42	–	2.25	–	1.50
Sulphate (mg/L)	Min																
	Max																
	Ave																
	StdDev																
Ammonia (mg/L)	Min																
	Max																
	Ave																
	StdDev																
Iron (mg/L)	Min																
	Max																
	Ave																
	StdDev																
Zinc (mg/L)	Min																
	Max																
	Ave																
	StdDev																

		MW8S		MW8D		MW9S		MW10S*	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	Min	–	6.54	–	6.21	–	5.43	–	NA
	Max	–	6.69	–	7.03	–	7.09	–	NA
	Ave	–	6.60	–	6.58	–	6.52	–	NA
	StdDev	–	0.07	–	0.25	–	0.41	–	NA
EC (uS/cm)	Min	–	11810	–	8700	–	710	–	NA
	Max	–	12900	–	11820	–	9570	–	NA
	Ave	–	12518	–	11047	–	8025	–	NA
	StdDev	–	515	–	842	–	2854	–	NA
SWL (mtoc)	Min	–	5.27	–	4.91	–	3.73	–	NA
	Max	–	7.25	–	8.03	–	5.00	–	NA
	Ave	–	6.71	–	6.77	–	4.30	–	NA
	StdDev	–	0.72	–	1.07	–	0.41	–	NA
Sulphate (mg/L)	Min	–	3100	–	2800	–	1300	–	NA
	Max	–	4800	–	4400	–	2500	–	NA
	Ave	–	4220	–	4073	–	1973	–	NA
	StdDev	–	750	–	450	–	361	–	NA
Ammonia (mg/L)	Min	–	0.01	–	0.01	–	0.01	–	NA
	Max	–	0.07	–	0.16	–	0.12	–	NA
	Ave	–	0.03	–	0.04	–	0.03	–	NA
	StdDev	–	0.02	–	0.04	–	0.03	–	NA
Iron (mg/L)	Min	–	2.20	–	0.01	–	0.01	–	NA
	Max	–	31	–	47	–	17	–	NA
	Ave	–	9.4	–	7.6	–	3.7	–	NA
	StdDev	–	12.2	–	14.6	–	5.1	–	NA
Zinc (mg/L)	Min	–	4.50	–	22.00	–	0.05	–	NA
	Max	–	24	–	31	–	0	–	NA
	Ave	–	16.9	–	25.0	–	0.1	–	NA
	StdDev	–	7.7	–	2.4	–	0.1	–	NA

Notes:
^ Statistics during mining (1978 to 2004)
^^ Statistics post mining (from 2005 to pr
* = no samples collected - well dry
NA = not available
– = established post mining operations

The '<' was removed from <LOR values and negative values were adjusted to positive values

All measurements are from laboratory analyses, with the exception of SWL from all wells, and pH and EC from MB2, MB3, MB4 landfill, MB5, MB6 landfill, MB7 landfill, MB8 landfill, MB10 landfill, MB11 landfill, MB12 landfill, MB13 landfill, MB14 mine (EC only), MB14 landfill, MB15 landfill, MB16 landfill, MB17 landfill, ED3B landfill, WM1-WM7 landfill, which are field measurements

Table 1B: Woodlawn Groundwater Level Data (from MB wells)

MB1		MB2		MB3		MB4		MB5		MB6		MB7		MB8		MB10		MB11	
Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)
6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00	6/12/1996	0.00		
17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00	17/06/1997	0.00		
7/08/1997	30.38	7/08/1997	1.65	7/08/1997	0.54	7/08/1997	10.14	7/08/1997	2.74	7/08/1997	11.98	7/08/1997	2.51	7/08/1997	3.46	7/08/1997	0.70	7/08/1997	0.26
11/11/1997	26.60	11/11/1997	1.57	11/11/1997	0.39	11/11/1997	10.12	11/11/1997	2.53	11/11/1997	11.84	11/11/1997	2.14	11/11/1997	3.22	11/11/1997	0.60	11/11/1997	0.37
																3/12/1997	0.78	3/12/1997	0.57
																5/02/1998	1.00	5/02/1998	0.73
																5/03/1998	1.16	5/03/1998	0.85
26/03/1998	26.74	26/03/1998	2.07	26/03/1998	0.64	26/03/1998	10.29	26/03/1998	2.84	26/03/1998	12.54	26/03/1998	3.08	26/03/1998	5.34	26/03/1998	1.25	26/03/1998	1.00
																11/05/1998	1.20		
9/06/1998	25.95	9/06/1998	2.07	9/06/1998	0.68	9/06/1998	10.52	9/06/1998	3.02	9/06/1998	12.48	9/06/1998	3.39	9/06/1998	4.77	9/06/1998	1.31	9/06/1998	0.73
																11/07/1998	1.22	11/07/1998	0.65
																10/08/1998	0.00	10/08/1998	0.03
7/09/1998	26.78	7/09/1998	1.38	7/09/1998	0.33	7/09/1998	10.43	7/09/1998	2.74	7/09/1998	10.35	7/09/1998	1.82	7/09/1998	2.00	7/09/1998	0.80	7/09/1998	0.00
																5/10/1998	0.00	5/10/1998	0.22
																6/11/1998	0.81	6/11/1998	0.47
1/12/1998	27.90	1/12/1998	1.61	1/12/1998	0.15	1/12/1998	10.05	1/12/1998	2.67	1/12/1998	10.42	1/12/1998	2.07	1/12/1998	3.01	1/12/1998	0.85	1/12/1998	0.60
																3/02/1999	1.03	3/02/1999	0.87
1/03/1999	28.20	1/03/1999	1.81	1/03/1999	0.27	1/03/1999	10.01	1/03/1999	2.81	1/03/1999	11.51	1/03/1999	2.76	1/03/1999	4.54	1/03/1999	1.06	1/03/1999	0.97
4/06/1999	28.10	4/06/1999	1.92	4/06/1999	0.41	4/06/1999	10.08	4/06/1999	3.08	4/06/1999	11.83	4/06/1999	2.94	4/06/1999	4.00	4/06/1999	1.24	4/06/1999	0.92
10/09/1999	28.48	10/09/1999	1.82	10/09/1999	0.53	10/09/1999	10.21	10/09/1999	3.18	10/09/1999	12.24	10/09/1999	2.55	10/09/1999	3.15	10/09/1999	1.18	10/09/1999	0.88
3/12/1999	29.04	3/12/1999	1.84	3/12/1999	0.57	3/12/1999	10.02	3/12/1999	3.12	3/12/1999	11.70	3/12/1999	2.39	3/12/1999	3.23	3/12/1999	1.15	3/12/1999	1.10
6/03/2000	28.77	6/03/2000	2.07	6/03/2000	0.67	6/03/2000	9.91	6/03/2000	3.17	6/03/2000	11.89	6/03/2000	2.80	6/03/2000	4.37	6/03/2000	1.33	6/03/2000	1.37
2/06/2000	29.05	2/06/2000	2.09	2/06/2000	0.76	2/06/2000	9.99	2/06/2000	3.31	2/06/2000	12.11	2/06/2000	2.93	2/06/2000	3.85	2/06/2000	1.38	2/06/2000	1.23
4/09/2000	29.13	4/09/2000	2.05	4/09/2000	0.85	4/09/2000	10.15	4/09/2000	3.46	4/09/2000	12.60	4/09/2000	2.65	4/09/2000	3.14	4/09/2000	1.84	4/09/2000	1.04
5/12/2000	29.60	5/12/2000	1.89	5/12/2000	0.86	5/12/2000	9.91	5/12/2000	3.12	5/12/2000	12.06	5/12/2000	2.18	5/12/2000	2.96	5/12/2000	1.20	5/12/2000	1.13
2/03/2001	29.13	2/03/2001	2.09	2/03/2001	0.89	2/03/2001	9.74	2/03/2001	3.23	2/03/2001	12.04	2/03/2001	2.64	2/03/2001	3.70	2/03/2001	1.36	2/03/2001	1.48
8/06/2001	29.73	8/06/2001	2.34	8/06/2001	0.95	8/06/2001	9.89	8/06/2001	3.51	8/06/2001	12.68	8/06/2001	3.14	8/06/2001	4.52	8/06/2001	1.62	8/06/2001	1.59
21/08/2001	29.61					21/08/2001	10.19			21/08/2001	13.05								
10/09/2001	30.10	10/09/2001	2.23	10/09/2001	1.03	10/09/2001	10.31	10/09/2001	3.79	10/09/2001	13.24	10/09/2001	2.94	10/09/2001	2.97	10/09/2001	1.62	10/09/2001	1.26
10/01/2002	29.31	10/01/2002	2.45	10/01/2002	1.13	10/01/2002	10.26	10/01/2002	3.86	10/01/2002	12.81	10/01/2002	3.08	10/01/2002	4.34	10/01/2002	1.77	10/01/2002	1.80
6/03/2002	29.31	6/03/2002	2.45	6/03/2002	1.13	6/03/2002	10.26	6/03/2002	3.86	6/03/2002	12.81	6/03/2002	3.08	6/03/2002	4.34	6/03/2002	1.77	6/03/2002	1.80
9/05/2002	30.60					9/05/2002	10.37			9/05/2002	11.58								
17/06/2002	29.90	17/06/2002	2.14	17/06/2002	1.13	17/06/2002	10.28	17/06/2002	3.82	17/06/2002	12.21	17/06/2002	3.00	17/06/2002	3.44	17/06/2002	1.51	17/06/2002	1.26
21/08/2002						21/08/2002				21/08/2002									
19/09/2002	29.95	19/09/2002	2.42	19/09/2002	1.13	19/09/2002	10.61	19/09/2002	4.38	19/09/2002	10.97	19/09/2002	3.22	19/09/2002	3.46	19/09/2002	1.80	19/09/2002	1.52
		4/12/2002	2.62	4/12/2002	1.25	4/12/2002	10.75	4/12/2002	4.49	4/12/2002	10.96	4/12/2002	3.48	4/12/2002	4.64	4/12/2002	2.05	4/12/2002	1.90
						18/02/2003	10.93			18/02/2003	11.10								
		18/03/2003	2.75	18/03/2003	1.34	18/03/2003	11.00	18/03/2003	4.80	18/03/2003	11.10	18/03/2003	3.88	18/03/2003	4.25	18/03/2003	2.25	18/03/2003	1.91
23/06/2003	28.22	23/06/2003	2.80	23/06/2003	1.35	23/06/2003	11.04	23/06/2003	4.80	23/06/2003	10.52	23/06/2003	3.90	23/06/2003	3.92	23/06/2003	2.30	23/06/2003	1.94
12/08/2003	29.20					12/08/2003	11.06			12/08/2003	10.64								
		3/09/2003	2.68	3/09/2003	1.40			3/09/2003	4.84			3/09/2003	3.67	3/09/2003	3.62	3/09/2003	2.36	3/09/2003	1.77
3/11/2003	28.54					3/11/2003	11.07			3/11/2003	10.55								
		26/11/2003	2.75	26/11/2003	1.46			26/11/2003	4.89			26/11/2003	3.56	26/11/2003	3.51	26/11/2003	2.40	26/11/2003	1.83
18/02/2004	29.86					18/02/2004	10.93			18/02/2004									
		18/03/2004	3.04	18/03/2004	1.57			18/03/2004	4.83			18/03/2004	4.04	18/03/2004	5.03	18/03/2004	2.67	18/03/2004	2.14
12/05/2004	29.48					12/05/2004	10.90			12/05/2004	10.19								
		22/06/2004	3.38	22/06/2004	1.69			22/06/2004	5.29			22/06/2004	6.67	22/06/2004	5.45	22/06/2004	3.19	22/06/2004	2.27
18/08/2004	30.08					18/08/2004	11.37			18/08/2004	10.69								
		6/09/2004	3.49	6/09/2004	1.74			6/09/2004	5.55			6/09/2004	4.78	6/09/2004	5.16	6/09/2004	3.36	6/09/2004	2.25
17/11/2004	29.67					17/11/2004	11.57			17/11/2004	10.54								
		8/12/2004	3.31	8/12/2004	1.84			8/12/2004	5.54			8/12/2004	4.20	8/12/2004	4.05	8/12/2004	3.16	8/12/2004	2.17
3/03/2005	29.44					3/03/2005	11.47			3/03/2005	10.13								
		21/03/2005	3.40	21/03/2005	1.90			21/03/2005	5.66			21/03/2005	4.51	21/03/2005	4.28			21/03/2005	2.56

Prepared by: DF
Checked by: DP

Table 1B- Woodlawn Groundwater Levels (MB)

MB1		MB2		MB3		MB4		MB5		MB6		MB7		MB8		MB10		MB11	
Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)
28/06/2005	28.92					28/06/2005	11.74			28/06/2005	10.17								
												1/07/2005	4.95						
		6/07/2005	3.36	6/07/2005	1.97			6/07/2005	5.74							6/07/2005	3.705	6/07/2005	2.085
														8/07/2005	3.48				
12/08/2005	28.69									12/08/2005	9.85								
						15/08/2005	11.67												
		8/09/2005	2.16	8/09/2005	1.97							8/09/2005	4.01	8/09/2005	3.28	8/09/2005	3.41	8/09/2005	1.69
								15/09/2005	5.70										
		14/11/2005	3.50	14/11/2005	1.97			14/11/2005	5.70			14/11/2005	3.68			14/11/2005	3.73	14/11/2005	2.08
16/11/2005	29.95					16/11/2005	11.63			16/11/2005	11.50								
9/02/2006	29.04					9/02/2006	11.71			9/02/2006	11.86								
		13/03/2006	3.10	13/03/2006	1.79			13/03/2006	5.67			13/03/2006	4.30	13/03/2006	3.7	13/03/2006	3.71	13/03/2006	1.85
31/05/2006	29.81					31/05/2006	11.52			31/05/2006	12.03								
		8/06/2006	2.68	8/06/2006	1.65			8/06/2006	5.57			8/06/2006	4.69	8/06/2006	3.81	8/06/2006	3.68	8/06/2006	2.03
15/08/2006	30.01					15/08/2006	11.60			15/08/2006	10.94								
		4/09/2006	2.84	4/09/2006	1.80			4/09/2006	4.97			4/09/2006	4.57	4/09/2006	3.54	4/09/2006	3.73	4/09/2006	1.93
														14/11/2006	3.16				
								30/11/2006	6.38			30/11/2006	7.14			30/11/2006	3.91	30/11/2006	2.1
		13/12/2006	3.60	13/12/2006	2.35									13/12/2006	4.63				
21/12/2006	27.33					21/12/2006	11.80												
										9/01/2007	9.85								
16/02/2007	27.76					16/02/2007	11.86			16/02/2007	9.59								
10/04/2007	28.04	20/04/2007	3.87	20/04/2007	2.48	10/04/2007	11.88			10/04/2007	9.50								
								19/04/2007	6.17			19/04/2007	4.73					19/04/2007	2.21
														20/04/2007	4.37	20/04/2007	4.11		
28/06/2007	27.93	28/06/2007	3.14	28/06/2007	2.39	28/06/2007	11.71	28/06/2007	5.14	28/06/2007	9.23	28/06/2007	4.49	28/06/2007	4.51	28/06/2007	3.98	28/06/2007	1.1
16/08/2007	27.75	16/08/2007	3.44					16/08/2007	6.03			16/08/2007	3.70			16/08/2007	3.85		
		22/08/2007	3.45	22/08/2007	2.42									22/08/2007	3.05				
31/08/2007	28.56					31/08/2007	12.06			31/08/2007	9.15								
																		4/09/2007	1.5
																		3/10/2007	0
		30/10/2007	3.62	30/10/2007	5.95			30/10/2007	4.50			30/10/2007	3.97	30/10/2007	3.66	30/10/2007	3.86	30/10/2007	3.4
7/12/2007	28.31					7/12/2007	11.77			7/12/2007	9.14								
		11/12/2007	3.57	11/12/2007	2.53							11/12/2007	3.98	11/12/2007	3.57	11/12/2007	3.8	11/12/2007	1.86
								12/12/2007	0.00										
								14/12/2007	6.14										
										15/02/2008	8.98								
26/02/2008	28.38					26/02/2008	11.56												
		15/04/2008	3.88	15/04/2008	2.66			15/04/2008	6.10					15/04/2008	4.89	15/04/2008	4.1		
												9/05/2008	4.52					9/05/2008	2.28
										27/05/2008	8.84								
30/05/2008	28.23					30/05/2008	11.60												
				26/06/2008	2.69									26/06/2008	4.62				
19/08/2008	27.90					19/08/2008	20.80			19/08/2008	8.93								
		30/09/2008	3.66	30/09/2008	2.80											30/09/2008	4.3		
								18/11/2008	6.14			18/11/2008	4.06					18/11/2008	2.3
														19/11/2008	4.53				
27/11/2008	27.51									27/11/2008	8.81								
						28/11/2008	11.94												
		6/01/2009	4.03	6/01/2009	2.90							6/01/2009	4.24			6/01/2009	4.31	6/01/2009	2.26
								9/01/2009	6.26					9/01/2009	4.57				
3/02/2009	27.67					3/02/2009	12.05			3/02/2009	8.64								
		21/05/2009	4.28	21/05/2009	3.09											21/05/2009	5.18		
								28/05/2009	6.38			28/05/2009	10.70					28/05/2009	2.41
														29/05/2009	5.5				
		23/06/2009	4.21	23/06/2009	3.10									23/06/2009	5.45	23/06/2009	4.84		
								25/06/2009	6.38			25/06/2009	5.17					25/06/2009	2.37
30/06/2009	27.36					30/06/2009	12.34			30/06/2009	8.60								
7/07/2009	27.47					7/07/2009	12.42			7/07/2009	8.68								
1/09/2009	27.77									1/09/2009	7.75								
						2/09/2009	12.58												
		19/10/2009	4.56	19/10/2009	3.26			19/10/2009	6.62			19/10/2009	4.94	19/10/2009	4.48	19/10/2009	5.05		
																		29/10/2009	2.37
17/11/2009	27.69					17/11/2009	12.64			17/11/2009	8.73								
		8/12/2009	4.6	8/12/2009	3.32									8/12/2009	5.21	8/12/2009	5.06		

Table 1B- Woodlawn Groundwater Levels (MB)

	MB1		MB2		MB3		MB4		MB5		MB6		MB7		MB8		MB10		MB11	
	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)
													12/01/2010	5.10					12/01/2010	2.41
									14/01/2010	6.55										
	25/03/2010	27.33					25/03/2010	12.71			25/03/2010	8.64								
			29/04/2010	4.46	29/04/2010	3.45			29/04/2010	6.42			29/04/2010	4.78	29/04/2010	4.6	29/04/2010	4.87		
																			30/04/2010	2.26
			15/06/2010	4.44	15/06/2010	3.48			15/06/2010	6.51					15/06/2010	4.16	15/06/2010	4.97		
													18/06/2010	4.70					18/06/2010	1.86
	21/06/2010	27.28					21/06/2010	12.74			21/06/2010	8.6								
	31/08/2010	27.63					31/08/2010	12.6			31/08/2010	8.44								

	MB1	MB2	MB3	MB4	MB5	MB6	MB7	MB8	MB10	MB11
OVERALL										
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	30.60	4.60	5.95	20.80	6.62	13.24	10.70	5.50	5.18	3.40
Average	27.61	2.77	1.65	10.88	4.44	10.34	3.75	3.90	2.36	1.50
StdDev	5.36937	1.02878	1.13246	2.5449	1.68564	2.43256	1.60825	1.08063	1.51919	0.75654
Count	58	55	55	60	55	59	54	55	62	61
MINING (1978 - 2004)										
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	30.60	3.49	1.84	11.57	5.55	13.24	6.67	5.45	3.36	2.27
Average	27.11	2.15	0.90	9.84	3.54	10.98	2.98	3.67	1.42	1.18
StdDev	7.20145	0.77417	0.50633	2.49992	1.29277	2.91641	1.20233	1.24439	0.82873	0.64375
Count	32	32	32	35	32	34	32	32	41	38
LANDFILL (2005+)										
Minimum	27.28	2.16	1.65	11.47	0.00	7.75	3.68	3.05	3.41	0.00
Maximum	30.01	4.60	5.95	20.80	6.62	12.03	10.70	5.50	5.18	3.40
Average	28.22	3.65	2.69	12.34	5.68	9.46	4.86	4.22	4.20	2.04
StdDev	0.84389	0.62612	0.90841	1.81115	1.35029	1.10845	1.4864	0.70754	0.55973	0.61946
Count	26	23	23	25	23	25	22	23	21	23

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Table 1B- Woodlawn Groundwater Levels (MB)

MB12		MB13		MB14		MB15		MB16		MB17		MB19		MB20		MB21		MB22	
Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)
7/08/1997	0.63	7/08/1997	2.25	7/08/1997	6.00	7/08/1997	0.00	7/08/1997	2.85	7/08/1997	4.07								
11/11/1997	0.55	11/11/1997	2.32	11/11/1997	5.76	11/11/1997	0.00	11/11/1997	2.72	11/11/1997	3.85								
27/11/1997	0.00	27/11/1997	0.00									27/11/1997	0.00						
3/12/1997	0.76																		
5/02/1998	0.94											5/02/1998	0.49	5/02/1998	1.19				
5/03/1998	1.06											5/03/1998	0.61	5/03/1998	1.32				
26/03/1998	1.15	26/03/1998	3.08	26/03/1998	6.63	26/03/1998	0.00	26/03/1998	2.73	26/03/1998	4.04	26/03/1998	0.74	26/03/1998	1.34				
11/05/1998	1.00											11/05/1998	0.49	11/05/1998	1.17				
9/06/1998	1.04	9/06/1998	2.75	9/06/1998	6.82	9/06/1998	0.00	9/06/1998	2.69	9/06/1998	4.02	9/06/1998	0.44	9/06/1998	0.95				
11/07/1998	0.92											11/07/1998	0.25	11/07/1998	0.97				
10/08/1998	0.09											10/08/1998	0.00	10/08/1998	0.00				
7/09/1998	0.00	7/09/1998	1.72	7/09/1998	5.48	7/09/1998	0.00	7/09/1998	2.46	7/09/1998	3.48	7/09/1998	0.00	7/09/1998	0.00				
5/10/1998	0.20											5/10/1998	0.00	5/10/1998	0.00				
6/11/1998	0.52											6/11/1998	0.00	6/11/1998	0.29				
1/12/1998	0.72	1/12/1998	2.19	1/12/1998	6.32	1/12/1998	0.00	1/12/1998	2.41	1/12/1998	3.39	1/12/1998	0.00	1/12/1998	0.47				
3/02/1999	1.03											3/02/1999	0.41	3/02/1999	1.14				
1/03/1999	1.12	1/03/1999	2.57	1/03/1999	6.76	1/03/1999	0.00	1/03/1999	2.53	1/03/1999	3.78								
4/06/1999	1.17	4/06/1999	2.39	4/06/1999	7.01	4/06/1999	0.00	4/06/1999	2.53	4/06/1999	3.85								
												14/07/1999	0.31	14/07/1999	1.06				
10/09/1999	1.10	10/09/1999	2.24	10/09/1999	7.04	10/09/1999	0.00	10/09/1999	2.51	10/09/1999	3.61								
												5/10/1999	0.30	5/10/1999	1.01				
3/12/1999	1.25	3/12/1999	2.38	3/12/1999	7.06	3/12/1999	0.00	3/12/1999	2.50	3/12/1999	3.77								
												3/01/2000	0.43	3/01/2000	1.19				
6/03/2000	1.52	6/03/2000	2.73	6/03/2000	7.30	6/03/2000	0.00	6/03/2000	2.55	6/03/2000	3.83								
												2/04/2000	0.90	2/04/2000	1.41				
2/06/2000	1.48	2/06/2000	2.45	2/06/2000	7.44	2/06/2000	0.00	2/06/2000	2.54	2/06/2000	3.84								
												3/07/2000	0.80	3/07/2000	1.55				
4/09/2000	1.33	4/09/2000	2.29	4/09/2000	7.48	4/09/2000	0.00	4/09/2000	2.53	4/09/2000	3.66								
												3/10/2000	0.66	3/10/2000	1.42				
5/12/2000	1.34	5/12/2000	2.20	5/12/2000	7.42	5/12/2000	0.00	5/12/2000	2.49	5/12/2000	3.57								
												11/01/2001	1.18	11/01/2001	1.70				
2/03/2001	1.66	2/03/2001	2.65	2/03/2001	7.62	2/03/2001	0.00	2/03/2001	2.40	2/03/2001	3.46								
8/06/2001	1.78	8/06/2001	2.84	8/06/2001	7.85	8/06/2001	0.00	8/06/2001	2.49	8/06/2001	3.67	5/04/2001	1.43	5/04/2001	1.94				
												2/07/2001	1.43	2/07/2001	1.95				
10/09/2001	1.55	10/09/2001	2.38	10/09/2001	7.86	10/09/2001	0.00	10/09/2001	2.47	10/09/2001	3.60								
												12/10/2001	0.75	12/10/2001	1.27				
10/01/2002	1.91	10/01/2002	2.92	10/01/2002	8.04	10/01/2002	0.00	10/01/2002	2.47	10/01/2002	3.90	10/01/2002	1.58	10/01/2002	2.32				
6/03/2002	1.91	6/03/2002	2.92	6/03/2002	8.04	6/03/2002	0.00	6/03/2002	2.47	6/03/2002	3.90								
												12/04/2002	1.15	12/04/2002	1.66				
17/06/2002	1.49	17/06/2002	2.54	17/06/2002	7.91	17/06/2002	0.00	17/06/2002	2.43	17/06/2002	3.81								
												1/07/2002	1.25	1/07/2002	2.01				
19/09/2002	1.83	19/09/2002	2.50	19/09/2002	8.26	19/09/2002	0.00	19/09/2002	2.57	19/09/2002	3.77								
												24/10/2002	1.54	24/10/2002	2.28				
4/12/2002	2.10	4/12/2002	3.18	4/12/2002	8.51	4/12/2002	0.00	4/12/2002	2.61	4/12/2002	4.08								
												23/01/2003	2.20	23/01/2003	2.50				
18/03/2003	2.22	18/03/2003	3.20	18/03/2003	8.77	18/03/2003	0.00	18/03/2003	2.54	18/03/2003	3.84								
23/06/2003	2.34	23/06/2003	2.98	23/06/2003	8.92	23/06/2003	0.00	23/06/2003	2.60	23/06/2003	4.02								
3/09/2003	2.15	3/09/2003	2.72	3/09/2003	8.82	3/09/2003	0.00	3/09/2003	2.54	3/09/2003	3.92	3/09/2003	1.78	3/09/2003	2.50				
26/11/2003	2.21	26/11/2003	2.68	26/11/2003	8.91	26/11/2003	0.00	26/11/2003	2.56	26/11/2003	3.95								
										18/03/2004	4.11	18/03/2004	3.31	18/03/2004	2.93				
18/03/2004	3.46	18/03/2004	3.59	18/03/2004	9.22	18/03/2004	0.00	18/03/2004	2.59										
22/06/2004	2.68	22/06/2004	3.95	22/06/2004	9.58	22/06/2004	0.38	22/06/2004	2.66	22/06/2004	4.45	22/06/2004	2.53	22/06/2004	3.04				
6/09/2004	2.69	6/09/2004	3.78	6/09/2004	9.71	6/09/2004	0.48	6/09/2004	2.66	6/09/2004	4.46	6/09/2004	2.58	6/09/2004	3.28				
8/12/2004	2.58	8/12/2004	3.17	8/12/2004	9.60	8/12/2004	0	8/12/2004	2.59	8/12/2004	4.11	8/12/2004	2.45	8/12/2004	9.62				
21/03/2005	2.66					21/03/2005	0	21/03/2005	2.58	21/03/2005	4.17	21/03/2005	2.6	21/03/2005	3.11				

Prepared by: DF
Checked by: DP

Table 1B- Woodlawn Groundwater Levels (MB)

MB12		MB13		MB14		MB15		MB16		MB17		MB19		MB20		MB21		MB22	
Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)
		1/07/2005	3.32																
6/07/2005	2.65	8/09/2005	2.6	6/07/2005	9.67	8/07/2005	0	8/07/2005	2.48	8/07/2005	3.973	1/07/2005	2.55	6/07/2005	3.03				
8/09/2005	2.23			8/09/2005	9.61							8/09/2005	1.865	8/09/2005	2.335				
						15/09/2005	0	15/09/2005	2.48	15/09/2005	3.98								
14/11/2005	2.75	14/11/2005	2.42	14/11/2005	8.57	14/11/2005	0	14/11/2005	2.5	14/11/2005	3.96	14/11/2005	1.62	14/11/2005					
13/03/2006	2.5	13/03/2006	3.04	13/03/2006	9.4	13/03/2006	0	13/03/2006	2.61	13/03/2006	4.2	13/03/2006	2.16	13/03/2006	5.81				
8/06/2006	2.64	8/06/2006	2.87	8/06/2006	9.52	8/06/2006	0	8/06/2006	2.49	8/06/2006	4.08	8/06/2006	2.07	8/06/2006					
4/09/2006	2.6	4/09/2006	2.92	4/09/2006	9.08	4/09/2006	0	4/09/2006	2.53	4/09/2006	4.35	4/09/2006	1.83	4/09/2006	4.68				
						13/12/2006	0												
30/11/2006	3.7			30/11/2006	9.82			30/11/2006	2.61	30/11/2006	5.39	30/11/2006	2.19	30/11/2006	1.68				
		20/12/2006	3.23																
19/04/2007	2.66	19/04/2007	3.24	19/04/2007	10.17	19/04/2007	0	19/04/2007	2.54	19/04/2007	4.21	19/04/2007	2.06	19/04/2007	2.25				
28/06/2007	2.05	28/06/2007	2.41	28/06/2007	9.12	28/06/2007	0	28/06/2007	2.57	28/06/2007	4.29	28/06/2007	0.82	28/06/2007	1.34				
16/08/2007	2.078					16/08/2007	2.245			16/08/2007	4.145	16/08/2007	0.734	4/09/2007	1.42				
		4/09/2007	2.46	4/09/2007	9.78			4/09/2007	2.51										
3/10/2007	0																		
30/10/2007	2.4	30/10/2007	2.75	30/10/2007	9.91	30/10/2007	0	30/10/2007	2.56	30/10/2007	4.19	30/10/2007	0	30/10/2007	1.31				
11/12/2007	2.45	11/12/2007	2.56	11/12/2007	9.85														
						14/12/2007	0	14/12/2007	2.48	14/12/2007	3.8	11/12/2007	1.47	11/12/2007	2				
																15/04/2008	3.81	15/04/2008	3.73
9/05/2008	3.54	9/05/2008	3.26	9/05/2008	10.08	9/05/2008	2.14	9/05/2008	2.53	9/05/2008	5.19	9/05/2008	2.12	9/05/2008	NA				
		26/06/2008	2.84	26/06/2008	10.03			26/06/2008	2.5					26/06/2008	NA	26/06/2008	3.70	26/06/2008	3.63
				30/09/2008	10.06														
18/11/2008	2.77	18/11/2008	2.96			18/11/2008	0	18/11/2008	2.55	18/11/2008	4.12	18/11/2008	2.38	18/11/2008	2.89				
																19/11/2008	3.97	19/11/2008	3.91
				6/01/2009	10.05														
7/01/2009	2.83	7/01/2009	2.85									7/01/2009	2.51	7/01/2009	3.07				
						9/01/2009	0	9/01/2009	2.46	9/01/2009	3.91					9/01/2009	3.76	9/01/2009	3.64
				21/05/2009	10.51														
28/05/2009	3.04	28/05/2009	3.95			28/05/2009	0.21	28/05/2009	2.59	28/05/2009	4.29	28/05/2009	3.09	28/05/2009	3.77	28/05/2009	4.25	28/05/2009	4.21
				23/06/2009	10.51														
25/06/2009	3.1	25/06/2009	3.8			25/06/2009	0	25/06/2009	2.6	25/06/2009	4.19	25/06/2009	3.07	25/06/2009	3.69	25/06/2009	4.16	25/06/2009	4.11
				19/10/2009	10.39														
29/10/2009	3.05	29/10/2009	2.96			29/10/2009	0	29/10/2009	2.57	29/10/2009	4.05								
												30/10/2009	3.16	30/10/2009	6.60	30/10/2009	4	30/10/2009	3.87
				8/12/2009	10.64														

Table 1B- Woodlawn Groundwater Levels (MB)

	MB12		MB13		MB14		MB15		MB16		MB17		MB19		MB20		MB21		MB22	
	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)	Date	Depth to water (m)
	12/01/2010	3.08	12/01/2010	3.3					12/01/2010	2.59	12/01/2010	4.08								
							14/01/2010	0					14/01/2010	3	14/01/2010	4.04	14/01/2010	4.5	14/01/2010	4.45
					29/04/2010	10.51	29/04/2010	0												
	30/04/2010	2.93	30/04/2010	3.42					30/04/2010	2.56	30/04/2010	4.31	30/04/2010	3.6	30/04/2010	3.65	30/04/2010	4.32	30/04/2010	4.29
					15/06/2010	10.34							15/06/2010	2.92	15/06/2010	3.46	15/06/2010	4.09	15/06/2010	3.99
	18/06/2010	2.74	18/06/2010	2.89			18/06/2010	0	18/06/2010	2.48	18/06/2010	3.92								
OVERALL																				
Minimum		0.00		0.00		5.48		0.00		2.40		3.39		0.00		0.00		3.70		3.63
Maximum		3.70		3.95		10.64		2.25		2.85		5.39		3.60		9.62		4.50		4.45
Average		1.84		2.79		8.65		0.10		2.55		4.01		1.45		2.27		4.06		3.98
StdDev		0.96502		0.61546		1.41987		0.43083		0.08265		0.35626		1.05474		1.72555		0.25859		0.27976
Count		63		53		52		52		53		52		55		51		10		10
MINING (1978 - 2004)																				
Minimum		0.00		0.00		5.48		0.00		2.40		3.39		0.00		0.00		0.00		0.00
Maximum		3.46		3.95		9.71		0.48		2.85		4.46		3.31		9.62		0.00		0.00
Average		1.39		2.63		7.74		0.03		2.56		3.86		0.97		1.73		#DIV/0!		#DIV/0!
StdDev		0.79262		0.6917		1.14572		0.10988		0.10176		0.25371		0.88197		1.67162		#DIV/0!		#DIV/0!
Count		40		31		30		30		30		30		33		32		0		0
LANDFILL (2005+)																				
Minimum		0.00		2.41		8.57		0.00		2.46		3.80		0.00		1.31		3.70		3.63
Maximum		3.70		3.95		10.64		2.25		2.61		5.39		3.60		6.60		4.50		4.45
Average		2.63		3.00		9.89		0.21		2.54		4.22		2.17		3.17		4.06		3.98
StdDev		0.69871		0.4123		0.52874		0.6438		0.04788		0.37681		0.874		1.44973		0.25859		0.27976
Count		23		22		22		22		23		22		22		19		10		10

Table 2: Summary Statistics for Surface Water (Site Discharges)

Parameter		Site 105		Site 115		Spring 2		WM201 (Plant)	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	**Min**	6.24	5.78	6.20	5.51	4.35	4.46	3.94	5.33
	Max	7.16	8.60	8.26	8.35	7.82	7.04	7.74	8.29
	Ave	6.89	7.20	7.67	7.22	5.81	5.48	5.58	6.74
	StdDev	0.44	0.60	0.41	0.67	1.32	1.10	1.60	0.86
EC (uS/cm)	**Min**	140	193	174	47	336	83	218	30
	Max	5350	4110	3390	2960	5230	10160	1352	1497
	Ave	2184	1620	1879	1188	2222	1231	658	543
	StdDev	959	912	949	865	1341	1808	339	375
Sulphate (mg/L)	**Min**	14	32	36	40	152	31	54	43
	Max	550	320	726	630	3180	820	232	256
	Ave	159	165	226	214	1301	375	122	150
	StdDev	112	84	135	165	811	158	57	61
Ammonia (mg/L)	**Min**	0.02	0.01	0.01	0.01	0.24	0.01	0.01	0.01
	Max	0.70	0.84	0.07	0.93	8.21	5.40	1.41	29.00
	Ave	0.16	0.15	0.05	0.17	4.77	1.53	0.20	2.04
	StdDev	0.20	0.20	0.03	0.20	2.85	1.36	0.41	7.46
Iron (mg/L)	**Min**	0.09	0.05	0.10	0.02	0.47	0.10	0.30	0.39
	Max	3.80	2.00	0.11	12.60	2.60	6.24	1.20	25.00
	Ave	1.01	0.51	0.11	1.96	1.88	1.42	0.77	3.02
	StdDev	1.31	0.44	0.01	3.49	0.67	1.37	0.33	6.16
Zinc (mg/L)	**Min**	0.02	0.04	0.06	0.01	4.88	3.10	0.40	1.76
	Max	1.76	2.02	0.13	0.98	140.00	130.00	12.40	22.00
	Ave	0.77	0.49	0.09	0.25	92.55	29.29	3.19	7.67
	StdDev	0.69	0.43	0.05	0.28	45.22	23.44	3.81	6.20

Notes:
^ Statistics for sites during mining operations (1978 to 2004)
^^ Statistics for sites post mining operations (from 2005 to present)
The '<' was removed from <LOR values and negative values were adjusted to positive values (see original excel spreadsheets in Appendices)

Prepared by: DF
Checked by: DP

Table 3: Summary Statistics for Surface Water (Dams, Site Operations and Creeks)

Parameter		WM202 (ED3S)		WM203 (ED3N)		WM200 (wl)		Pond 2		Pond 3	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	**Min**	2.31	2.38	2.29	2.49	6.63	5.20	2.56	2.57	2.89	2.58
	Max	4.02	8.87	3.33	7.01	8.71	8.21	4.81	6.61	3.39	6.55
	Ave	2.83	3.98	2.66	4.42	8.04	6.93	3.05	4.21	3.08	4.24
	StdDev	0.25	1.20	0.23	1.22	0.52	0.92	0.72	1.03	0.21	1.08
EC (uS/cm)	**Min**	533	4840	522	2500	360	18	3640	3460	2930	3080
	Max	33300	14370	48300	31700	2930	17400	11200	16920	14500	45003
	Ave	16979	9830	24977	16575	1568	2477	7443	8981	6290	10265
	StdDev	6135	2589	15118	8849	476	3677	2660	4042	4741	10574
Sulphate (mg/L)	**Min**	708	3490	744	785	124	340	2050	1840	2110	2300
	Max	55300	15200	80000	24200	407	1050	16100	15000	15400	17000
	Ave	18346	10040	31884	14337	194	527	8502	8025	8755	6431
	StdDev	8735	3112	23870	4815	73	173	6267	3920	9397	3823
Ammonia (mg/L)	**Min**	1.02	2.58	1.23	1.40	0.01	0.01	0.11	0.05	0.01	1.01
	Max	16.30	180.00	25.60	1400.00	0.13	0.25	1.38	780	6.90	730
	Ave	6.39	83.10	13.95	467.59	0.06	0.07	0.72	222	2.75	131
	StdDev	5.09	60.59	7.75	513.24	0.04	0.07	0.48	253	3.66	208
Iron (mg/L)	**Min**	103.00	47.00	100.00	0.32	0.01	0.03	45	1	27	16
	Max	258.00	540.00	288.00	610.00	0.10	6.51	366	12000	204	1500
	Ave	187.75	221.93	197.00	247.09	0.05	0.59	188	1081	116	358
	StdDev	79.00	150.57	94.14	230.06	0.05	1.51	163	2223	125	406
Zinc (mg/L)	**Min**	442.00	120.00	476.00	53.20	0.27	1	21.10	13.00	650.00	73.00
	Max	3860	1770	8340	3570	4.2	38	1380	1600	2300	1200
	Ave	2266	712	4082	929	1.6	12	844	446	1475	384
	StdDev	1268	577	3972	840	2	12	579	398	1167	276

Notes:

^ Statistics for sites during mining operations (1978 to 2004)

^^ Statistics for sites post mining operations (from 2005 to present)

The '<' was removed from <LOR values and negative values were adjusted to positive values (see original excel spreadsheets in Appendices)

Prepared by: DF
Checked by: DP

Table 4: IMF Surface Water Monitoring Results

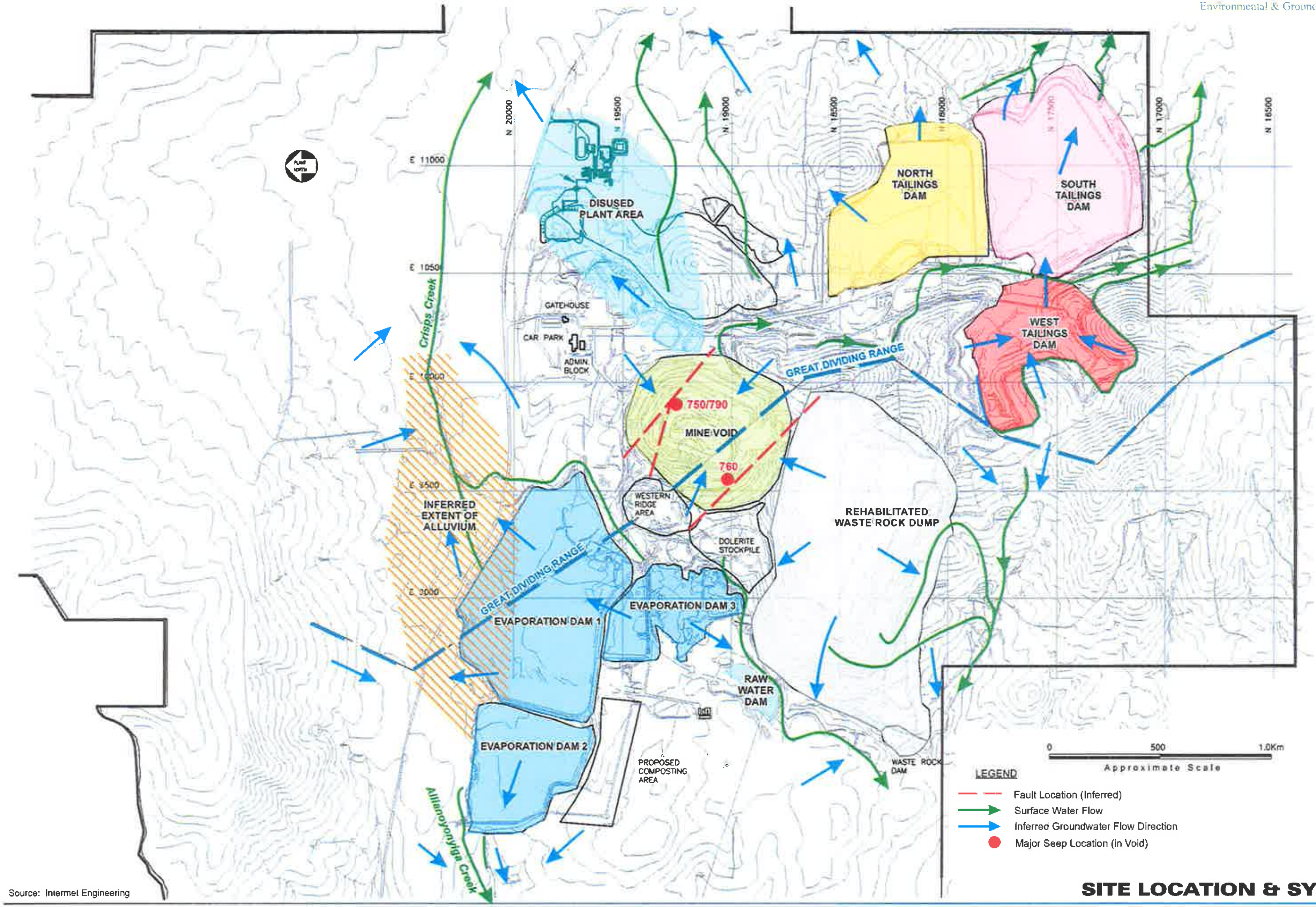
Parameter		Site 110		Site 130		Site 150	
		Mine^	Landfill^^	Mine^	Landfill^^	Mine^	Landfill^^
pH	**Min**	6.28	5.82	6.16	6.55	3.89	6.11
	Max	8.20	8.63	7.98	8.63	8.53	8.36
	Ave	7.50	7.21	7.22	7.43	7.54	7.36
	StdDev	0.32	0.69	0.67	0.56	0.77	0.56
EC (uS/cm)	**Min**	8	61	395	39	186	77
	Max	3100	2440	764	953	1850	1246
	Ave	1223	917	571	455	962	757
	StdDev	586	615	100	231	358	343
Sulphate (mg/L)	**Min**	20	13	11	1	16	21
	Max	440	220	148	73	140	127
	Ave	117	86	50	26	80	73
	StdDev	61	52	37	21	33	26
Ammonia (mg/L)	**Min**	0.01	0.01	0.01	0.01	0.01	0.01
	Max	0.56	0.82	0.10	0.13	0.20	0.84
	Ave	0.13	0.10	0.04	0.03	0.06	0.09
	StdDev	0.17	0.15	0.04	0.03	0.06	0.16
Iron (mg/L)	**Min**	0.30	0.05	0.20	0.05	0.10	0.05
	Max	5.20	11.00	0.70	4.34	1.03	3.13
	Ave	1.91	1.32	0.42	0.68	0.43	0.69
	StdDev	1.85	2.11	0.17	0.86	0.39	0.62
Zinc (mg/L)	**Min**	0.08	0.02	0.01	0.00	0.01	0.01
	Max	1.40	1.30	0.02	0.11	0.04	6.69
	Ave	0.43	0.21	0.01	0.02	0.02	0.34
	StdDev	0.52	0.23	0.01	0.02	0.01	1.22

Notes:
^ Statistics for sites during mining operations (1978 to 2004)
^^ Statistics for sites post mining operations (from 2005 to present)
The '<' was removed from <LOR values and negative values were adjusted to positive values (see original excel spreadsheets in Appendices)

Prepared by: DF
Checked by: DP

FIGURES

earth2water Pty Ltd
Environmental & Groundwater Consulting



Source: Intermet Engineering

SITE LOCATION & SYSTEMS

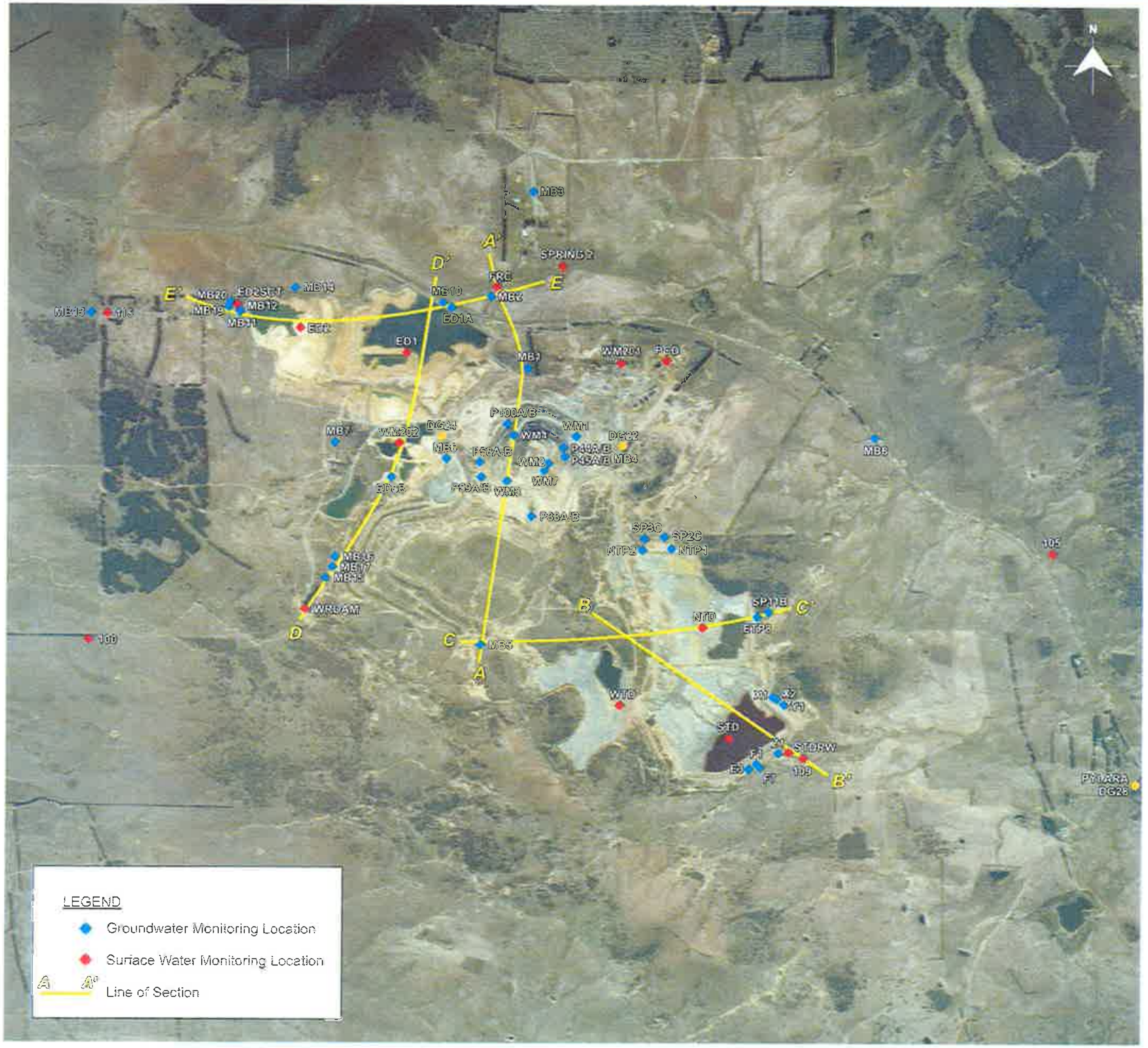
VEOLIA ENVIRONMENTAL SERVICES - WOODLAWN BIOREACTOR

Date: 21 October 2007

Reference: E2W_083_01.cdr

Figure 1

earth2water Pty Ltd
Environmental & Groundwater Consulting



0 500 1000m
Approximate Scale

Source: Kells Land Development Solutions

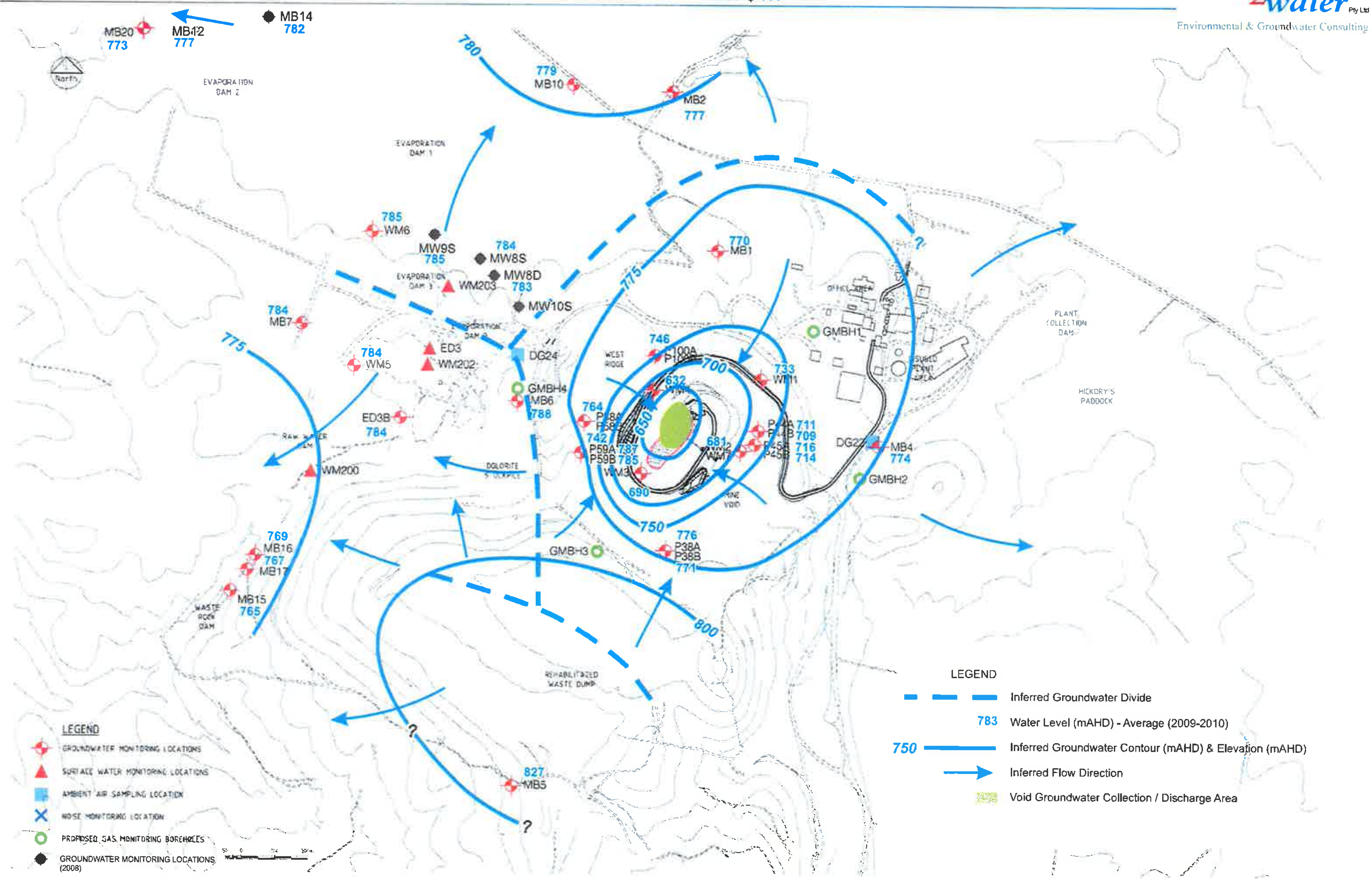
SITE LAYOUT & MONITORING LOCATIONS

VEOLIA ENVIRONMENTAL SERVICES - WOODLAWN BIOREACTOR TECHNICAL REVIEW

Date: 21 October 2007

Reference: E2W_083_02.cdr

Figure 2



Source: Maunsell

SITE LAYOUT & INFERRED GROUNDWATER FLOW REGIME

WOODLAWN BIOREACTOR - MONITORING REPORT

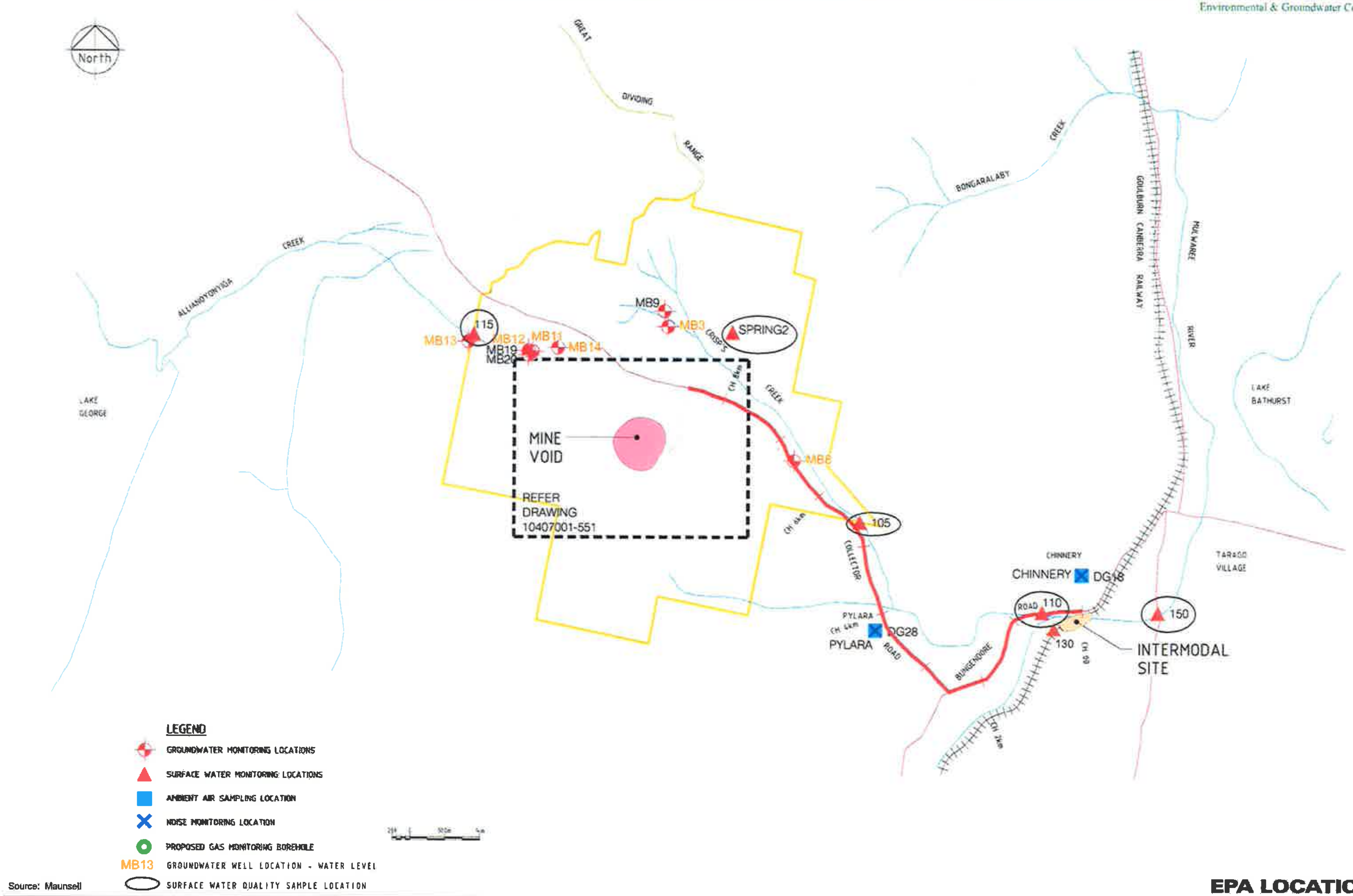
Figure 3A

Date: *8 November 2010*

Reference: *E2W_083_21.cdr*

earth2water Pty Ltd – Environmental & Groundwater Consulting

earth2water Pty Ltd
Environmental & Groundwater Consulting



Source: Maunsell

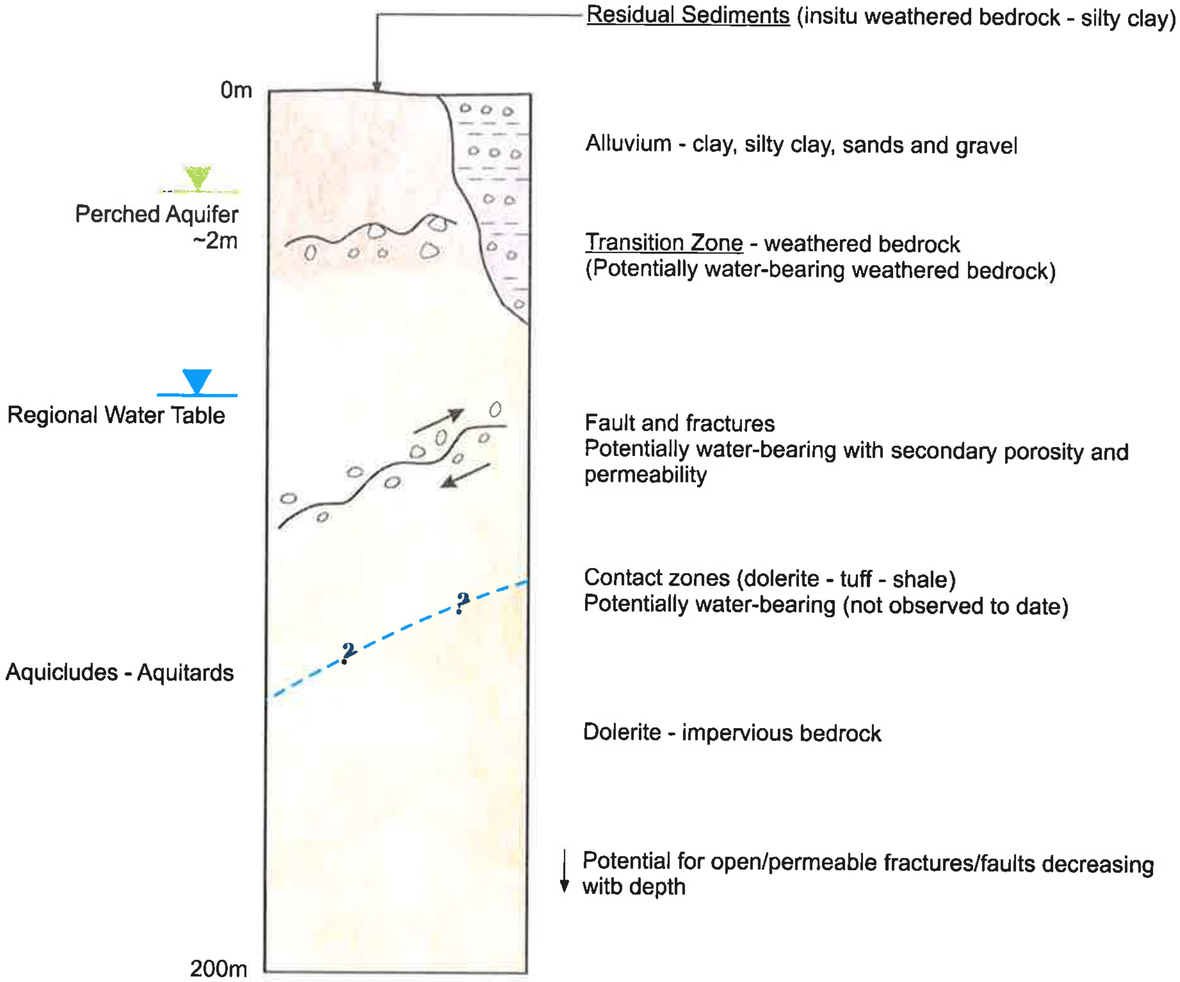
EPA LOCATIONS

VEOLIA ENVIRONMENTAL SERVICES - WOODLAWN BIOREACTOR

Figure 3B

Date: 21 October 2007

Reference: E2W_083_11.cdr



SUMMARY OF AQUIFER UNITS AT BIOREACTOR SITE

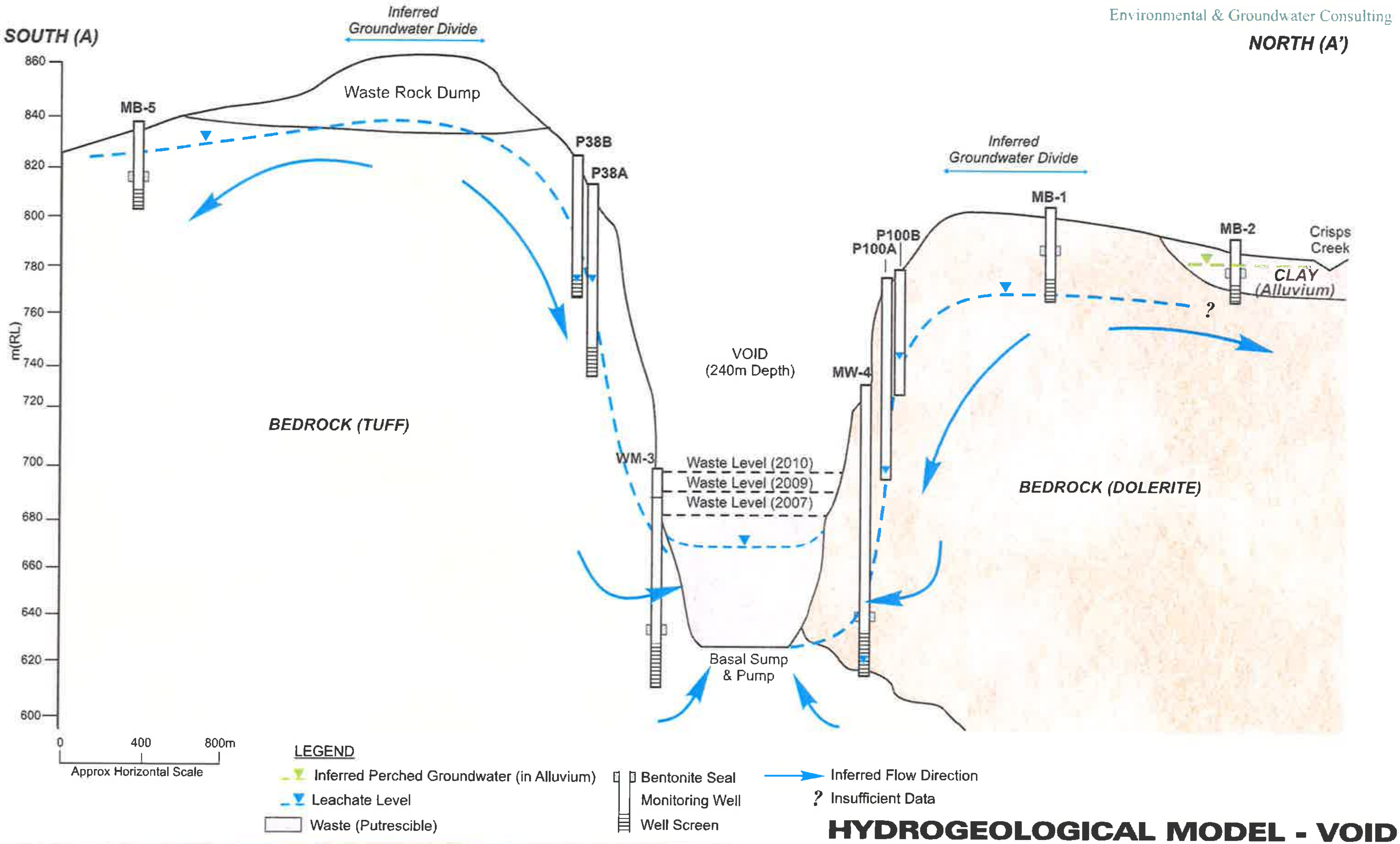
VEOLIA ENVIRONMENTAL SERVICES - WOODLAWN BIOREACTOR

Date: *16 October 2007*

Reference: *E2W_083_03.cdr*

Figure 4

earth2water Pty Ltd
Environmental & Groundwater Consulting



HYDROGEOLOGICAL MODEL - VOID

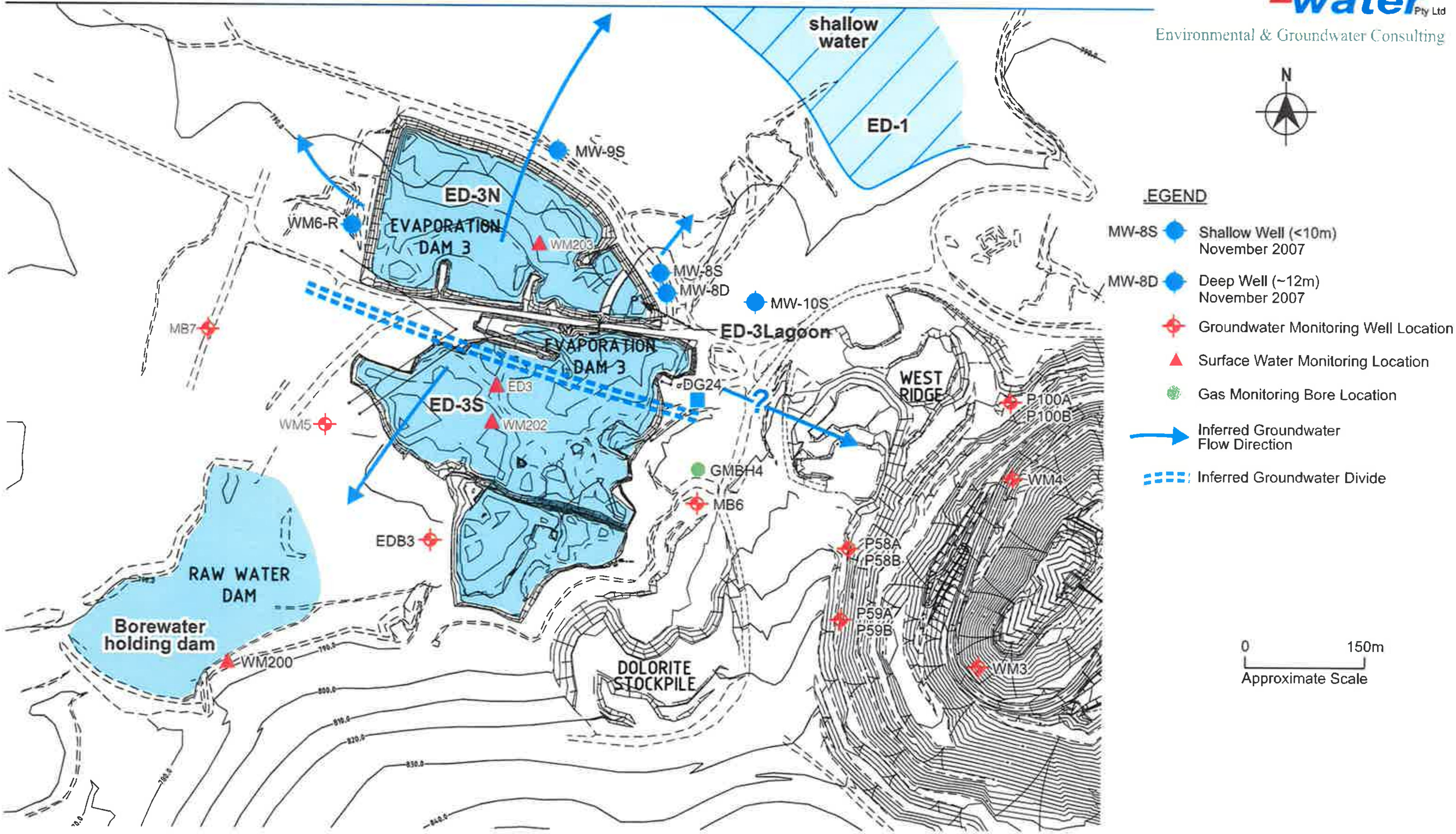
Date: *8 November 2010*

Reference: *E2W_083_20.cdr*

VEOLIA ENVIRONMENTAL SERVICES - WOODLAWN BIOREACTOR

Figure 5

Environmental & Groundwater Consulting



Source: *Baseplan - Maunsell*

Layout of ED-3 and New Well Locations (November 2007)

VEOLIA ENVIRONMENTAL SERVICES - WOODLAWN BIOREACTOR

Date: *15 November2007*

Reference: *E2W_083_13.cdr*

Figure 6

APPENDIX A

Appendix A: Woodlawn Bioreactor and Intermodal Facility Monitoring Locations (EPL 11436, EPL 11455)

SITE CODE	Description	Required by	Licence Number	EASTING	NORTHING	RL (top of casing)	DEPTH (from top of casing) m	CATEGORY
PYLARA	High Volume Air Sampling Location	DECC	EPL 11455	13520.00	7160.00			Air
DG18	Dust Gauge #18 - Radially North of IMF 500m - Chinnery's	No longer required by DECC		16240.00	8510.00			Dust
DG22	Dust Gauge #22 - Radially East of Mine Void 150m	DECC	EPL 11436	10320.000	9270.000			Dust
DG24	Dust Gauge #24 - Radially West of Mine Void 150m	DECC	EPL 11436	9200.000	9320.000			Dust
DG28	Dust Gauge #28 - Pylara West of Homestead	DECC	EPL 11436	13520.00	7160.00			Dust
E3	South Tailings Dam Piezometer - Southern wall	Mine	SML20	11280.00	7320.00	774.52	19.38	Groundwater
ED3B	Evaporation Dam 3 Piezometer	DECC	EPL 11436	8882.70	9062.40	786.80	5.90	Groundwater
ETP8	North Tailings Dam Piezometer - Eastern wall	Mine	SML20	11180.00	8210.00	776.47	9.17	Groundwater
F1	South Tailings Dam Piezometer - Southern wall	Mine	SMIL20	11300.00	7340.00	774.49	23.28	Groundwater
F7	South Tailings Dam Piezometer - Southern wall	Mine	SML20	11300.00	7350.00	773.25	13.90	Groundwater
MB1	1 Monitoring Bore	DECC	EPL 11436	9735.00	9752.10	797.51	32.20	Groundwater
MB2	2 Monitoring Bore	DECC	EPL 11436	9502.90	10201.80	781.86	13.20	Groundwater
MB3	3 Monitoring Bore	DECC	EPL 11436	9762.30	10850.50	793.20	25.80	Groundwater
MB4	4 Monitoring Bore	DECC	EPL 11436	10333.50	9263.20	786.50	25.80	Groundwater
MB5	5 Monitoring Bore	DECC	EPL 11436	9443.70	8025.20	833.98	25.80	Groundwater
MB6	6 Monitoring Bore	DECC	EPL 11436	9224.90	9181.90	796.21	25.80	Groundwater
MB7	7 Monitoring Bore	DECC	EPL 11436	8532.40	9283.10	789.07	29.00	Groundwater
MB8	8 Monitoring Bore	DECC	EPL 11436	11896.10	9322.20	752.57	25.90	Groundwater
MB10	10 Monitoring Bore	DECC	EPL 11436	9200.90	10163.90	783.80	20.80	Groundwater
MB11	11 Monitoring Bore	DECC	EPL 11436	7930.30	10126.50	778.97	5.30	Groundwater
MB12	12 Monitoring Bore	DECC	EPL 11436	7930.30	10129.30	779.95	13.20	Groundwater
MB13	13 Monitoring Bore	DECC	EPL 11436	7004.70	10089.90	748.66	13.20	Groundwater
MB14	14 Monitoring Bore	DECC	EPL 11436	8273.80	10251.60	792.37	12.50	Groundwater
MB15	15 Monitoring Bore	DECC	EPL 11436	8482.70	8438.10	764.86	23.70	Groundwater
MB16	16 Monitoring Bore	DECC	EPL 11436	8535.60	8560.40	771.39	7.30	Groundwater
MB17	17 Monitoring Bore	DECC	EPL 11436	8520.10	8511.20	771.07	15.40	Groundwater
MB19	19 Monitoring Bore	DECC	EPL 11436	7870.00	10130.00	777.52	12.00	Groundwater
MB20	20 Monitoring Bore	DECC	EPL 11436			778.02		Groundwater
NTP1	North Tailings Dam Piezometer - Northern wall	Mine	SML20	10620.00	8620.00	787.87	9.44	Groundwater
NTP2	North Tailings Dam Piezometer - Eastern wall	Mine	SML20	10465.00	8620.00	789.42	10.85	Groundwater
P100A	Pit Piezometer P100 shallow	DECC	EPL 11436	9610.00	9400.00	776.43	41.00	Groundwater
P100B	Pit Piezometer P100 deep	DECC	EPL 11436	9610.00	9400.00	776.43	78.00	Groundwater
P38A	Pit Piezometer P38 shallow	DECC	EPL 11436	9760.00	8820.00	815.31	39.70	Groundwater
P38B	Pit Piezometer P38 deep	DECC	EPL 11436	9760.00	8820.00	815.31	76.50	Groundwater
P44A	Pit Piezometer 44 shallow	DECC	EPL 11436	9965.00	9237.00	731.05	40.50	Groundwater
P44B	Pit Piezometer 44 deep	DECC	EPL 11436	9965.00	9237.00	731.05	73.00	Groundwater
P45A	Pit Piezometer 45 shallow	DECC	EPL 11436	9962.00	9194.00	731.16	40.45	Groundwater
P45B	Pit Piezometer 45 deep	DECC	EPL 11436	9962.00	9194.00	731.11	78.00	Groundwater
P58A	Pit Piezometer 58 shallow	DECC	EPL 11436	9436.36	9162.22	807.39	42.00	Groundwater
P58B	Pit Piezometer 58 deep	DECC	EPL 11436	9436.36	9162.22	807.39	75.00	Groundwater
P59A	Pit Piezometer 59 shallow	DECC	EPL 11436	9445.60	9066.20	804.70	34.00	Groundwater
P59B	Pit Piezometer 59 deep	DECC	EPL 11436	9445.60	9066.20	804.70	77.00	Groundwater

Appendix A: Woodlawn Bioreactor and Intermodal Facility Monitoring Locations (EPL 11436, EPL 11455)

SITE CODE	Description	Required by	Licence Number	EASTING	NORTHING	RL (top of casing)	DEPTH (from top of casing) m	CATEGORY
SP11B	North Tailings Dam Piezometer - Eastern wall	Mine	SML20	11210.00	8220.00	774.24	15.37	Groundwater
SP2C	North Tailings Dam Piezometer - Northern wall	Mine	SML20	10595.00	8695.00	786.87	21.28	Groundwater
SP3C	North Tailings Dam Piezometer - Eastern wall	Mine	SML20	10455.00	8670.00	788.93	11.97	Groundwater
WM1	1 Monitoring Well	DECC	EPL 11436	4690.90	7081.57	781.27	115.00	Groundwater
WM3	3 Monitoring Well	DECC	EPL 11436	4211.97	6891.54	707.62	85.00	Groundwater
WM4	4 Monitoring Well	DECC	EPL 11436	4310.77	7161.86	733.92	108.00	Groundwater
WM5	5 Monitoring Well	DECC	EPL 11436	3378.57	7152.83	786.73	6.00	Groundwater
WM6	6 Monitoring Well	DECC	EPL 11436	3400.82	7469.32	790.34	6.00	Groundwater
WM7	7 Monitoring Well	DECC	EPL 11436	4459.56	6913.17	686.94		Groundwater
X1	South Tailings Dam Piezometer - Eastern wall	Mine	SML20	11300.00	7690.00	781.51	7.95	Groundwater
X2	South Tailings Dam Piezometer - Eastern wall	Mine	SML20	11303.70	7683.70	780.90	7.96	Groundwater
Y1	South Tailings Dam Piezometer - Eastern wall	Mine	SML20	11315.00	7660.00	776.98	7.03	Groundwater
Z1	South Tailings Dam Piezometer - Southern wall	Mine	SML20	11350.00	7360.00	769.52	20.72	Groundwater
WM201	Woodlawn Front Gate	Mine	SML20	10310.00	9790.00			Surface Water
100	Woodlawn/Willeroo Boundary South	Mine	SML20	7000.00	8040.00			Surface Water
105	Crisp's Creek - Pylara Boundary	DECC	EPL 11436	13000.00	8600.00			Surface Water
109	Pylara Boundary-Below South Tailings Dam	Mine	EPL 11436	11460.00	7310.00			Surface Water
110	Crisp's Creek - Bridge	DECC	EPL 11455	16000.00	8250.00			Surface Water
115	Woodlawn/Willeroo Boundary North	DECC	EPL 11436	7100.00	10090.00			Surface Water
130	Creek between bridges	DECC	EPL 11455					Surface Water
150	Mulwarree River at Braidwood Road Crossing	DECC	EPL 11455	17570.00	8690.00			Surface Water
ED1	Evaporation Dam 1	Mine	SML20	8970.00	9850.00	788.50		Surface Water
ED2	Evaporation Dam 2	Mine	SML20	8310.00	10000.00	788.80		Surface Water
ED2SCT	ED2 SeDECCge Collection Trench Overflow Pipe	Mine	SML20	7920.00	10130.00			Surface Water
FRC	Crisp's Creek - Farm Road Culvert	Mine	SML20	9540.00	10260.00			Surface Water
NTD	North Tailings Dam	Mine	SML20	10830.00	8130.00			Surface Water
PCD	Plant Collection Dam	Mine	SML20	10600.00	9800.00			Surface Water
Pond 1	Pond 1 (In Void)	DECC				670.00		Surface Water
Pond 2	Pond 2 (In Void)	DECC	EPL 11436					Surface Water
Pond 3	Pond 3 (In Void)	DECC	EPL 11436					Surface Water
SPRING2	Crisp's Creek - Pond 2 Outflow	DECC	EPL 11436	9950.00	10390.00			Surface Water
STD	South Tailings Dam	Mine	SML20	11000.00	7440.00			Surface Water
STDRW	South Tailings Dam Return Water	Mine	SML20	11370.00	7350.00			Surface Water
WM202	Evaporation Dam 3 South	DECC	EPL 11436	8930.00	9280.00	790.37		Surface Water
WM203	Evaporation Dam 3 North	DECC	EPL 11436	8930.00	9280.00	790.03		Surface Water
WRDAM	Waste Rock Dam	Mine	SML20	8350.00	8240.00	760.50		Surface Water
WTD	West Tailings Dam	Mine	SML20	10320.00	7640.00			Surface Water
IMF FF	IMF First Flush	DECC						Surface Water

APPENDIX B

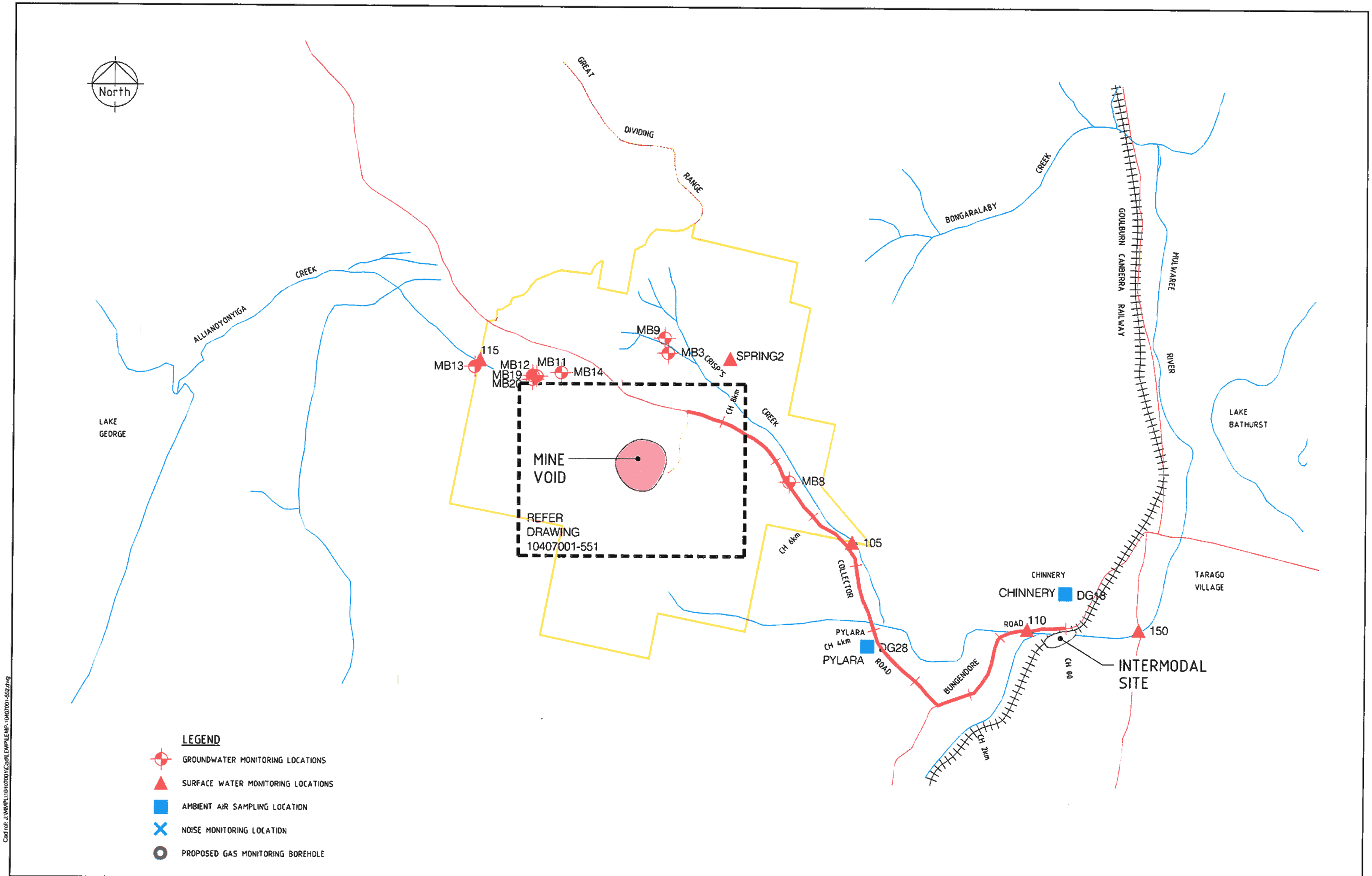
Appendix B: Woodlawn Monitoring Locations Details

SITE CODE	Location Description	Required by	RL (top of casing)	Date Installed	DEPTH (from top of casing) m	Geology	Well Screen Interval (mbgl)	Bentonite Seal (mbgl)	Notes
ED3B	Evaporation Dam 3 Piezometer	EPA	786.800		5.900				GW - no log
MB1	1 Monitoring Bore	EPA	797.510		32.200	Bedrock Dolerite = 0 - 32 m	26 - 32 m	18 - 19 m	GW
MB10	10 Monitoring Bore	EPA	783.800		20.800	Clay (Brown) = 0 -1 m, Clay (Grey) = 1 - 1.8 m, Gravel = 1.8 - 3.2 m, Sand (Gravel) = 3.2 - 12.2 m, Hard Silicious Band = 12.2 - 12.6 m, Gravel = 12.6 - 19.8 m, Dolerite = 19.8 - 20.8 m	19 - 20.8 m	12.6 - 13 m	GW
MB11	11 Monitoring Bore	EPA	778.970		5.300	Clay = 0 - 1.2 m, Dolerite = 1.2 - 3.3 m, Shale = 3.3 - 5.3 m	2.3 - 5.3 m	0.5 - 1.2 m	GW
MB12	12 Monitoring Bore	EPA	779.950		13.200	Dolerite Floater = 0 - 0.5 m, Dolerite/Shale/Acid Vocanic = 0.5 - 13.2 m	10.3 - 13.2 m	8.6 - 9.4 m	GW
MB13	13 Monitoring Bore	EPA	748.660		13.200	Silty Sand = 0 - 0.8 m, Clay = 0.8 - 1.8 m, Sandy Clay = 1.8 - 3 m, Volcanic (Foliated) = 3 - 9 m, Dolerite = 9 - 13.2 m	10.3 - 13.2 m	6.8 - 7.4 m	GW
MB14	14 Monitoring Bore	EPA	792.370		12.500	Clay = 0 - 1.2 m, Dolerite = 1.2 - 12.5 m, Fracture = 8.1 m	9.5 - 12.5 m	5.2 - 5.8 m	GW
MB15	15 Monitoring Bore	EPA	764.860		23.700	Fill = 0 - 0.4 m, Rhyolite/Volcanic = 0.4 - 23.7 m (Becoming softer)	16.4 - 23.7 m	7.2 - 7.4 m	GW
MB16	16 Monitoring Bore	EPA	771.390		7.300	Fill = 0 - 0.8 m, Clayey Gravel/Gravelly Clay = 0.8 - 4 m, Rhyolite = 4 - 7.3 m	3.2 - 6.2 m	2 - 2.7 m	GW
MB17	17 Monitoring Bore	EPA	771.070		15.400	Fill = 0 - 0.4 m, Sandy Clay = 0.4 - 2.4 m, Volcanics = 2.4 - 6.4 m, Tuff = 6.4 - 8 m, Volcanics = 8 - 15.4 m	9.3 - 15.4 m	8.4 - 9 m	GW
MB2	2 Monitoring Bore	EPA	781.860		13.200	Clay = 0 - 9 m, Dolerite = 9 - 13 m	7.2 - 13.2 m	5.2 - 6 m	GW
MB3	3 Monitoring Bore	EPA	793.200		25.800	Fill = 0 - 0.2 m, Clay = 0.2 - 3.5 m, Siltstone = 3.5 - 6 m, Clay = 6 - 18.5 m, Gravel = 18.5 - 25.8 m	20 - 25.8 m	14 - 16 m	GW
MB4	4 Monitoring Bore	EPA	786.500		25.800	Fill = 0 - 2.5 m, Shale (Grey to Red) = 2.5 - 25.8 m	19.8 - 25.8 m	14 - 16 m	GW
MB5	5 Monitoring Bore	EPA	833.980		25.800	Top Soil = 0 - 0.1 m, Tuff = 0.1 - 1.5 m, Tuff (with weathered zones x 2) = 1.5 - 25.8 m	19.8 - 25.8m	16 - 17 m	GW
MB6	6 Monitoring Bore	EPA	796.210		25.800	Fill (Dolerite & Shale) = 0 - 2.5 m, Shale = 2.5 - 11 m, Clay = 11 - 11.5 m, Shale (Siltstone) = 11.5 - 19 m, Shale = 19 - 25.8 m	19.8 - 25.8 m	13.2 - 15 m	GW
MB7	7 Monitoring Bore	EPA	789.070		29.000	Clay = 0 - 2 m, Shale = 2 - 25 m, Tuff = 25 - 29 m	25 - 29 m	22 - 23 m	GW
MB8	8 Monitoring Bore	EPA	752.570		25.900	**NO DATA**	NA	NA	GW - no log

Appendix B: Woodlawn Monitoring Locations Details

SITE CODE	Location Description	Required by	RL (top of casing)	Date Installed	DEPTH (from top of casing) m	Geology	Well Screen Interval (mbgl)	Bentonite Seal (mbgl)	Notes
WM1	1 Monitoring Well	EPA	781.270	5/06/2003	115.000	Dolerite = 0 - 115 m	NA	NA	GW
WM2	2 Monitoring Well	EPA	686.730	3/06/2003	115.000	Shale = 0 - 2.5 m, Tuff/Tuffaceous Sediment = 2.5 - 47 m, (FeO2 Coatings on Fractures and Joints = 6.0 - 13 m, Decrease in Chip Size = to 34 m, Increase in Talc content = 35 - 47 m), Dolerite = 47 - 48.5 m, Tuff/Tuffaceous Sediment = 48.5 - 115 m	NA	NA	GW
WM3	3 Monitoring Well	EPA	707.620	4/06/2003	85.000	Tuff/Tuffaceous Sediment (Brown) = 0 - 2 m, Tuff/Tuffaceous Sediment (Light Grey) = 2 - 8 m, Tuff = 8 - 49 m, Tuff/Tuffaceous Sediment (Mid/Light Grey), Tuff (Mid Grey) = 59 - 68 m, Tuff/Tuffaceous Sediment (Light Cream) = 68 - 85 m	NA	NA	GW
WM4	4 Monitoring Well	EPA	733.920	5/06/2003	108.000	Unkown = 0 - 60 m, Dolerite (Dark grey green) = 60 - 62 m, Tuff/Tuffaceous Sediment = 62 - 71 m, Dolerite (Olive Green) = 71 - 84 m, Tuff = 84 - 102 m, Dolerite = 102 - 108 m	NA	NA	GW
WM5	5 Monitoring Well	EPA	786.730	7/06/2003	6.000	Clay = 0 - 1 m, Crystal Tuff = 1 - 6 m	NA	NA	GW - no log
WM6	6 Monitoring Well	EPA	790.340	7/06/2003	6.000	Clay = 0 - 2 m, Tuff = 2 - 4 m, Yellow Brown Silicified Volcanics = 4 - 6 m	NA	NA	GW - no log
WM7	7 Monitoring Well	EPA	686.730			**NO DATA**	NA	NA	GW - no log

APPENDIX C



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Last modified: 29 Jun 04 - 11:43

REVISIONS				
A	SGG	29.6.04		
No.	BY	DATE	DESCRIPTION	APPD

Before commencing work, all controlling dimensions on the drawings must be verified on the site, particularly those relative to property alignments, other structures, and services.

Figured dimensions take preference over scaled. If in doubt, ask.

SCALES

250 0 500m 1km

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE MAUNSELL AUSTRALIA QUALITY ASSURANCE SYSTEM CERTIFIED TO AS/NZS ISO 9001-1994

	PREPARED	CHECKED	PASSED
DESIGN			DATE
DRAFTING	SGG		

maunsell

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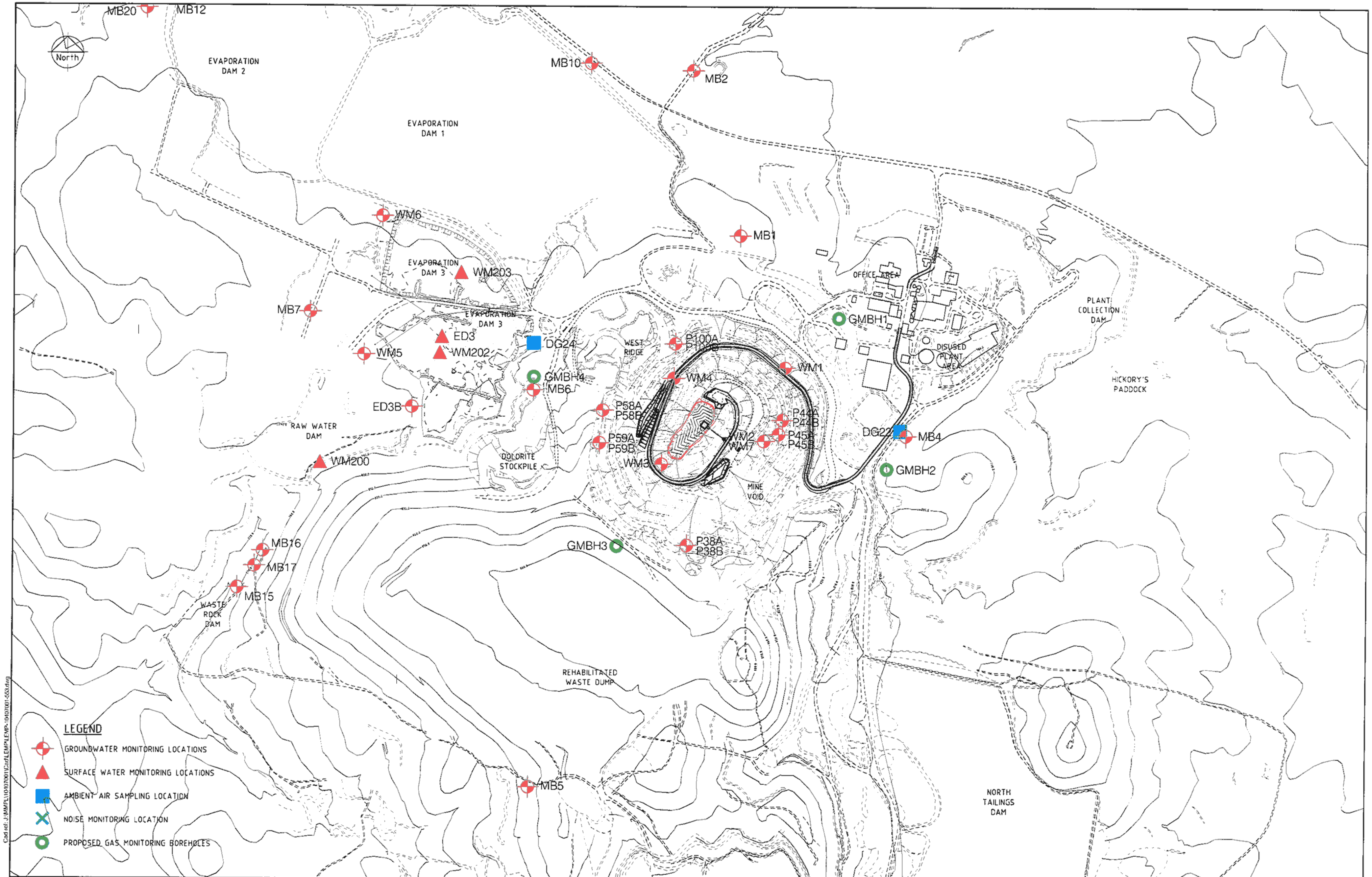
An AECOM company

WOODLAWN BIOREACTOR

MINE SITE
EPA MONITORING LOCATIONS
OVERALL SITE

10407001-552 | A



REVISIONS				
A	SGG	29.6.04		
No.	BY	DATE	DESCRIPTION	APPD

Before commencing work, all controlling dimensions on the drawings must be verified on the site, particularly those relative to property alignments, other structures, and services.

Figured dimensions take preference over scaled. If in doubt, ask.

SCALES

50 0 100 200m

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE MAUNSELL AUSTRALIA QUALITY ASSURANCE SYSTEM CERTIFIED TO AS/NZS ISO 9001-1994

	PREPARED	CHECKED	PASSED
DESIGN			
DRAFTING	SGG		DATE

maunsell

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WOODLAWN BIOREACTOR

MINE SITE
EPA MONITORING LOCATIONS
MINE AREA

10407001-553 A

Last modified: 29 Jun 04 - 15:08

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VEOLIA
ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR

Veolia Environmental Services

Woodlawn Bioreactor & IMF

Environmental Monitoring Schedule

AUGUST 2010

List of Figures

10407001 – 550 A	All monitoring locations – overall site
10407001 – 551 A	All monitoring locations – mine area
10407001 – 552 A	EPA monitoring locations – overall site
10407001 – 553 A	EPA monitoring locations – mine area

Program	Locations	Parameters	Frequency	Requirement	Notes
METEOROLOGY * EPL – Point 9	Meteorological Station	▪ Wind speed @ 10m ▪ Wind direction @10m ▪ Sigma theta @ 10m ▪ Temperature @10m ▪ Temperature @ 2m ▪ Solar radiation ▪ rainfall	Continuous	EPA licence, consent	Logged at 15min intervals to provide 1hr average values, must be able to provide instantaneous wind speed an direction to assist in investigation of complaints

Program	Locations	Parameters	Frequency	Requirement	Notes
LEACHATE QUALITY MONITORING **EPL – Point 23,24**	Leachate Pond Leachate Recirculation System	▪ Alkalinity as HCO_3^- & CO_3^{2-} ▪ Ammonia as N ▪ Calcium ▪ Chloride ▪ Conductivity ▪ Magnesium ▪ Potassium ▪ Sodium ▪ Sulphate ▪ Total Dissolved Solids ▪ Total Organic Carbon ▪ pH ▪ Total Suspended Solids ▪ Phosphorus (Total) ▪ Aluminium ▪ Barium ▪ Chromium (Hexavalent) ▪ Chromium (Total) ▪ Arsenic ▪ Fluoride ▪ Mercury ▪ Copper ▪ Lead ▪ Manganese ▪ Bicarbonate ▪ Polycyclic Aromatic Hydrocarbons ▪ Zinc ▪ Cobalt ▪ Cadmium ▪ Carbonate	Annually		

Program	Locations	Parameters	Frequency	Requirement	Notes
		▪ Nitrate ▪ Nitrite ▪ Organochlorine Pesticides ▪ Organophosphate Pesticides ▪ Total Phenolics ▪ BTEX ▪ Total Petroleum Hydrocarbons			
WATER QUALITY					
SURFACE WATER					
EPL – Points 13 to 22	Monitoring Sites: ▪ 115 ▪ Spring 2 ▪ 105 ▪ WM201 ▪ WM202 (ED3 S) ▪ WM203 (ED3 N) ▪ WM200 (Raw Water Dam) ▪ Pond 2 ▪ Pond 3	▪ Ammonia as N ▪ BOD ▪ Conductivity ▪ Potassium ▪ Total Dissolved Solids ▪ Total Organic Carbon ▪ pH ▪ Dissolved Oxygen ▪ Redox Potential	▪ Quarterly ▪ After rainfall events greater than 25mm ▪ If quarterly monitoring not possible due to lack of flow, monitoring based on rainfall events and creek flow assessment ▪ Special frequency 1 (EPL)	EPA licence	Note: WM200 to be sampled twice during rehabilitation of the Western Ridge.
MINE SITE SURFACE WATER	▪ Farm Road Culvert ▪ Site 100 ▪ Site 109	▪ pH ▪ Conductivity	Quarterly	Mine	Metal Analysis on a annual basis. Zinc, Copper, Iron, Lead, Sulphate
	▪ ED1 ▪ ED2 ▪ Waste Rock	▪ pH ▪ Conductivity	Six monthly	Mine	Metal Analysis on a annual basis. Zinc, Copper, Iron, Lead, Sulphate

Program	Locations	Parameters	Frequency	Requirement	Notes
	Dam ▪ Sth Tailings Dam ▪ Nth tailings Dam ▪ Plant Collection Dam ▪ ED2 SCT ▪ STD Return Water				
INTERMODAL FACILITY EPL – POINT 1 TO 3	110 (IMF) 150 (IMF) 130 (IMF) Outlet from IMF Stormwater Pond	▪ Ammonia as N ▪ BOD ▪ Conductivity ▪ Potassium ▪ Total Dissolved Solids ▪ Total Organic Carbon ▪ pH ▪ Dissolved Oxygen	Quarterly	EPA licence 130 added by Veolia for extra upstream data	In the case of no flow at these points sampling may need to be based on rainfall events

Program	Locations	Parameters	Frequency	Requirement	Notes
WATER LEVELS IN DAMS * **EPL – Point 18**	ED3 North ED3 South Waste Rock Dam ED2 ED1 Nth Tailings Dam Sth Tailings Dam Raw Water Dam	Level	Monthly Note consent condition 132: "the monitoring of ED3 will initially be at **weekly** intervals and will be reviewed 12 months after commencement of landfilling operations"	ED3 in EPA licence Others for Mine Site	To be record on Key Indicators Checklist
PUMP READINGS	PP06 (in pit) PP07 (in pit) PP08 (in pit) Bore Field Booster 1 – Flow meter Woodlawn Dam (Raw Water Dam) Pump & flowmeter Plant Collection Dam Sth Tailings Return Water	Pump hours/readings	Monthly	EPA licence and Mine Site	To be record on Key Indicators Checklist
GROUNDWATER					
Sampling * **EPL – Point 25 to 47, and 55 to 58**	▪ MB1 – 17 ▪ ED3B ▪ WM1 ▪ WM3 ▪ WM4 ▪ WM5	**Quarterly** ▪ **Alkalinity as HCO_3^- & CO_3^{2-}** ▪ **Ammonia as N** ▪ **Standing Water Level** ▪ **Calcium** ▪ **Chloride** ▪ **Conductivity** ▪ **Magnesium**	Annually and Quartely	EPA licence	Except MB9

Program	Locations	Parameters	Frequency	Requirement	Notes
	▪ WM6 ▪ WM7 ▪ MW8S ▪ MW8D ▪ MW9S ▪ MW10S	▪ **Potassium** ▪ **Sodium** ▪ **Sulphate** ▪ **Total Dissolved Solids** ▪ **pH** ▪ **Standing Water Level** **Annually** ▪ Chromium ▪ Arsenic ▪ Copper ▪ Fluoride ▪ Lead ▪ Manganese ▪ Bicarbonate ▪ Cadmium ▪ Carbonate ▪ Nitrate ▪ Nitrite ▪ Organochlorine Pesticides ▪ Organophosphate Pesticides ▪ Total Phenolics ▪ Total Organic Carbon ▪ Zinc ▪ Aluminium ▪ Phosphate ▪ Barium ▪ Chromium (Hexavalent) ▪ Chromium (Total) ▪ Mercury ▪ Cobalt ▪ BTEX ▪ Total Petroleum Hydrocarbon			

Program	Locations	Parameters	Frequency	Requirement	Notes
		▪ Polycyclic Aromatic Hydrocarbons			
Piezometers * **EPL – Point 48 to 53**	▪ P38 ▪ P44 ▪ P45 ▪ P58 ▪ P59 ▪ P100	▪ Standing Water level (mAHD)	Quarterly	EPA licence	
OTHER GROUNDWATER MONITORING	MB 1 - 20	▪ pH ▪ Standing Water Level (mAHD) ▪ Conductivity	Quarterly	Mine	Some overlap with EPA requirements – MB 1,4,6 already done, 1-17 level required. Note MB18 is now filled in & MB 9 not monitored. Metal Analysis on a annual basis. Zinc, Copper, Iron, Lead, Sulphate
	▪ NTP1 ▪ NTP2 ▪ SP2C ▪ SP3C ▪ ETP8 ▪ SP11B ▪ E3 ▪ F1 ▪ F7 ▪ X1 ▪ X2 ▪ Y1 ▪ Z1	▪ pH ▪ Standing Water Level (mAHD) ▪ Conductivity	Six monthly	Mine	Metal Analysis on a annual basis. Zinc, Copper, Iron, Lead, Sulphate

Program	Locations	Parameters	Frequency	Requirement	Notes
LANDFILL GAS					
Subsurface Gas					
* EPL – Point 1 - 4	GMBH1 GMBH2 GMBH4	▪ CH_4 - % By Volume	Quarterly	EPA Licence/BPMP	Special method 1 – ELP Licence only requires quarterly methane, at locations in and near the mine void as shown in LEMP. Must be sampled before any purging or adding of air.
	Internal to the Bioreactor : At Gas Manifolds	▪ CH_4 ▪ CO_2 ▪ O_2 ▪ H_2S ▪ CO ▪ N balance ▪ Flow ▪ Rel. pressure - mb	Operational requirement for performance of Power Station	BPMP	Veolia to do extra as part of BPMP
	At flare	▪ CH_4 ▪ CO_2 ▪ O_2 ▪ H_2S	Weekly	BPMP	Veolia to do extra as part of BPMP

Program	Locations	Parameters	Frequency	Requirement	Notes
Surface Gas * EPL – Point 6	Locations on the surface of the landfilled waste (grid 30m x 30m)	▪ CH_4 - % By Volume	Quarterly	EPA licence BPMP	Special method 2 – EPL Licence only requires quarterly methane, Veolia to do extra as part of BPMP Sampling procedure as per NSW EPA Environmental Guidelines: Solid Waste Landfills
LANDFILL GAS EXTRACTION BOOSTER * EPL – Point 5	Power Station – Flare Compound	▪ Carbon Dioxide ▪ Dry Gas Density ▪ Moisture Content ▪ Molecular Weight of Stack Gases ▪ Oxygen ▪ Temperature ▪ Volatile Organic Compounds ▪ Volumetric Flow Rate	Annually	EPA Licence	Sampling procedure as per NSW EPA Environmental Guidelines: Solid Waste Landfills
LANDFILL GAS FLARE * EPL – Point 7	Power Station – Flare Compound	▪ Temperature ▪ Residence Time	Annual	EPA licence	

Program	Locations	Parameters	Frequency	Requirement	Notes
LANDFILL GAS FIRED POWER STATION * EPL – Point 8	Air Discharge	▪ Carbon Dioxide ▪ Dry Gas Density ▪ Moisture Content ▪ Nitrogen Oxides ▪ 0xygen ▪ Sulphur Dioxide ▪ Sulphuric Acid mist and/or sulphur trioxide ▪ Temperature ▪ Volatile Organic Compounds ▪ Velocity ▪ Volumetric flow rate ▪ Carbon Monoxide ▪ Molecular Weight of Stack Gases ▪ Hydrogen Sulphide	Annually	EPA licence	Sampling procedure as per NSW EPA Environmental Guidelines: Solid Waste Landfills

Program	Locations	Parameters	Frequency	Requirement	Notes
AMBIENT AIR QUALITY EPL – Point 10, 11, 12	DG 22 – West Void DG 24 – East Void DG 28 - Pylara	Particulates – Deposited Matter	Monthly	EPA licence	
ODOUR	Odour Monitoring is performance based, and linked to complaints received about odour				

Program	Locations	Parameters	Frequency	Requirement	Notes
NOISE		Attended noise monitoring (Laeq and LA 10 (15min)) week at start of operations, then only if intensity changes or we receive any complaints No unattended monitoring, unless queries over attended results			
Bioreactor	Pylara Night time: (10pm to 7am) 1m from façade of residence Day time : (7am to 10pm) At the residential boundary or 30m from the residence	Laeq and LA 10 (15min)	Attended noise monitoring for 1 week at the commencement of operations	EPA licence, consent	Unattended monitoring or further attended monitoring will only be undertaken if the intensity of operations increase significantly or there are noise complaints 5dB (A) must be added to the measured level if the noise is substantially tonal or impulsive in character

Program	Locations	Parameters	Frequency	Requirement	Notes
Intermodal	Chinnery Night time: (10pm to 7am) 1m from façade of residence Day time : (7am to 10pm) At the residential boundary or 30m from the residence	Laeq and LA 10 (15min)	Attended noise monitoring for 1 week at the commencement of operation	EPA licence, consent	Unattended monitoring or further attended monitoring will only be undertaken if the intensity of operations increase significantly or there are noise complaints 5dB (A) must be added to the measured level if the noise is substantially tonal or impulsive in character

Program	Locations	Parameters	Frequency	Requirement	Notes
PEST, VERMIN & WEED MANAGEMENT					
	Bioreactor and Intermodal Facility Sites	Presence of vermin and/or noxious weeds	Monthly	Consent condition 152	Regular inspections of the sites by Bioreactor Operations Manager. Appropriate corrective actions as required
	Bioreactor and Intermodal Facility Sites	Presence of vermin and/or noxious weeds	6 monthly	Consent condition 152	Inspection by registered pest controller. Appropriate corrective actions as required.
GEOTECHNICAL STABILITY	Mine void	Visual inspection of pit crest, all berms and toe of slope, and photographic record	Weekly	Consent condition 137 which refers to report by BFP 1998 (updated 2004)	
		Slope monitoring survey	Monthly		Frequency to be reviewed after 12 months
		Survey interpretation and geotechnical monitoring report	Quarterly		

JAN	FEB	MAR	APR	MAY	JUN
Print weather station report	Print weather station report	Print weather station report	Print weather station report	Print weather station report	Print weather station report
Dust gauge 22, 24, 28	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**
		Surface Waters : Spring 2 105 115 WM201 WM202 WM203 Pond 2 Pond 3 Leachate Pond 1 Leachate Recir		**Surface Waters:** ED1 ED2 WRDAM STD NTD PCD ED2SCT STDRW	**Surface Waters:** Spring 2 105 115 WM201 WM202 WM203 Pond 2 Pond 3 Leachate pH/EC Pond 1 Leachate Recir. pH/EC
		FRC | 100 | 109			FRC | 100 | 109
IMF Surface Waters: 110 150 130 first flush		**IMF Surface Waters:** 110 150 130 first flush		**IMF Surface Waters:** 110 150 130 first flush	
	Groundwater: Include Annual Monitoring Parameters MB 1 MB 4 MB 6 ED3B WM 1 WM2 WM 3 WM 4 WM 5 WM 6 WM7 MW 8S MW 8D MW 9S MW 10S	**Groundwater: MB # Quarterly** 2 3 5 7 8 10 11 12 13 14 15 16 17 19 20		**Groundwater:** MB 1 MB 4 MB 6 ED3B WM 1 WM 2 WM 3 WM 4 WM 5 WM 6 WM7 MW 8S MW 8D MW 9S MW 10S	**Groundwater: MB #s Quarterly** 2 3 5 7 8 10 11 12 13 14 15 16 17 19 20
Subsurface Gas Bore Holes GMBH1 GMBH2 GMBH4	**Surface Gas Monitoring**		**Subsurface Gas Bore Holes** GMBH1 GMBH2 GMBH4	**Surface Gas Monitoring**	
Mine Site Piezos: Incl: pH, EC, SO4, Cu, Pb, Zn, Fe NTP1 NTP2 SP2C SP3C ETP8 SP11B E3 F1 F7 X1 X2 Y1 Z1	**Pit Piezos:** P38 P44 P45 P58 P59 P100			**Pit Piezos:** P38 P44 P45 P58 P59 P100	

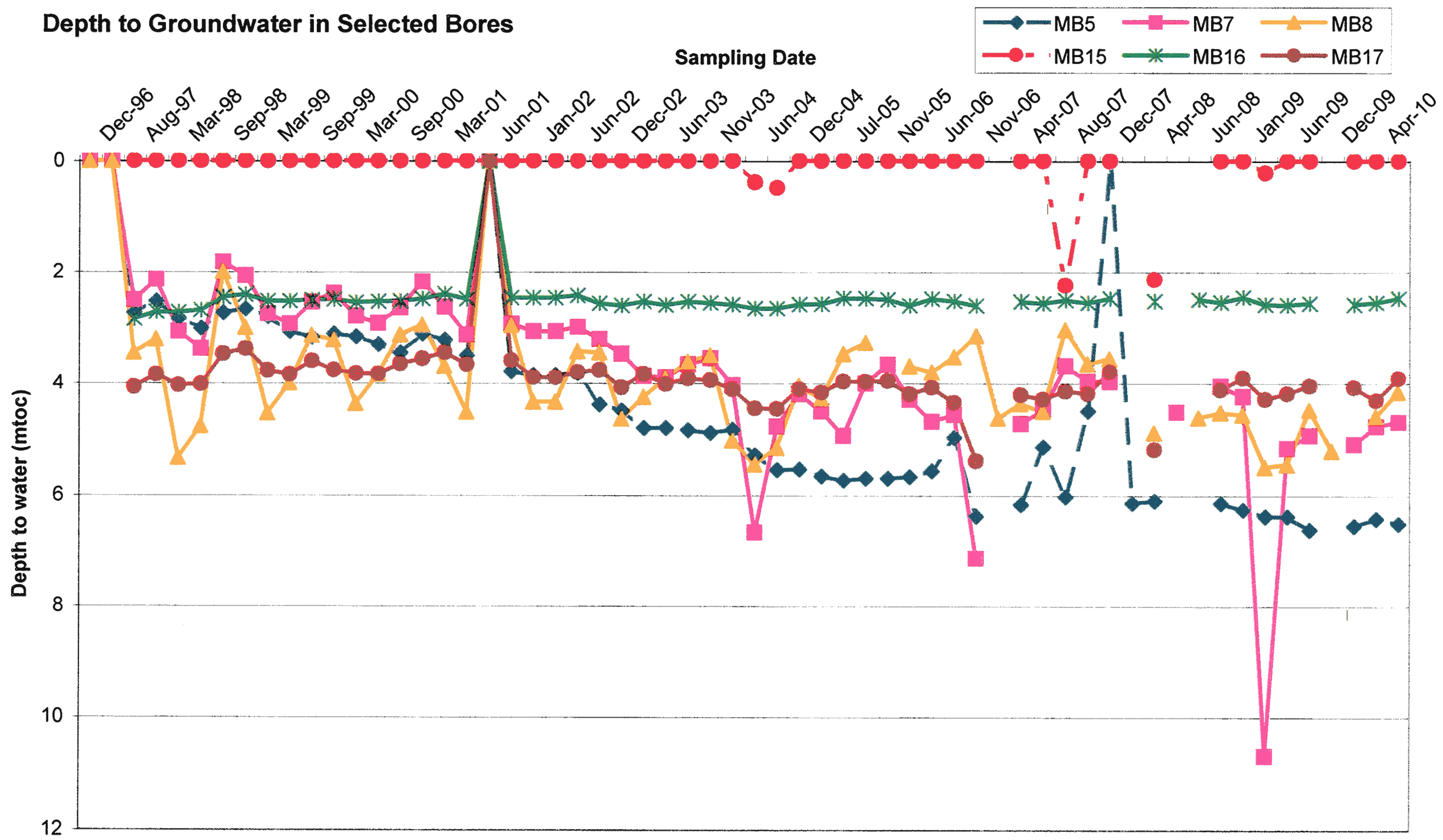
JUL	AUG	SEP	OCT	NOV	DEC
Print weather station report	Print weather station report	Print weather station report	Print weather station report	Print weather station report	Print weather station report
Dust gauge 22, 24, 28	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**	**Dust gauge 22, 24, 28**
		Surface Waters : Spring 2 105 115 WM201 WM202 WM203 Pond 2 Pond 3 Leachate pH/EC Pond 1 Leachate Recir. pH/EC		**Surface Waters:** ED1 ED2 WRDAM STD NTD PCD ED2SCT STDRW	**Surface Waters:** Spring 2 105 115 WM201 WM202 WM203 Pond 2 Pond 3 Leachate pH/EC Pond 1 Leachate Recir. pH/EC
		FRC 100 109			FRC 100 109
IMF Surface Waters: 110 150 130 first flush		**IMF Surface Waters:** 110 150 130 first flush		**IMF Surface Waters:** 110 150 130 first flush	
	Groundwater: MB 1 MB 4 MB 6 ED3B WM1 WM 2 WM 3 WM 4 WM 5 WM 6 WM7 MW 8S MW 8D MW 9S MW 10S	**Groundwater: MB#: : Include Annual Monitoring Parameters** 2 3 5 7 8 10 11 12 13 14 15 16 17 19 20		**Groundwater** MB 1 MB 4 MB 6 ED3B WM 1 WM 2 WM 3 WM 4 WM 5 WM 6 WM7 MW 8S MW 8D MW 9S MW 10S	**Groundwater: MB #s Quarterly** 2 3 5 7 8 10 11 12 13 14 15 16 17 19 20
Subsurface Gas Bore Holes GMBH1 GMBH2 GMBH4	**Surface Gas Monitoring**		**Subsurface Gas Bore Holes** GMBH1 GMBH2 GMBH4	**Surface Gas Monitoring**	
Mine Site Piezos: NTP1 NTP2 SP2C SP3C ETP8 SP11B E3 F1 F7 X1 X2 Y1 Z1	**Pit Piezos:** P38 P44 P45 P58 P59 P100			**Pit Piezos:** P38 P44 P45 P58 P59 P100	

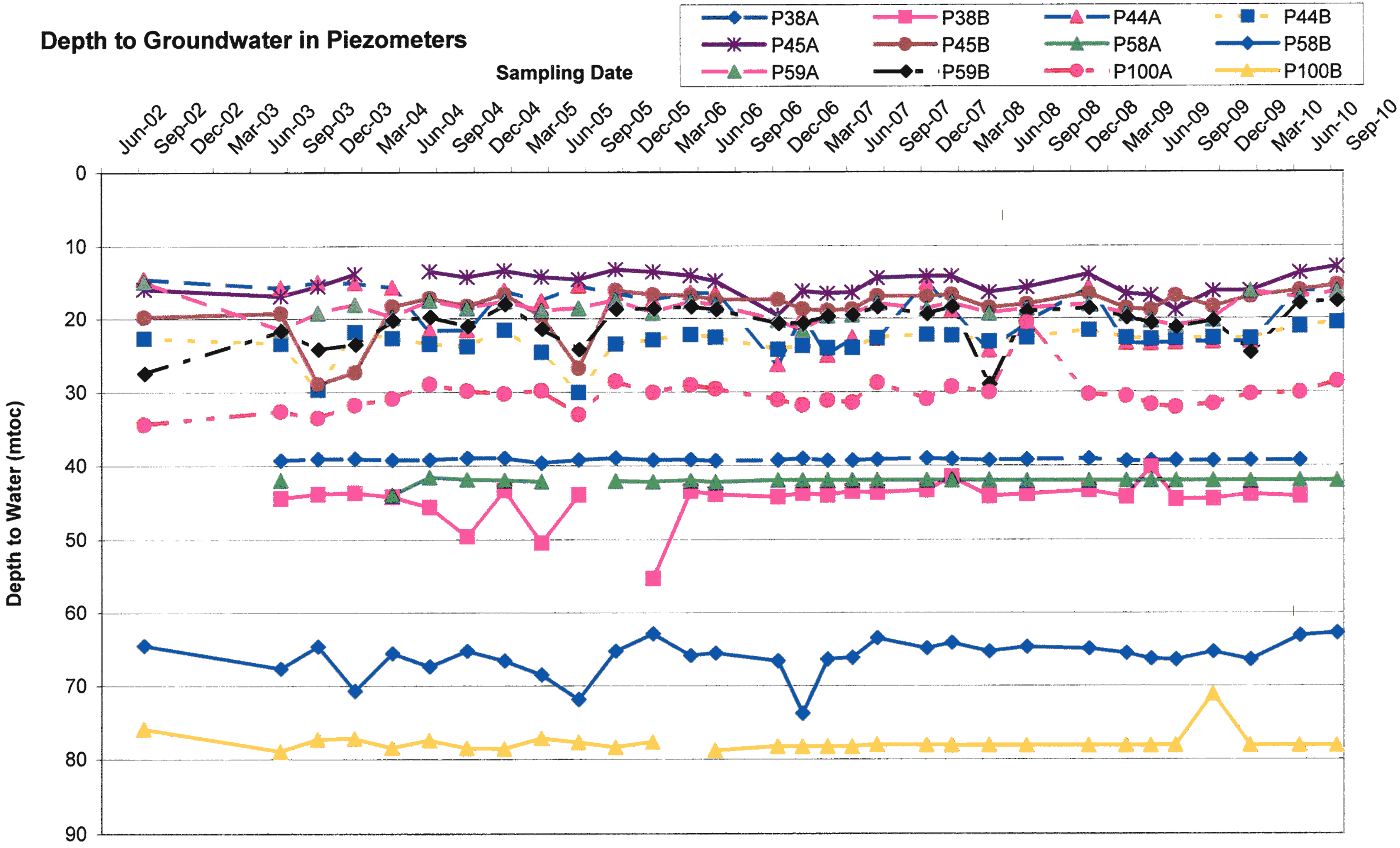
NSW Woodlawn Bioreactor Monthly Indicators Check

Date	___/___/___	___/___/___	Date	___/___/___	___/___/___
Bore field (Booster 1)	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**PIT PUMP PP 08**	___ ___ ___ ___ ___	___ ___ ___ ___ ___
Woodlawn Dam Pump Volume	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**North Tailings Dam** (top of peg 793.80m RL Kell '01)	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___
ED3N Genset Run Time Hours	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**South Tailings Dam** (Top of peg 783.38m RL Kell 01)	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___
Standby Generator Run Time Hours	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**South Tailings Dam Return Water**	___ ___ ___ ___ ___	___ ___ ___ ___ ___
Creek flow @ Farm Road Culvert	YES NO	YES NO	**Evap Dam 1** (top of peg 787.03m RL Kell '01)	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___
Sewage Treatment System	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**Evap Dam 2** (top of peg 786.41m RL Kell '01)	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___
Plant Collection Dam Hours	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**Evap Dam 3 (N)** (top of peg 790.03m RL Kell '01, lowest peg)	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___
PIT PUMP PP 06	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**Evap Dam 3 (S)** (top of peg 790.37m RL Kell '01)	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___
PIT PUMP PP 07	___ ___ ___ ___ ___	___ ___ ___ ___ ___	**Waste Rock Dam** (top of higher peg 759.55m RL Kell '01)	Peg ___ . ___ ___ = ___ ___ ___ . ___	Peg ___ . ___ ___ = ___ ___ ___ . ___ ___

Document: FOR-NSW-218-011-2

APPENDIX D


Depth to Groundwater in Selected Bores
Sampling Date
MB5
MB7
MB8
MB15
MB16
MB17
Dec-96
Aug-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Jun-01
Jan-02
Jun-02
Dec-02
Jun-03
Nov-03
Jun-04
Dec-04
Jul-05
Nov-05
Jun-06
Nov-06
Apr-07
Aug-07
Dec-07
Apr-08
Jun-08
Jan-09
Jun-09
Dec-09
Apr-10
Depth to water (mtoc)
0
2
4
6
8
10
12


Depth to Groundwater in Piezometers
Sampling Date
P38A
P38B
P44A
P44B
P45A
P45B
P58A
P58B
P59A
P59B
P100A
P100B
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
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Jun-10
Sep-10
Depth to Water (mtoc)
0
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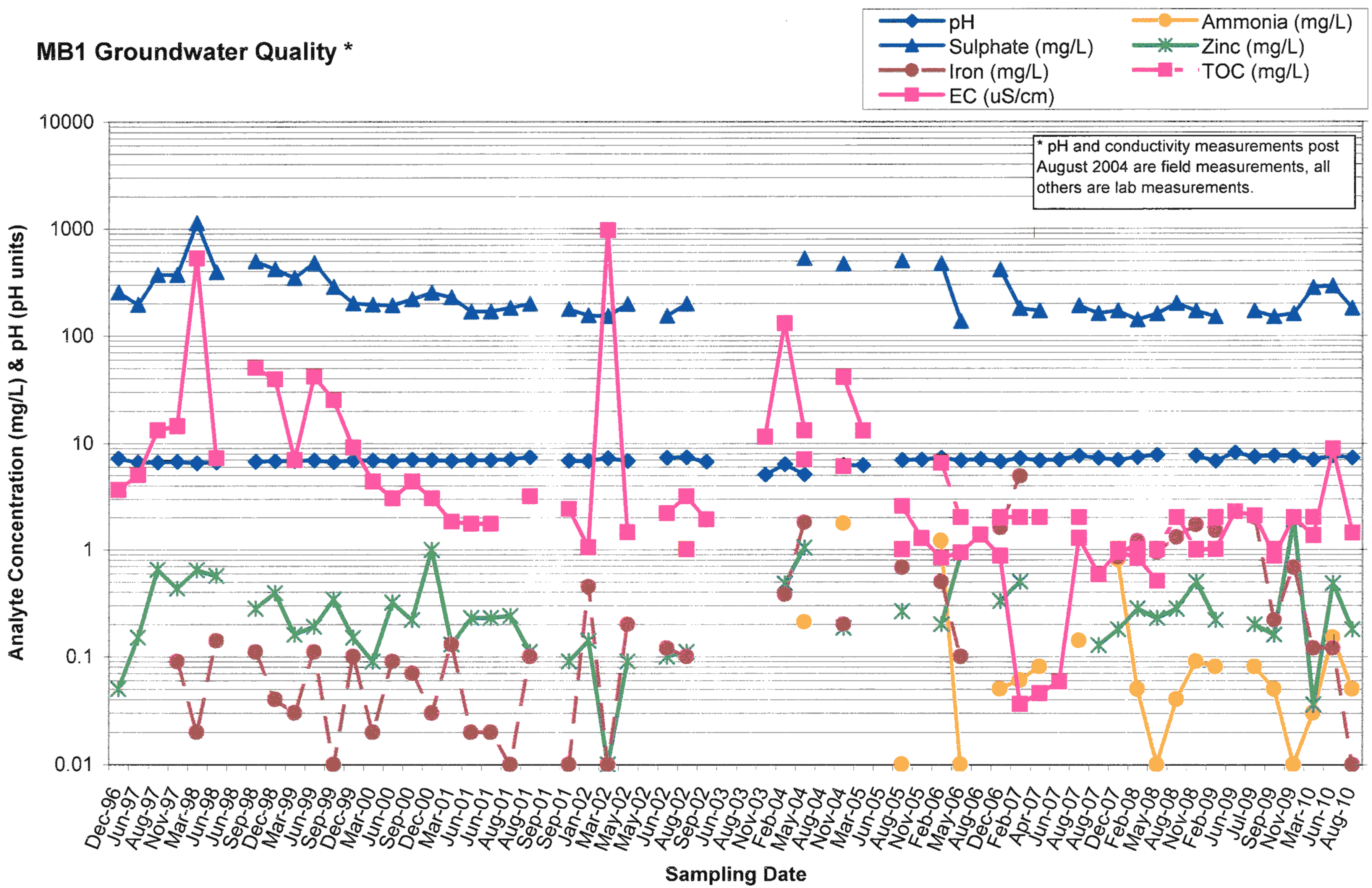
20
30
40
50
60
70
80
90


MB1 Groundwater Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
3000
2500
2000
1500
1000
500
0
Sampling Date
Dec-96
Jun-97
Aug-97
Nov-97
Mar-98
Jun-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Jun-01
Aug-01
Aug-01
Sep-01
Sep-01
Jan-02
Mar-02
May-02
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Feb-06
May-06
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Feb-07
Apr-07
Jun-07
Aug-07
Aug-07
Dec-07
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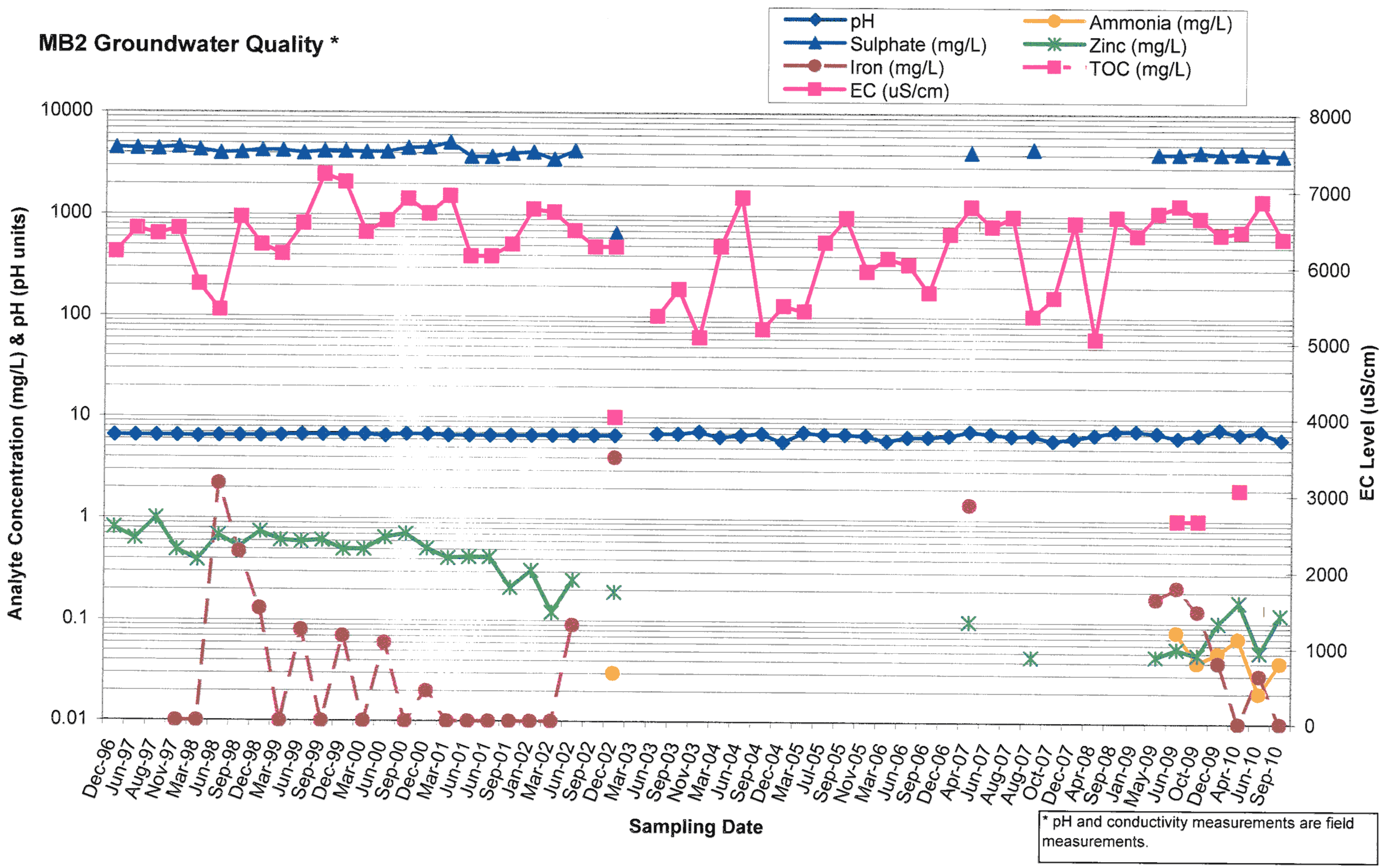
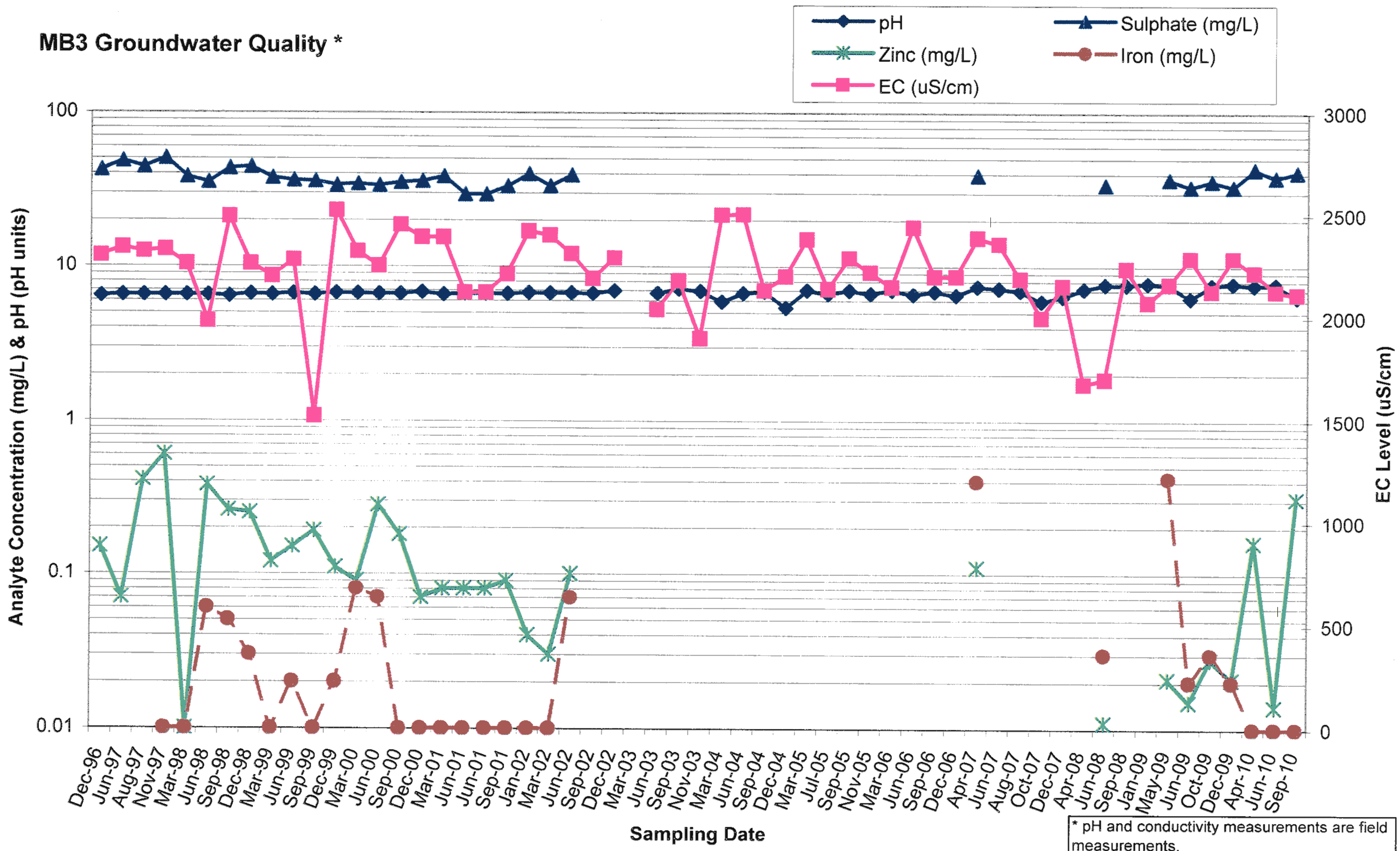
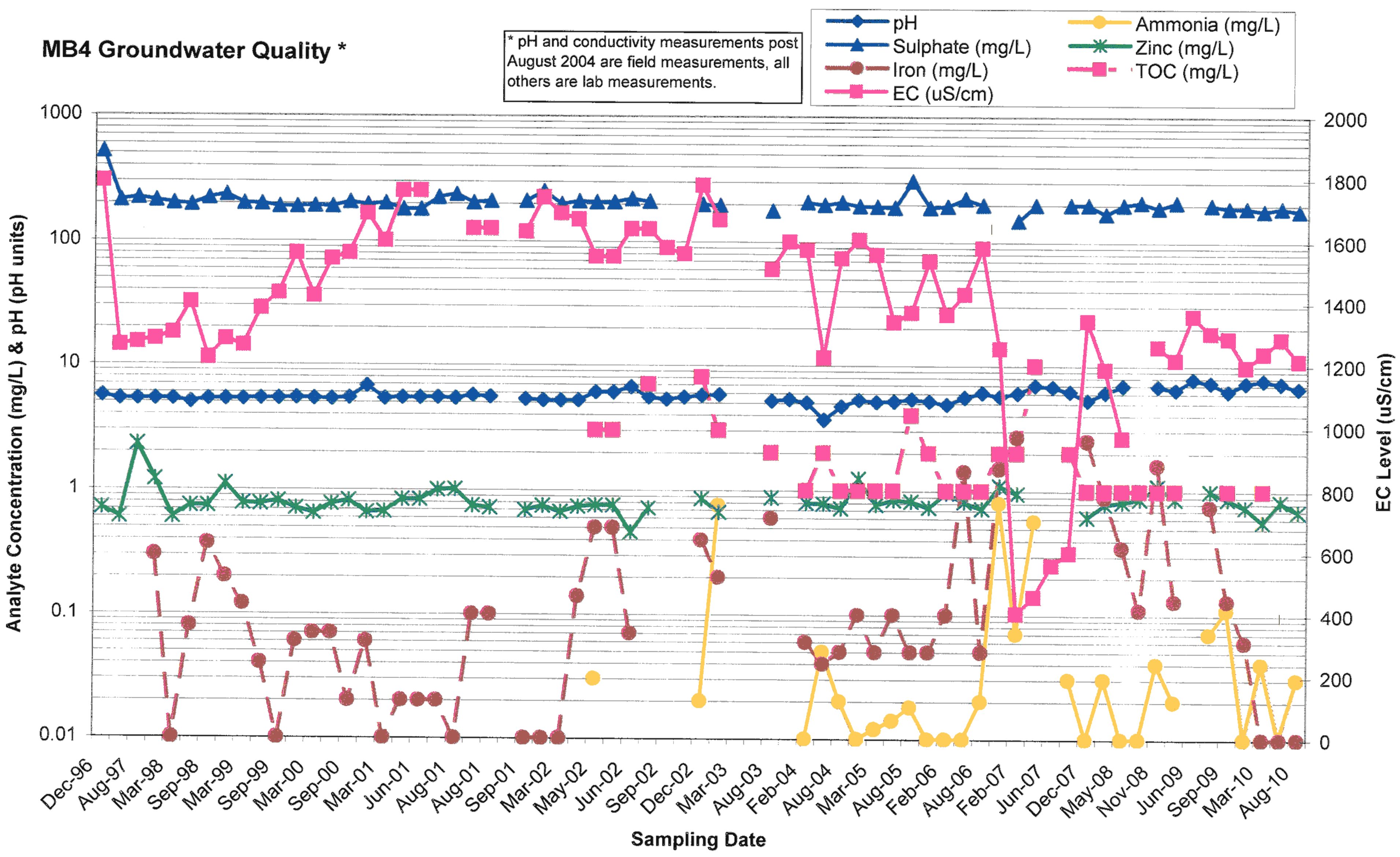
Nov-09
Mar-10
Jun-10
Aug-10



MB2 Groundwater Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
8000
7000
6000
5000
4000
3000
2000
1000
0
Dec-96 Jun-97 Aug-97 Nov-97 Mar-98 Jun-98 Sep-98 Dec-98 Mar-99 Jun-99 Sep-99 Dec-99 Mar-00 Jun-00 Sep-00 Dec-00 Mar-01 Jun-01 Jun-01 Sep-01 Jan-02 Mar-02 Jun-02 Sep-02 Dec-02 Mar-03 Jun-03 Sep-03 Nov-03 Mar-04 Jun-04 Sep-04 Dec-04 Mar-05 Jul-05 Sep-05 Nov-05 Mar-06 Jun-06 Sep-06 Dec-06 Apr-07 Jun-07 Aug-07 Aug-07 Oct-07 Dec-07 Apr-08 Sep-08 Jan-09 May-09 Jun-09 Oct-09 Dec-09 Apr-10 Jun-10 Sep-10
Sampling Date
* pH and conductivity measurements are field measurements.



* pH and conductivity measurements are field measurements.



MB4 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Dec-96
Aug-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Jun-01
Aug-01
Aug-01
Sep-01
Mar-02
May-02
Jun-02
Sep-02
Dec-02
Mar-03
Aug-03
Feb-04
Aug-04
Mar-05
Aug-05
Feb-06
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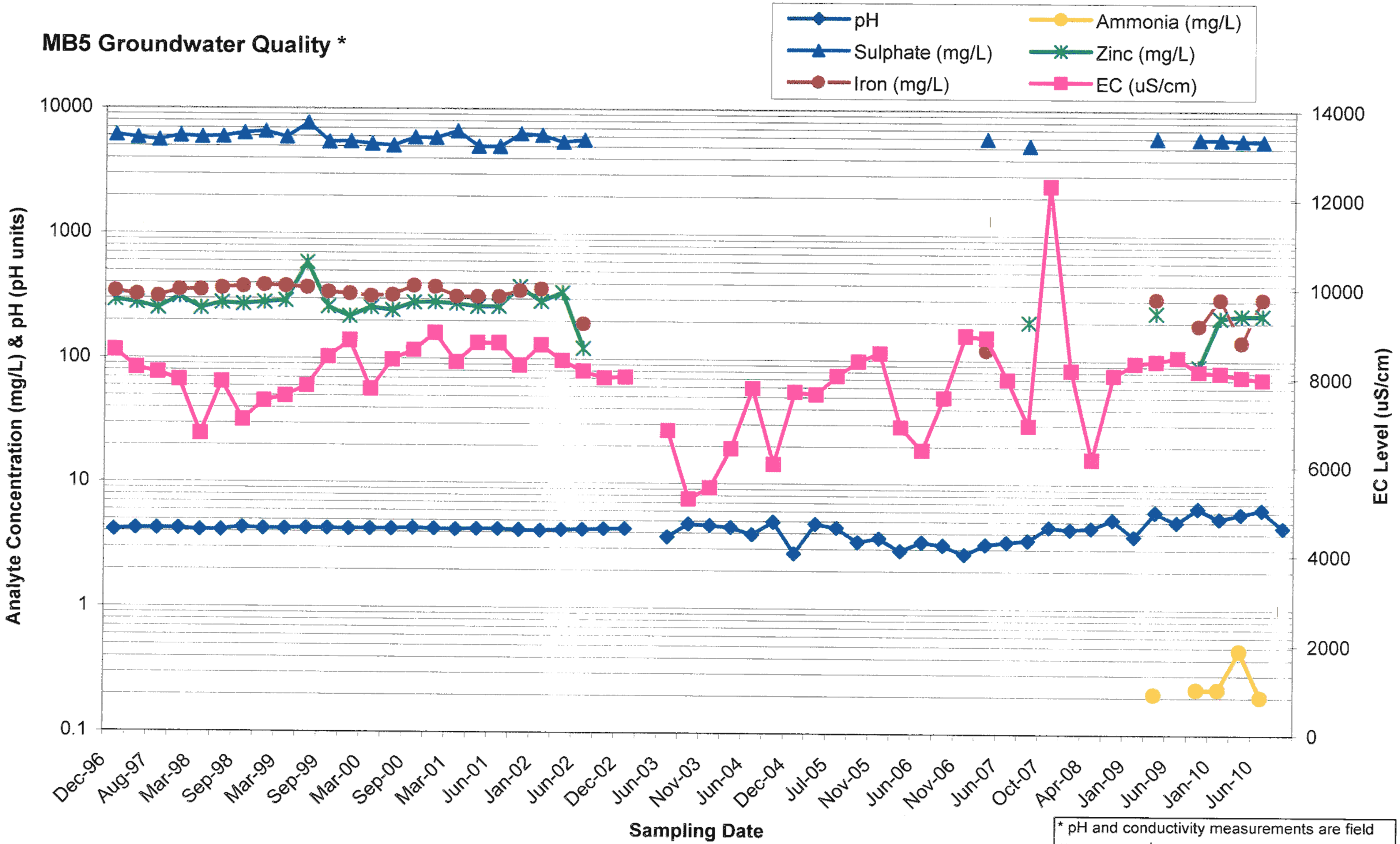
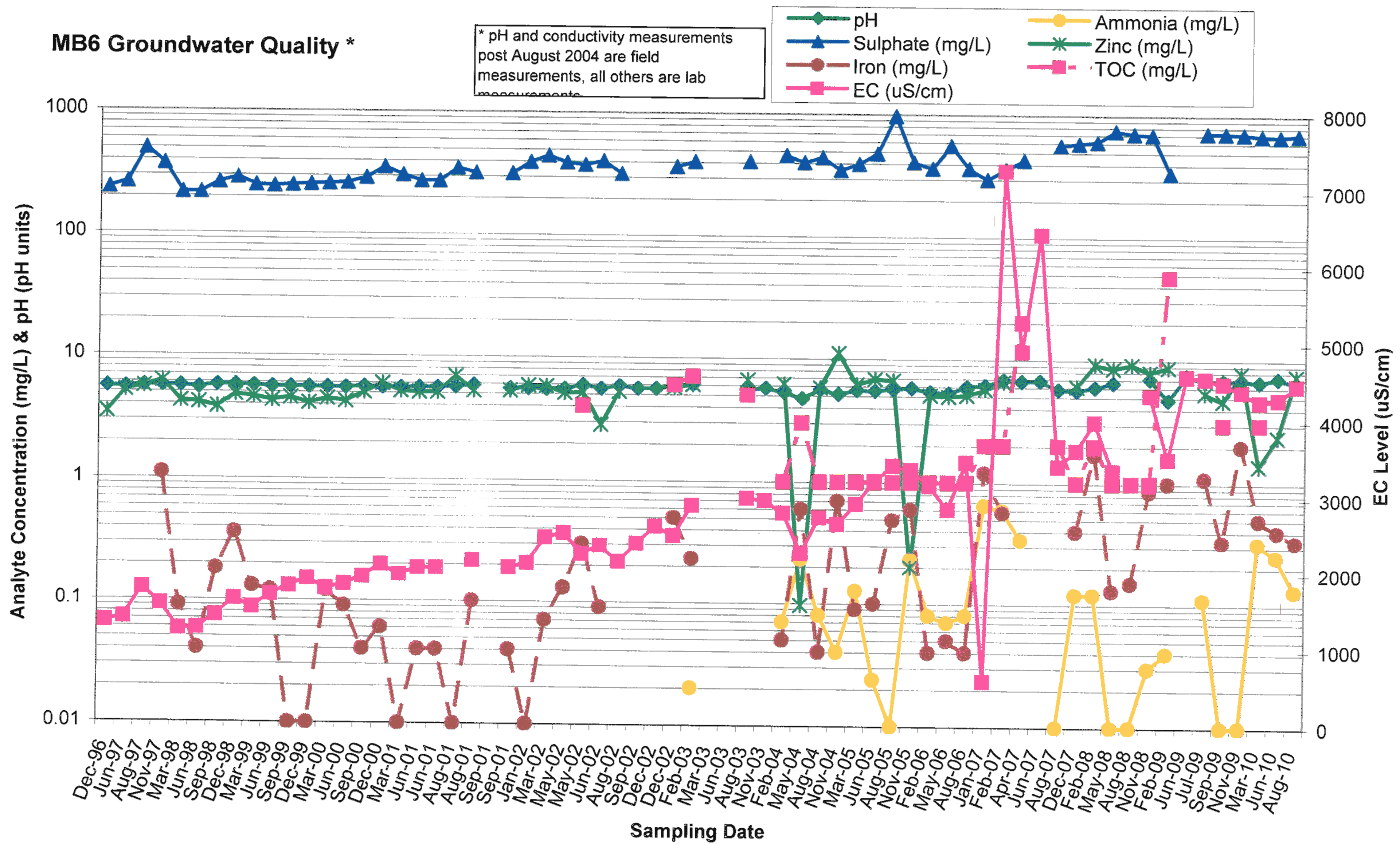
Jun-07
Dec-07
May-08
Nov-08
Jun-09
Sep-09
Mar-10
Aug-10
Sampling Date



* pH and conductivity measurements are field measurements.


MB6 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
8000
7000
6000
5000
4000
3000
2000
1000
0
Sampling Date
Dec-96
Jun-97
Aug-97
Nov-97
Mar-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Jun-01
Aug-01
Aug-01
Sep-01
Sep-01
Jan-02
Mar-02
May-02
May-02
Jun-02
Aug-02
Sep-02
Dec-02
Dec-02
Feb-03
Mar-03
Jun-03
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Mar-05
Jun-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Jan-07
Feb-07
Apr-07
Jun-07
Aug-07
Dec-07
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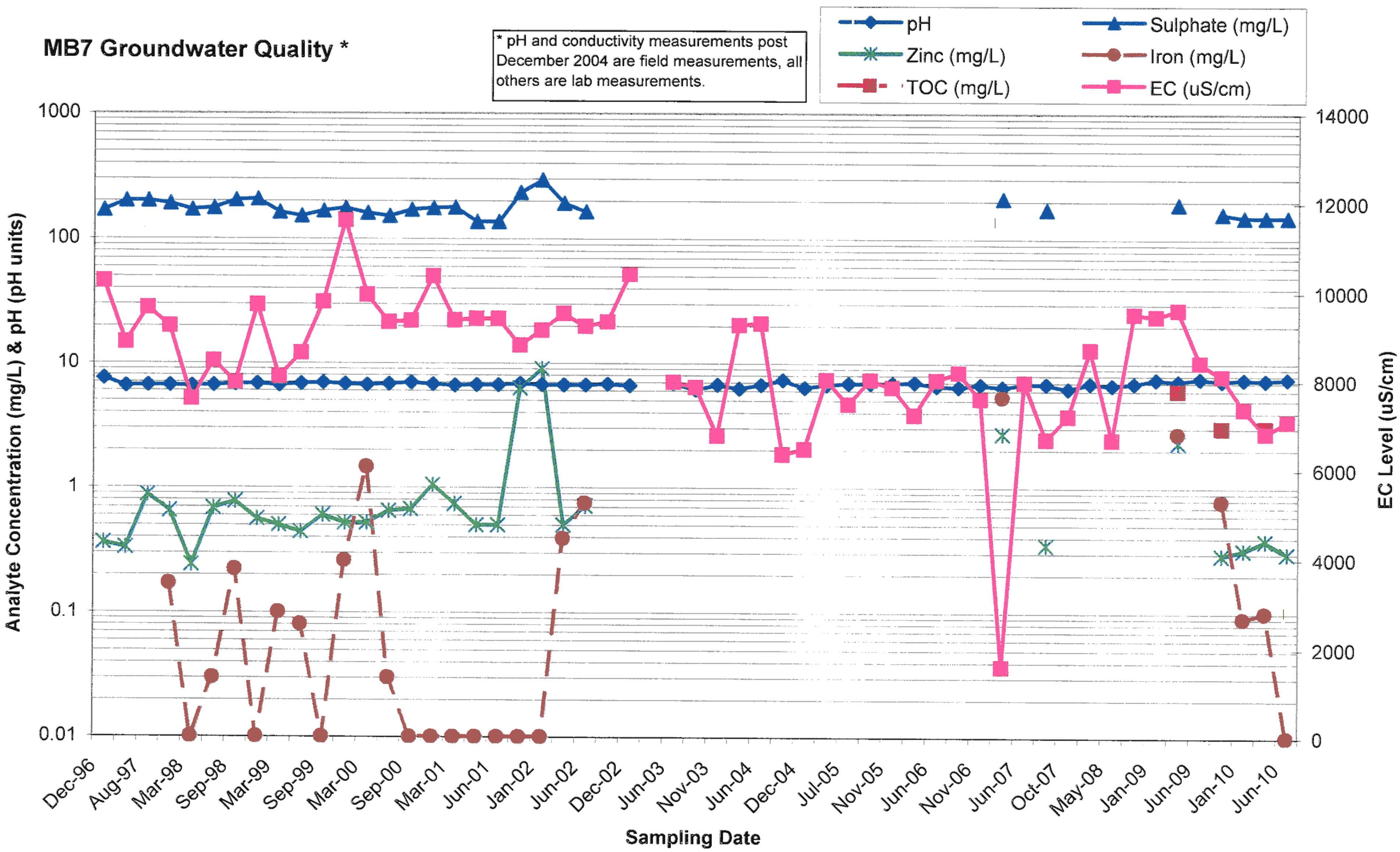
Mar-10
Jun-10
Aug-10


MB7 Groundwater Quality *
* pH and conductivity measurements post December 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Zinc (mg/L)
Iron (mg/L)
TOC (mg/L)
EC (uS/cm)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
14000
12000
10000
8000
6000
4000
2000
0
Dec-96
Aug-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Jun-01
Jan-02
Jun-02
Dec-02
Jun-03
Nov-03
Jun-04
Dec-04
Jul-05
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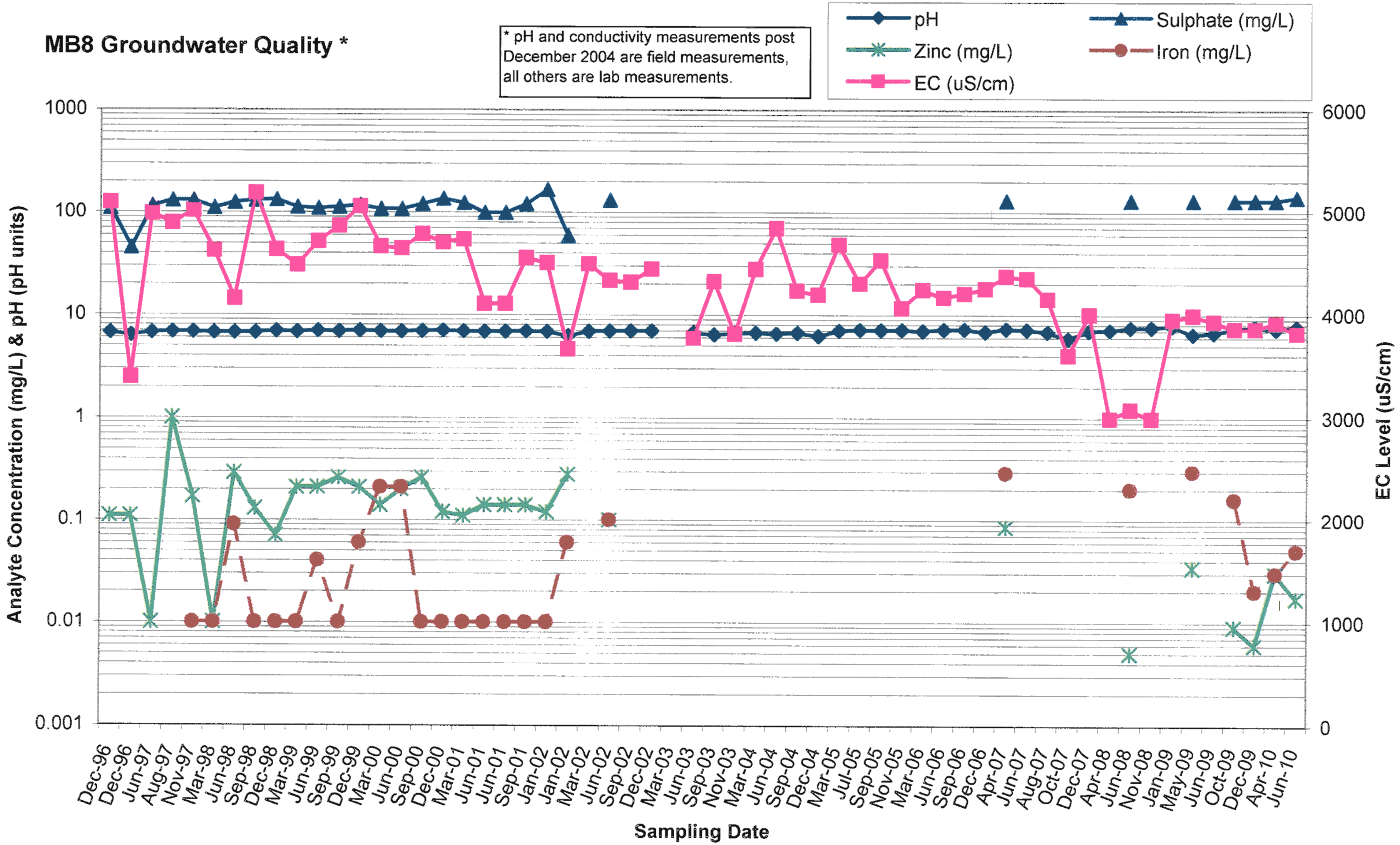
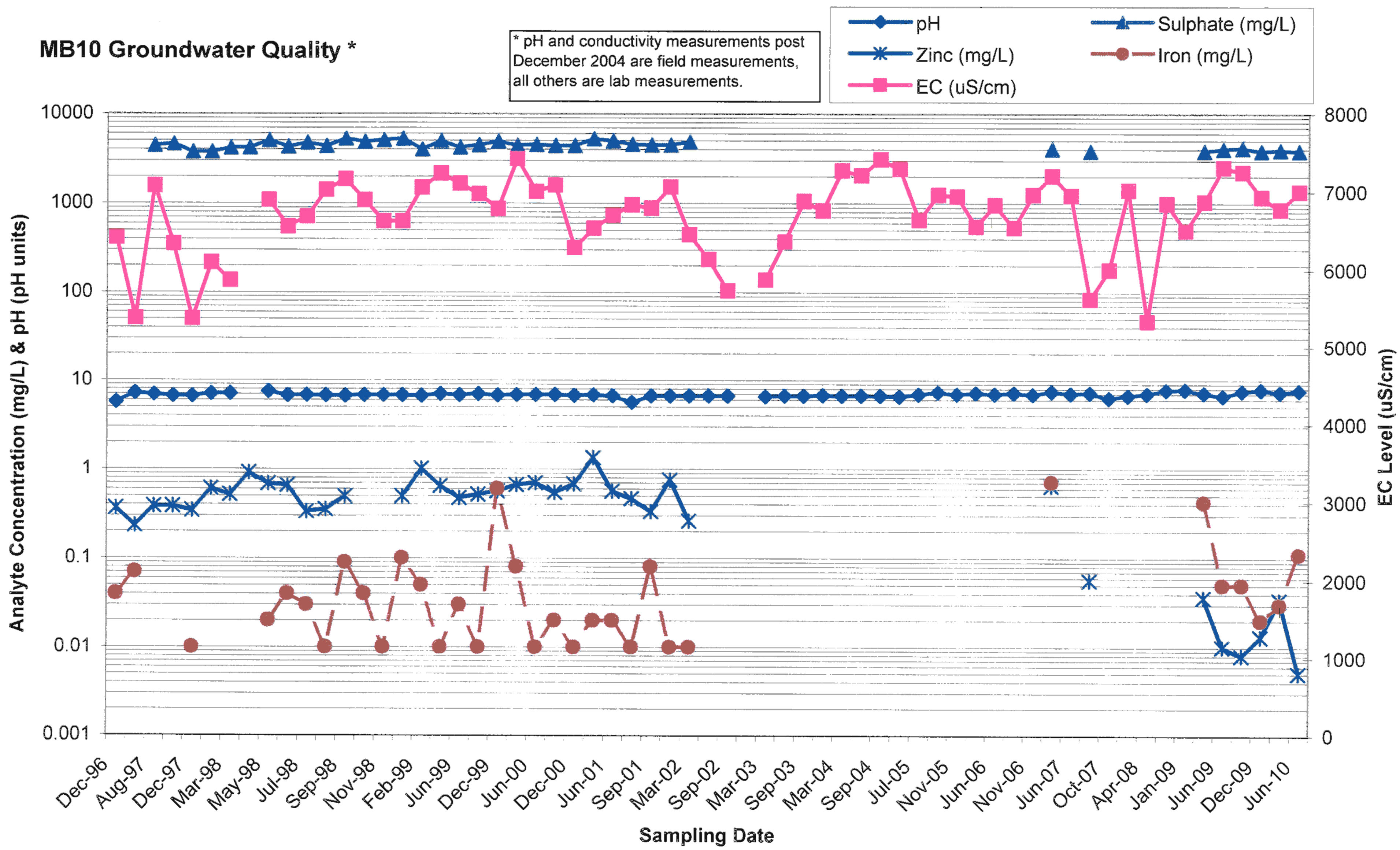
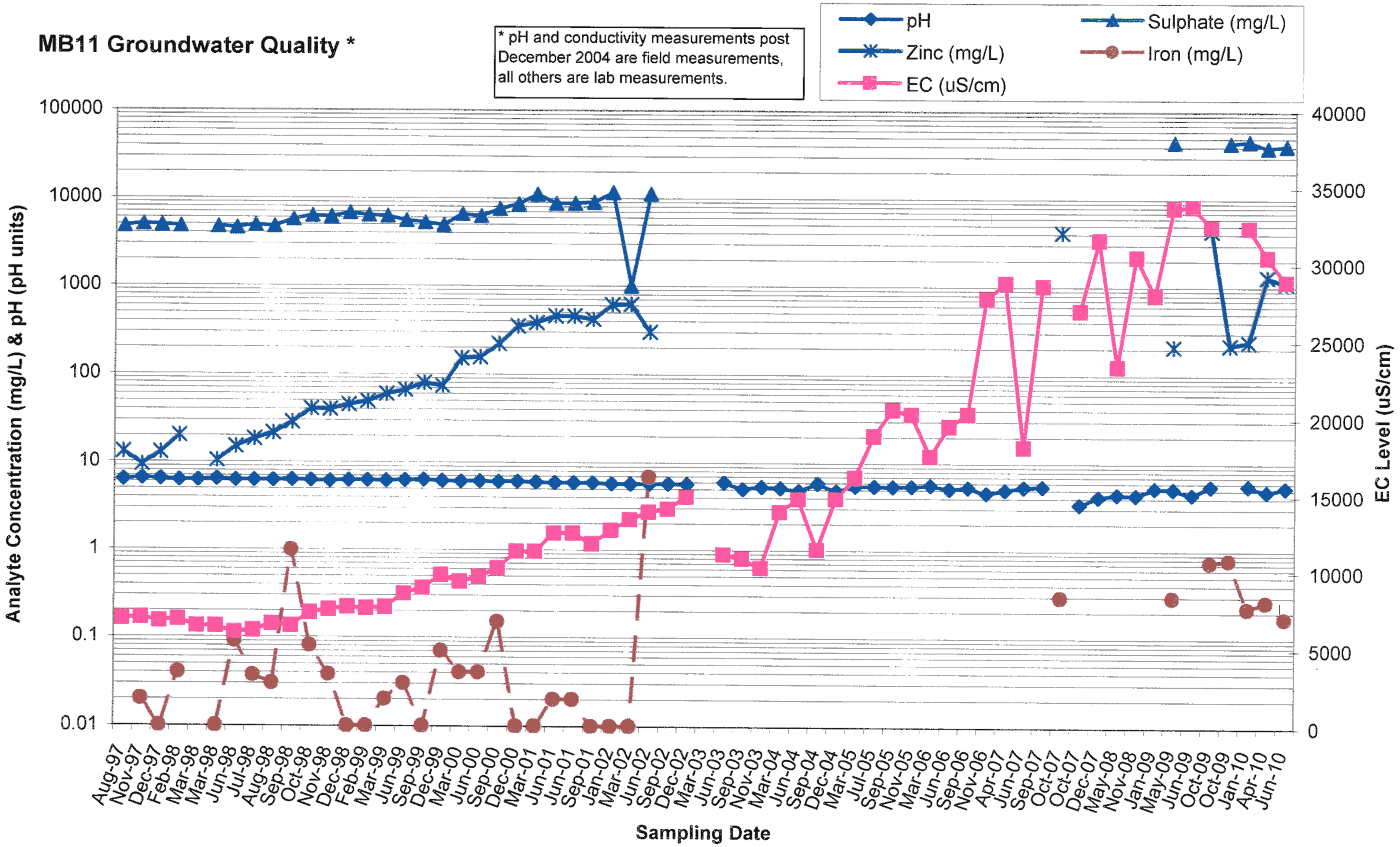
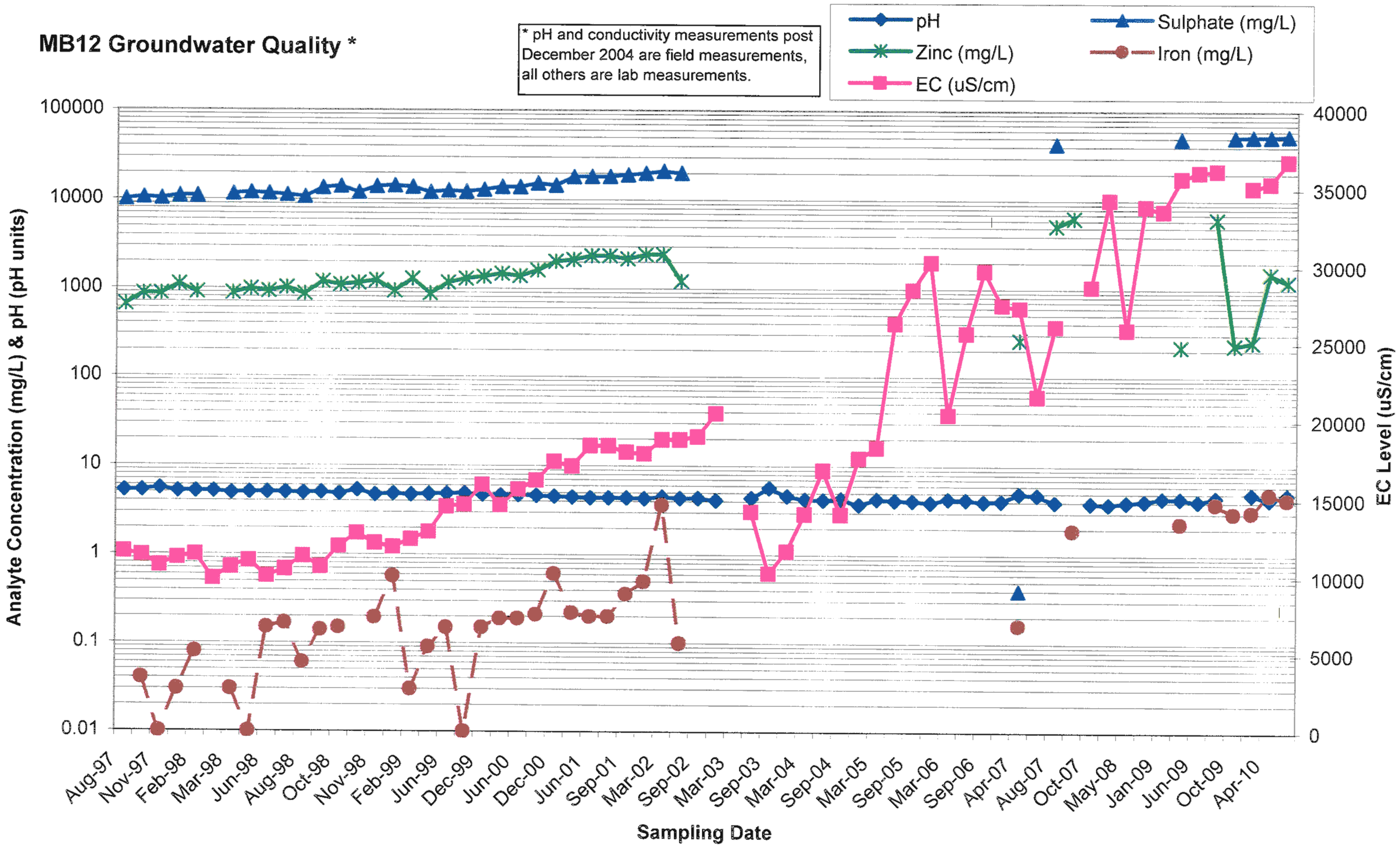
May-08
Jan-09
Jun-09
Jan-10
Jun-10
Sampling Date


MB8 Groundwater Quality *
* pH and conductivity measurements post December 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
6000
5000
4000
3000
2000
1000
0
Sampling Date
Dec-96
Dec-96
Jun-97
Aug-97
Nov-97
Mar-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Jun-01
Sep-01
Jan-02
Jan-02
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jul-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Apr-07
Jun-07
Aug-07
Oct-07
Dec-07
Apr-08
Jun-08
Nov-08
Jan-09
May-09
Jun-09
Oct-09
Dec-09
Apr-10
Jun-10

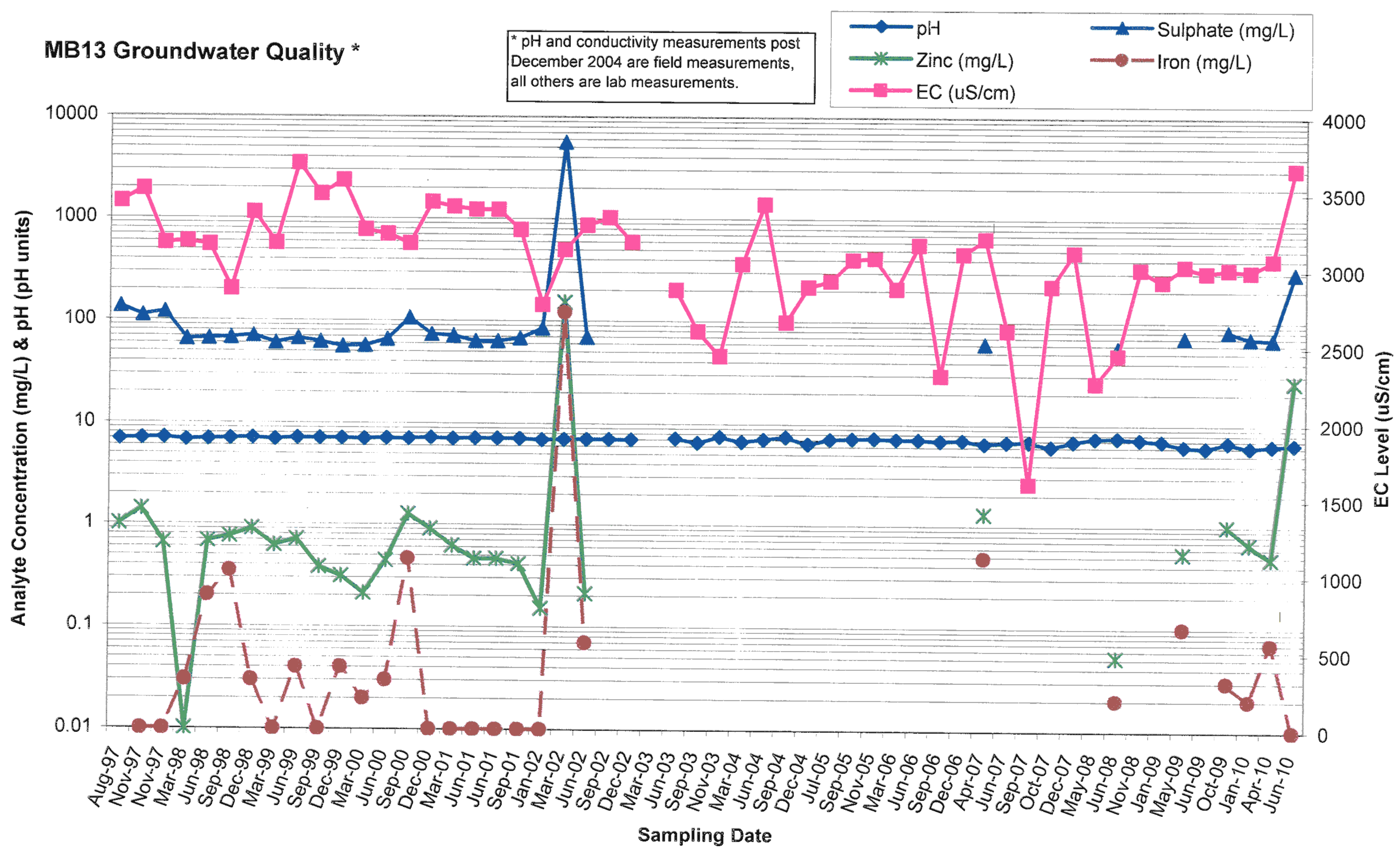


MB10 Groundwater Quality *
* pH and conductivity measurements post December 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
8000
7000
6000
5000
4000
3000
2000
1000
0
Dec-96
Aug-97
Dec-97
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Feb-99
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Jul-05
Nov-05
Jun-06
Nov-06
Jun-07
Oct-07
Apr-08
Jan-09
Jun-09
Dec-09
Jun-10
Sampling Date


MB11 Groundwater Quality *
* pH and conductivity measurements post December 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
40000
35000
30000
25000
20000
15000
10000
5000
0
Sampling Date
Aug-97
Nov-97
Dec-97
Feb-98
Mar-98
Mar-98
Jun-98
Jul-98
Aug-98
Sep-98
Oct-98
Nov-98
Dec-98
Feb-99
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Jun-01
Sep-01
Jan-02
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jul-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Nov-06
Apr-07
Jun-07
Sep-07
Oct-07
Oct-07
Dec-07
May-08
Nov-08
Jan-09
May-09
Jun-09
Oct-09
Oct-09
Jan-10
Apr-10
Jun-10

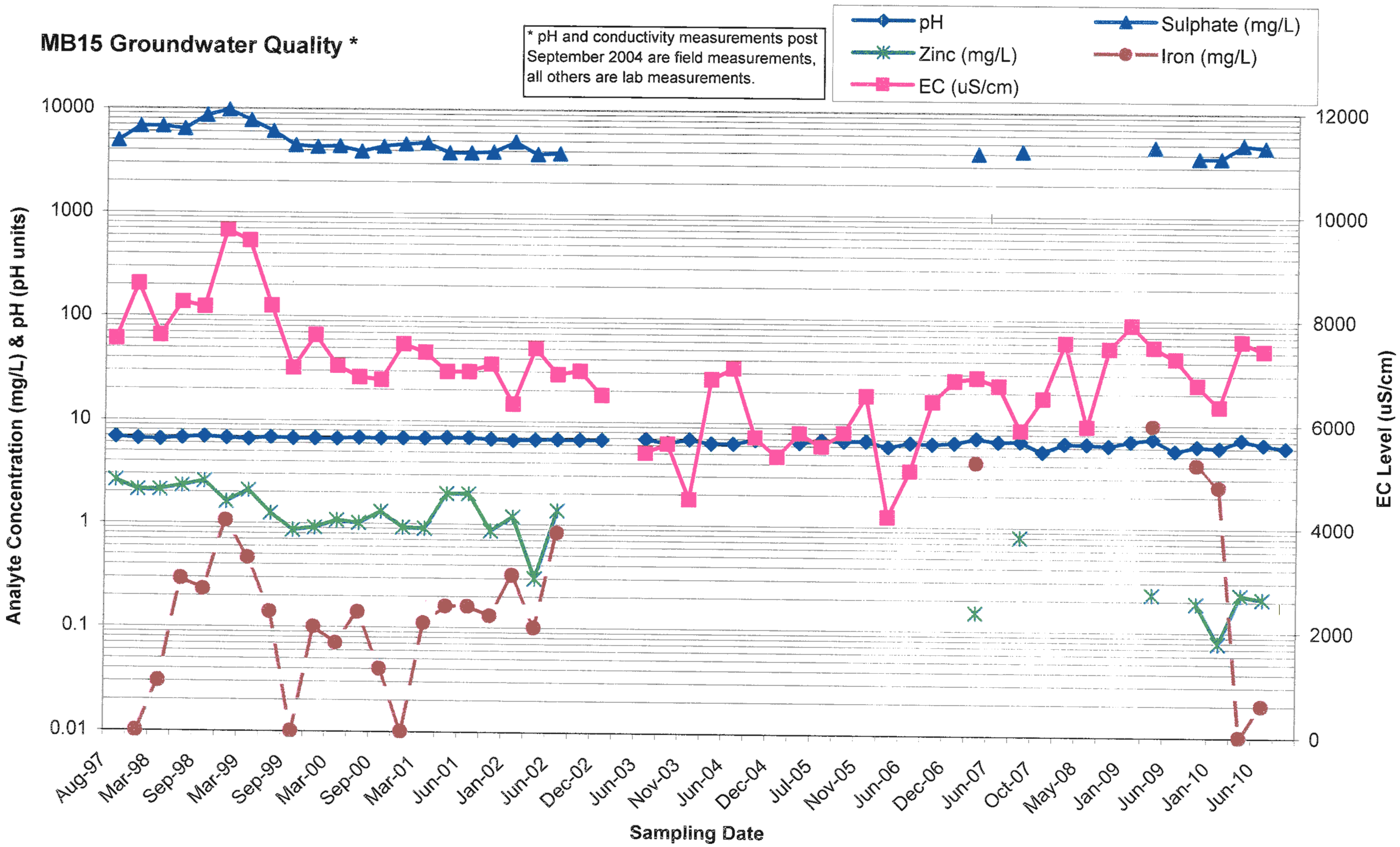


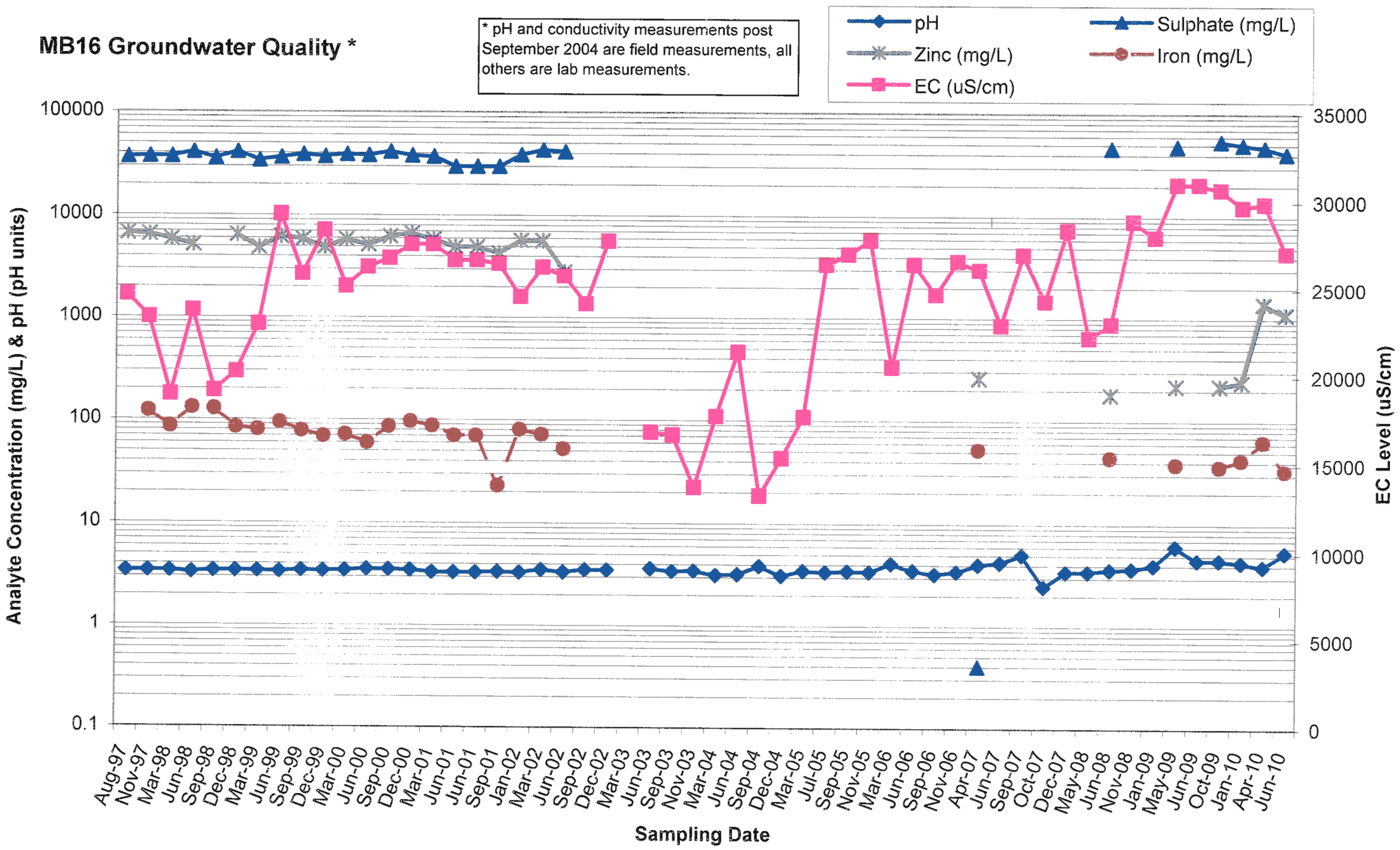
MB12 Groundwater Quality *
* pH and conductivity measurements post December 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
40000
35000
30000
25000
20000
15000
10000
5000
0
Aug-97
Nov-97
Feb-98
Mar-98
Jun-98
Aug-98
Oct-98
Nov-98
Feb-99
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Apr-07
Aug-07
Oct-07
May-08
Jan-09
Jun-09
Oct-09
Apr-10
Sampling Date

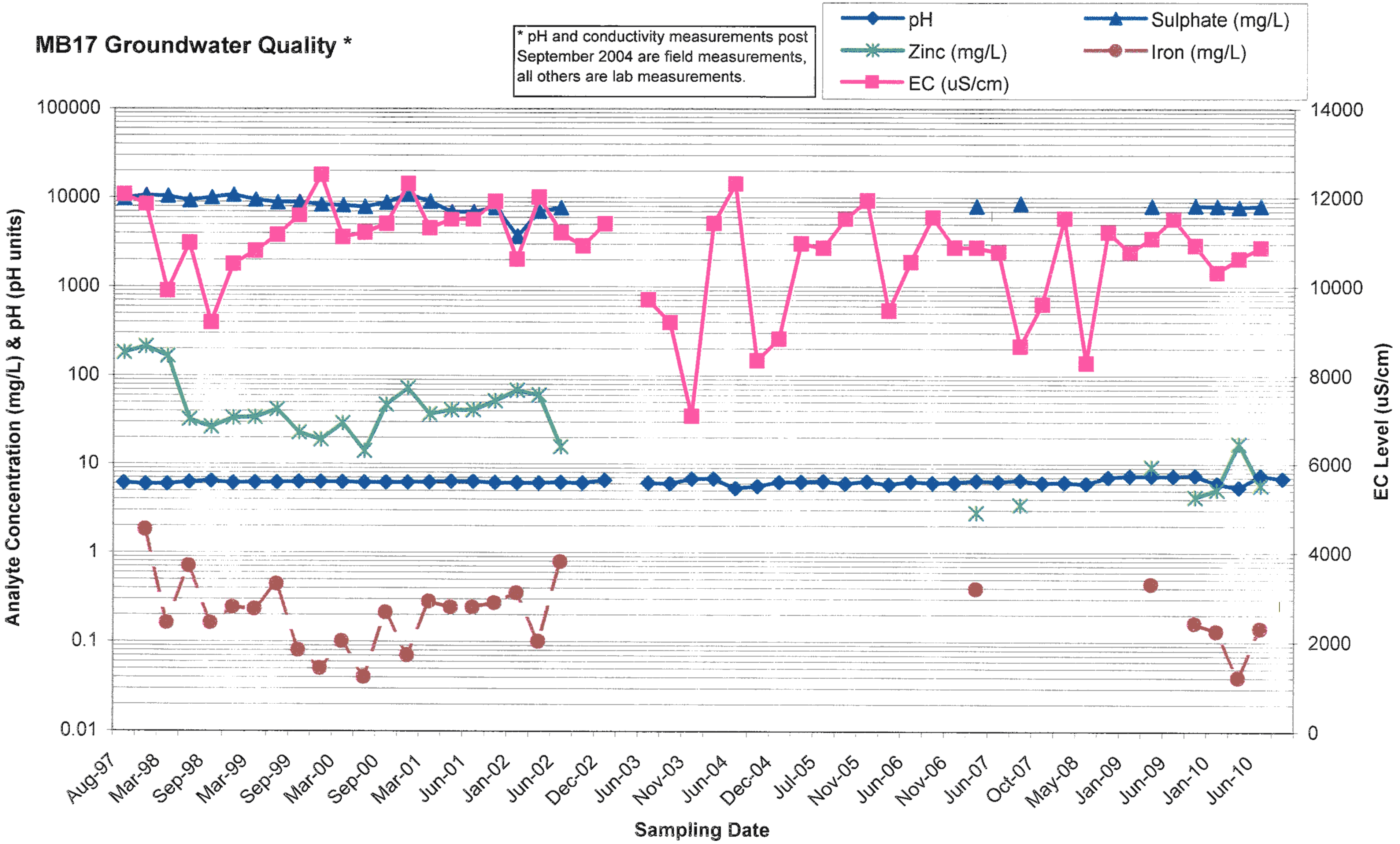


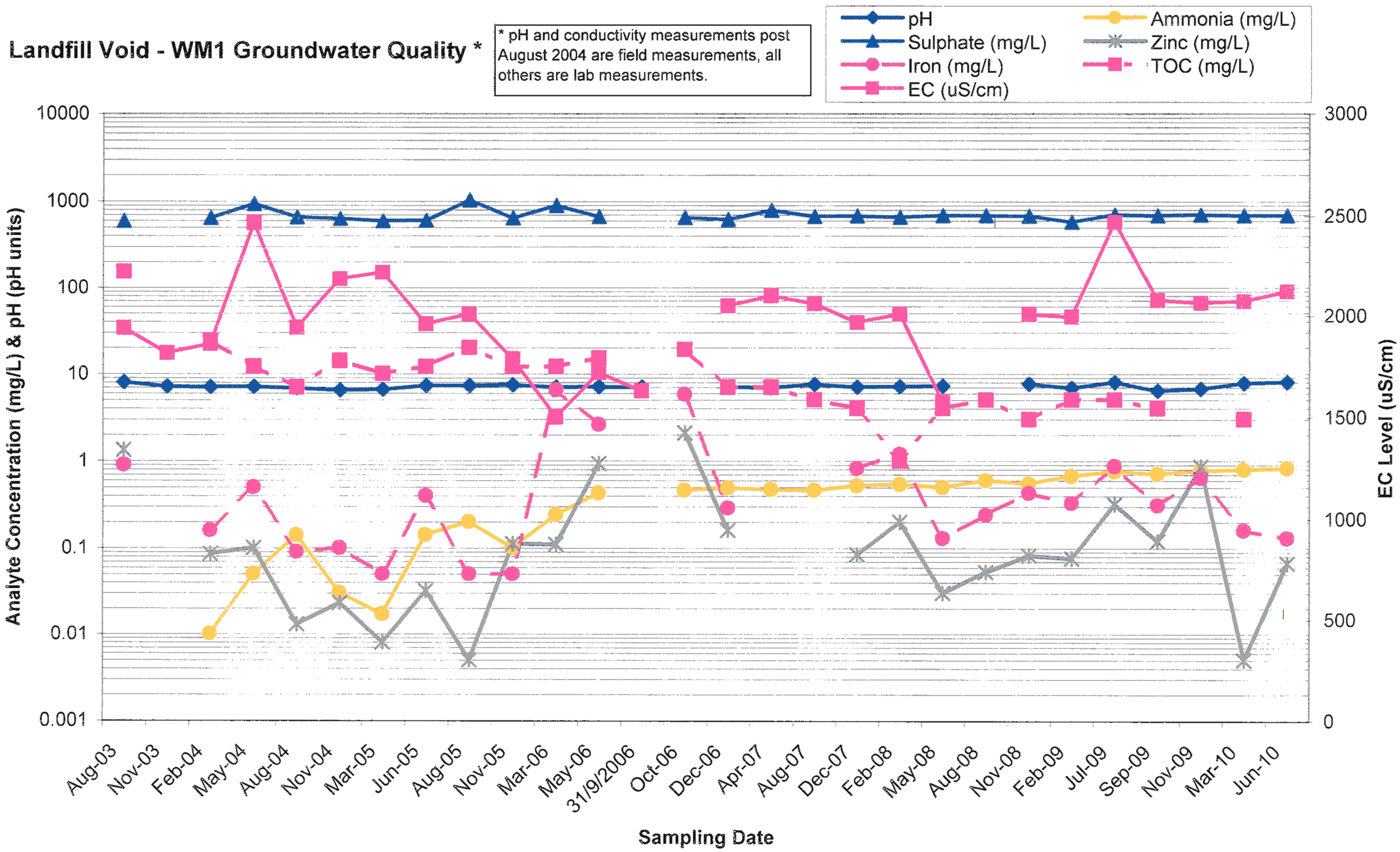
MB13 Groundwater Quality *
* pH and conductivity measurements post December 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
4000
3500
3000
2500
2000
1500
1000
500
0
Aug-97
Nov-97
Nov-97
Mar-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Jun-01
Sep-01
Jan-02
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Dec-04
Jul-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Dec-06
Apr-07
Jun-07
Sep-07
Oct-07
Dec-07
May-08
Jun-08
Nov-08
Jan-09
May-09
Jun-09
Oct-09
Jan-10
Apr-10
Jun-10
Sampling Date

MB14 Groundwater Quality *
* pH measurements post December 2004 are field measurements, all others are lab measurements. All conductivity values are field measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
7000
6000
5000
4000
3000
2000
1000
0
Sampling Date
Aug-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Jun-01
Jan-02
Jun-02
Dec-02
Jun-03
Nov-03
Jun-04
Dec-04
Sep-05
Mar-06
Sep-06
Apr-07
Sep-07
Dec-07
Jun-08
Jan-09
Jun-09
Dec-09
Jun-10

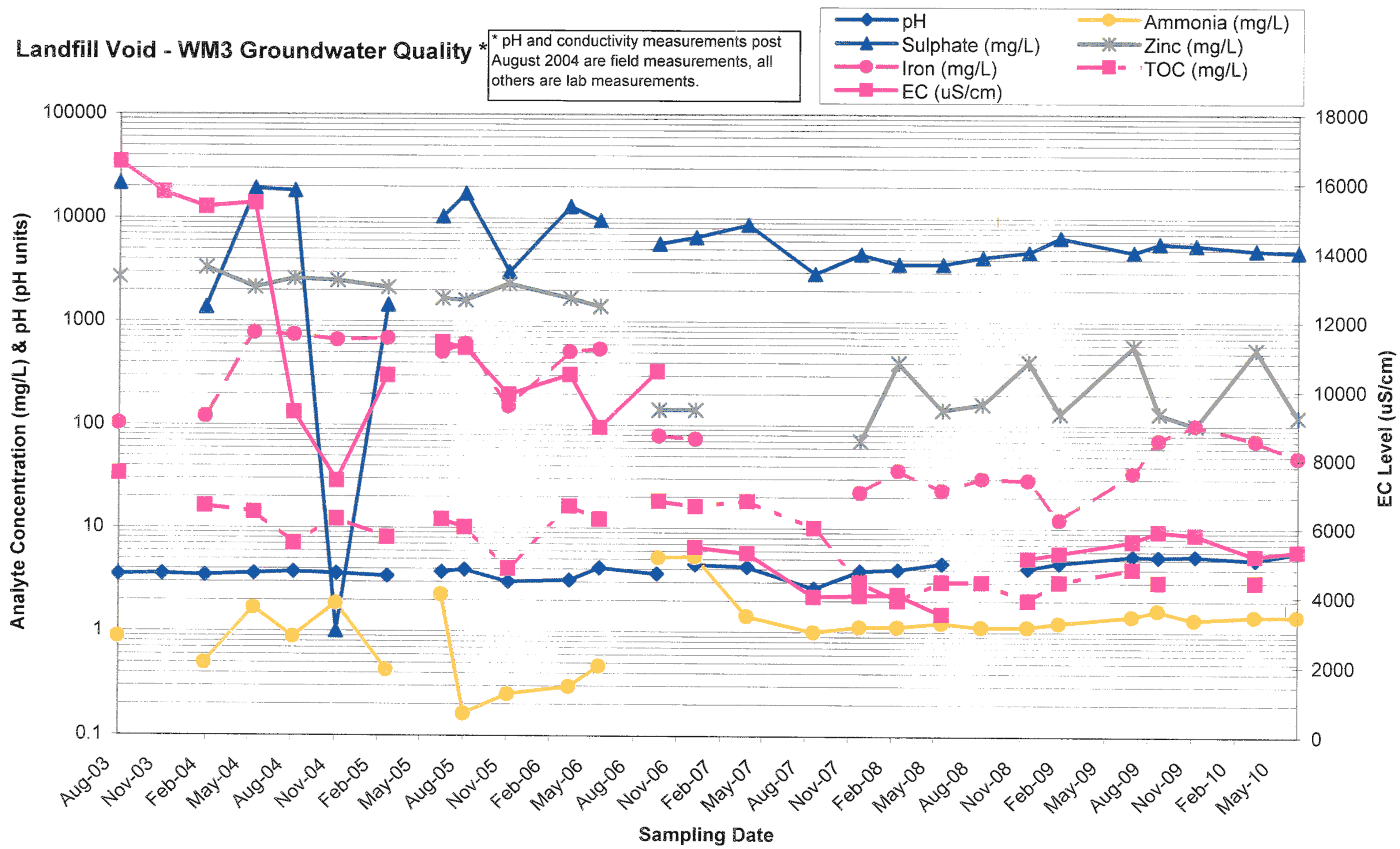

MB15 Groundwater Quality *
* pH and conductivity measurements post September 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
12000
10000
8000
6000
4000
2000
0
Aug-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Jun-01
Jan-02
Jun-02
Dec-02
Jun-03
Nov-03
Jun-04
Dec-04
Jul-05
Nov-05
Jun-06
Dec-06
Jun-07
Oct-07
May-08
Jan-09
Jun-09
Jan-10
Jun-10
Sampling Date


MB16 Groundwater Quality *
* pH and conductivity measurements post September 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
EC Level (uS/cm)
35000
30000
25000
20000
15000
10000
5000
0
Aug-97
Nov-97
Mar-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Jun-01
Sep-01
Jan-02
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jul-05
Sep-05
Nov-05
Mar-06
Jun-06
Sep-06
Nov-06
Apr-07
Jun-07
Sep-07
Oct-07
Dec-07
May-08
Jun-08
Nov-08
Jan-09
May-09
Jun-09
Oct-09
Jan-10
Apr-10
Jun-10
Sampling Date

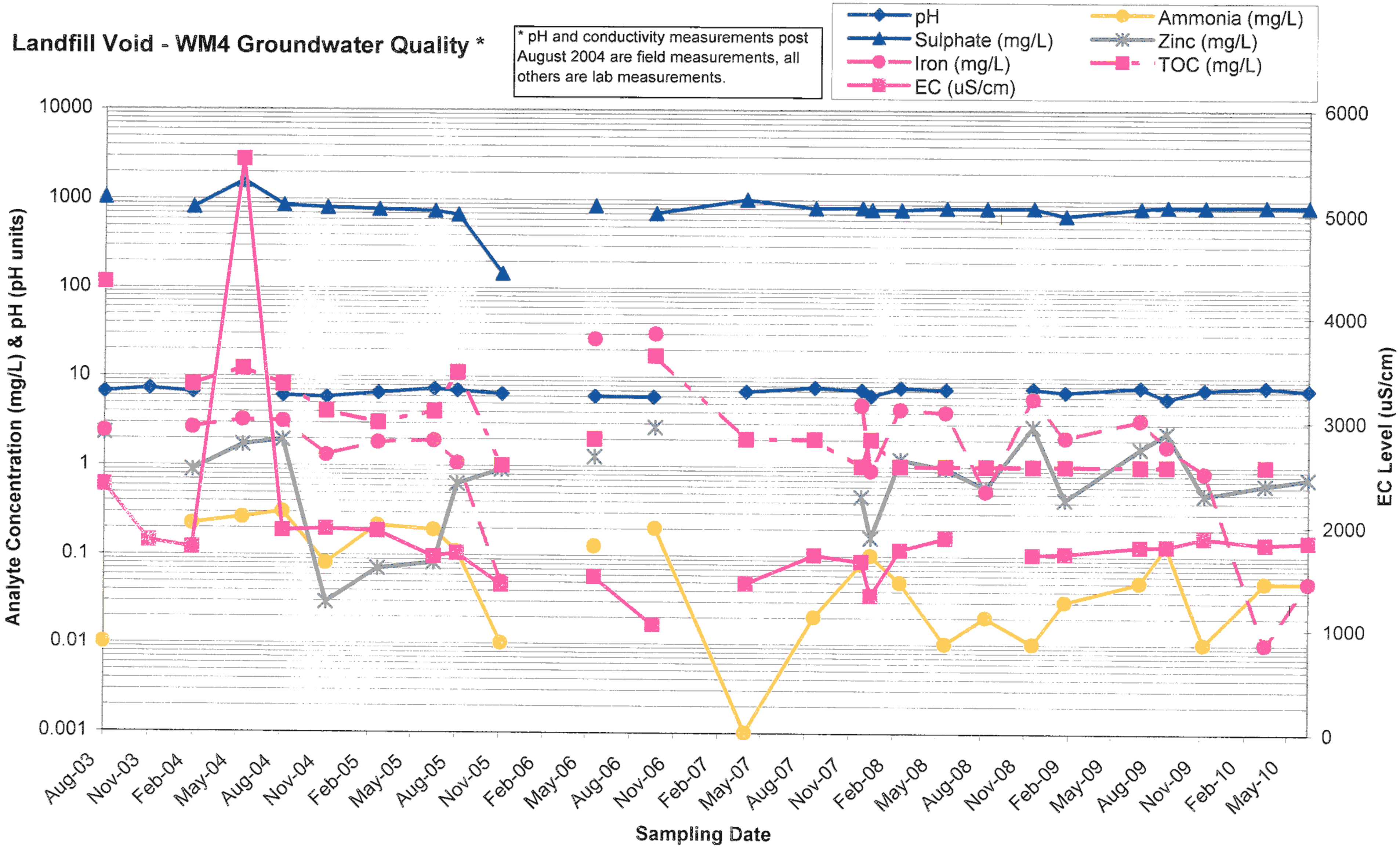

MB17 Groundwater Quality *
* pH and conductivity measurements post September 2004 are field measurements, all others are lab measurements.
pH
Zinc (mg/L)
EC (uS/cm)
Sulphate (mg/L)
Iron (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
14000
12000
10000
8000
6000
4000
2000
0
Aug-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Jun-01
Jan-02
Jun-02
Dec-02
Jun-03
Nov-03
Jun-04
Dec-04
Jul-05
Nov-05
Jun-06
Nov-06
Jun-07
Oct-07
May-08
Jan-09
Jun-09
Jan-10
Jun-10
Sampling Date



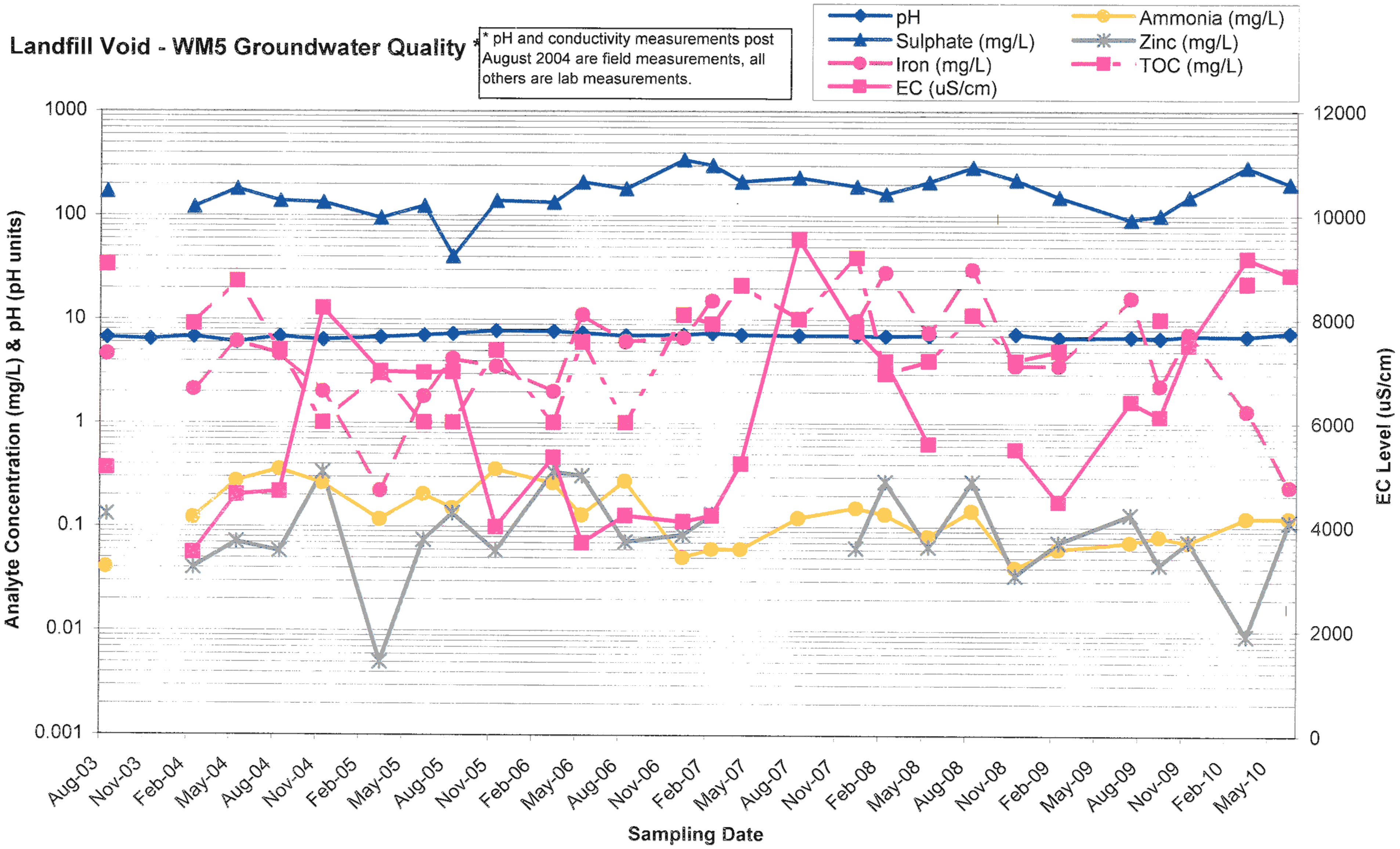
Landfill Void - WM1 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
3000
2500
2000
1500
1000
500
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Mar-05
Jun-05
Aug-05
Nov-05
Mar-06
May-06
31/9/2006
Oct-06
Dec-06
Apr-07
Aug-07
Dec-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
Jul-09
Sep-09
Nov-09
Mar-10
Jun-10
Sampling Date

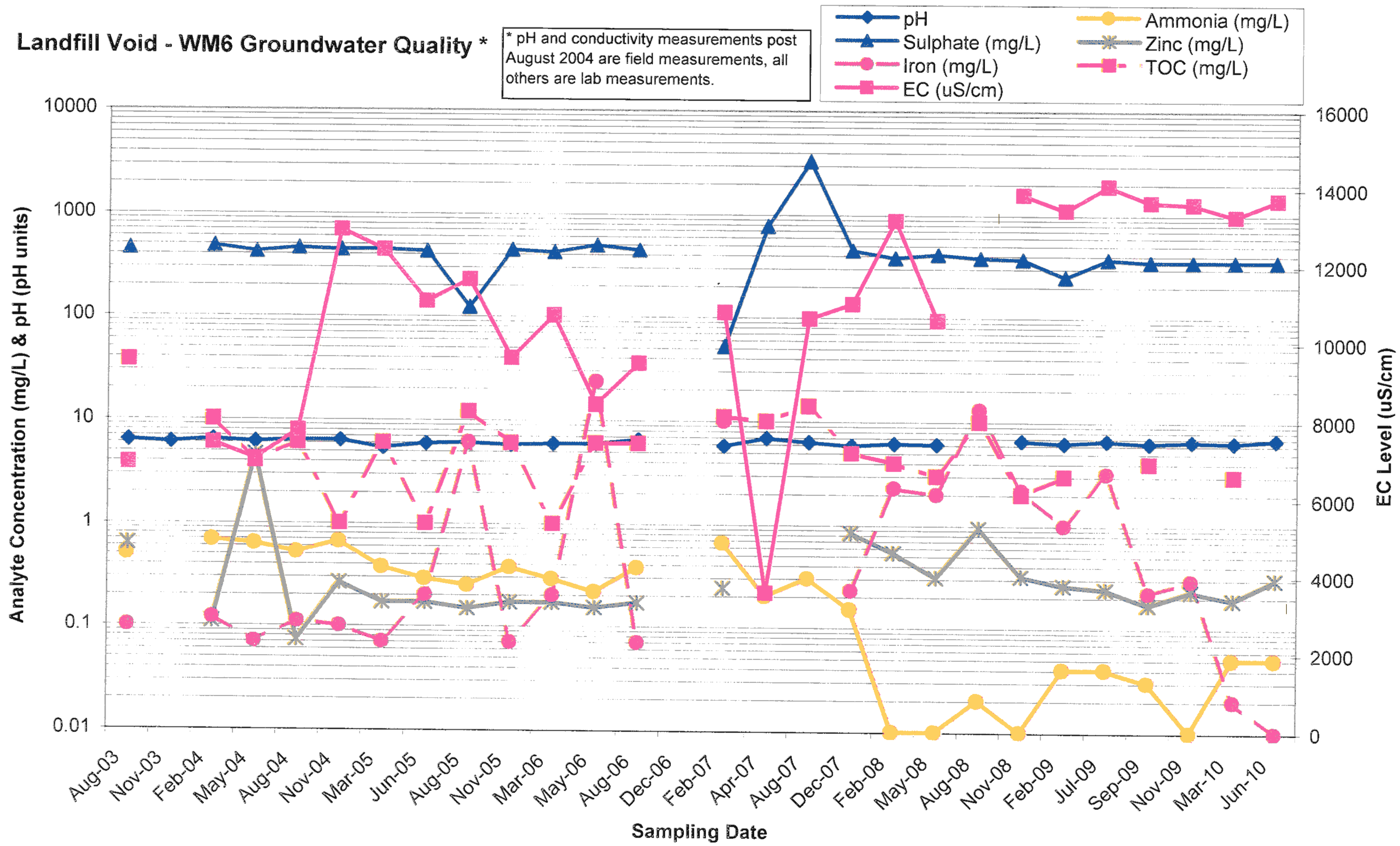


Landfill Void - WM3 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
EC Level (uS/cm)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Nov-09
Feb-10
May-10
Sampling Date

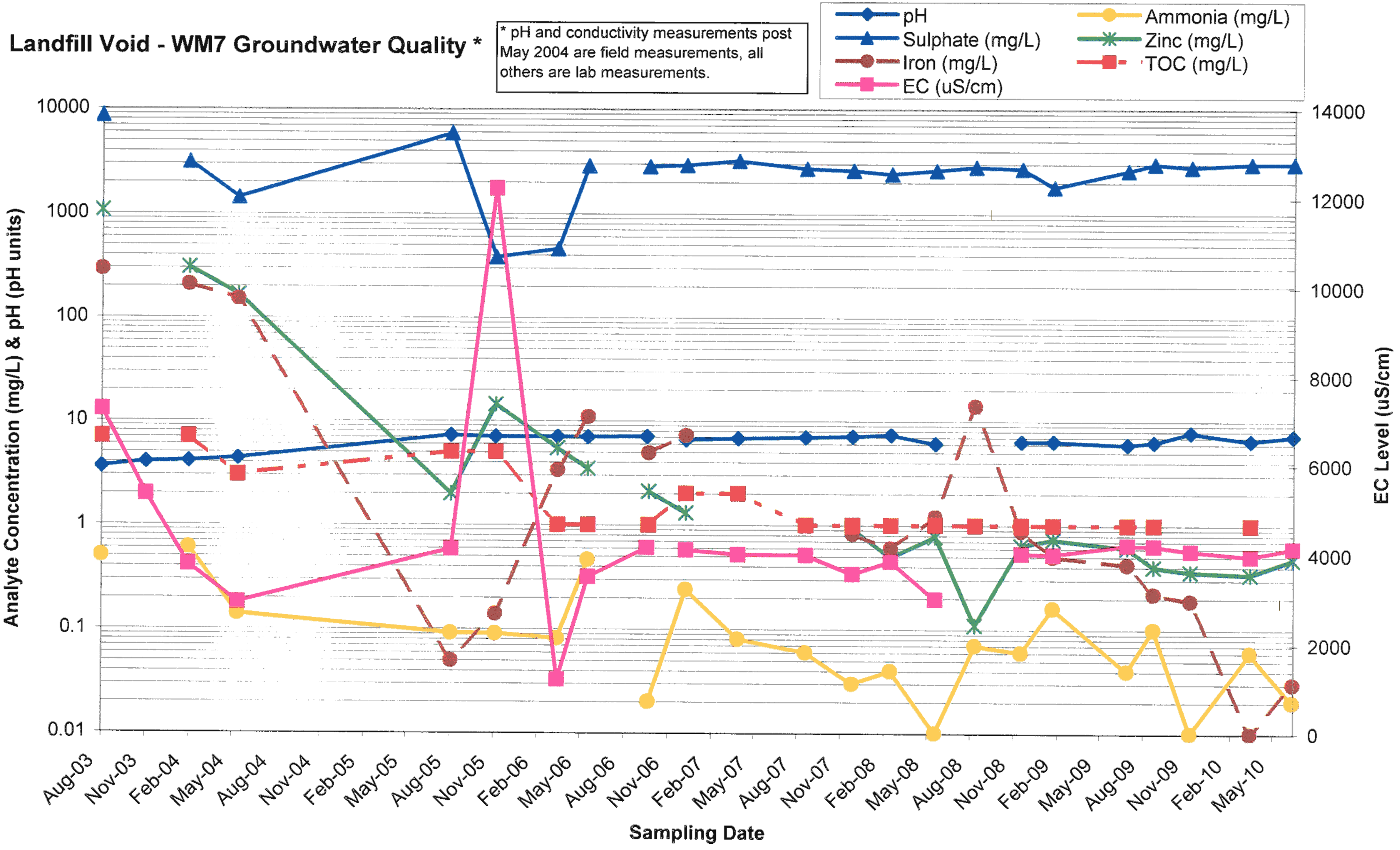


Landfill Void - WM4 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
6000
5000
4000
3000
2000
1000
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Nov-09
Feb-10
May-10
Sampling Date

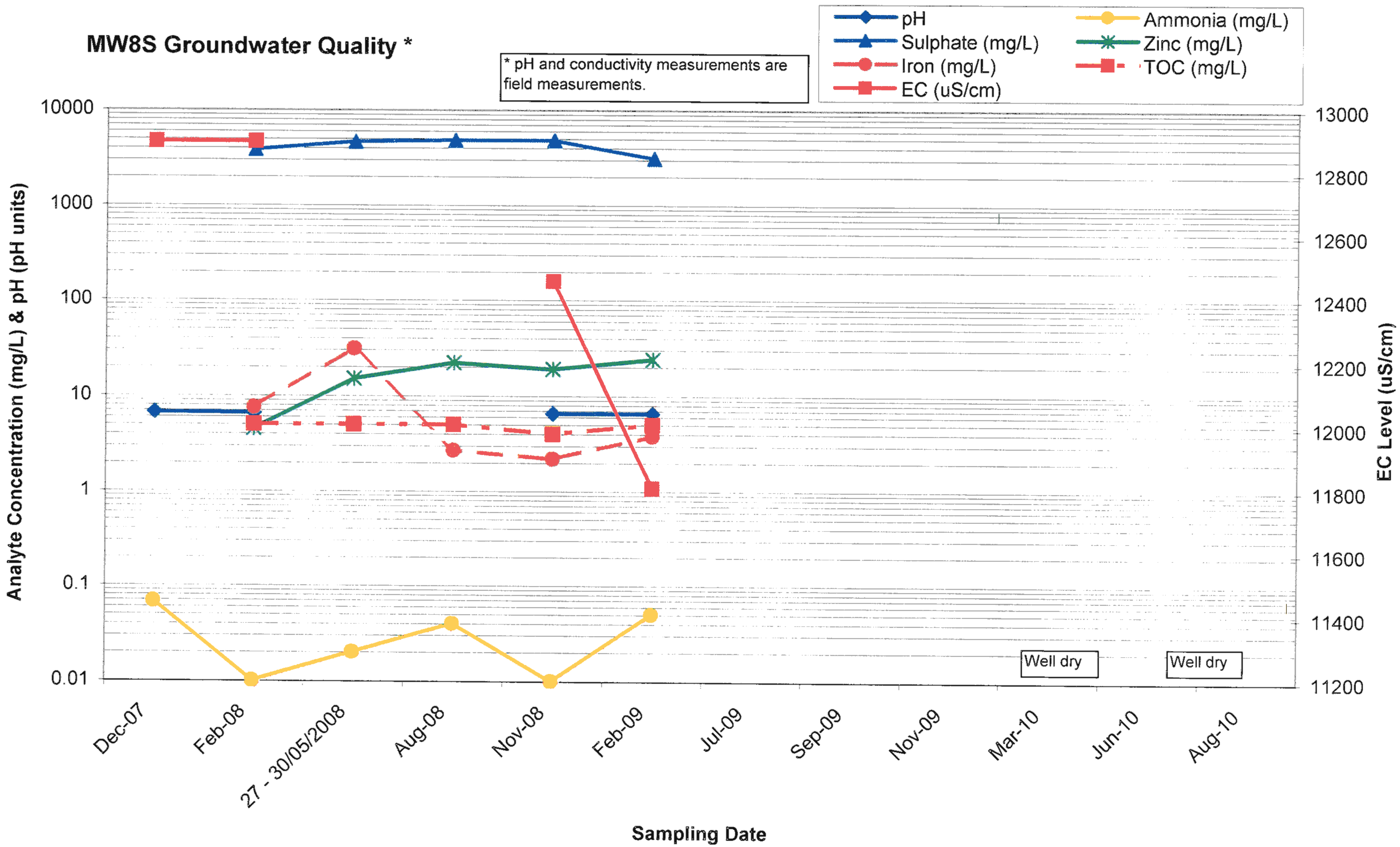

Landfill Void - WM5 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
12000
10000
8000
6000
4000
2000
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Nov-09
Feb-10
May-10
Sampling Date

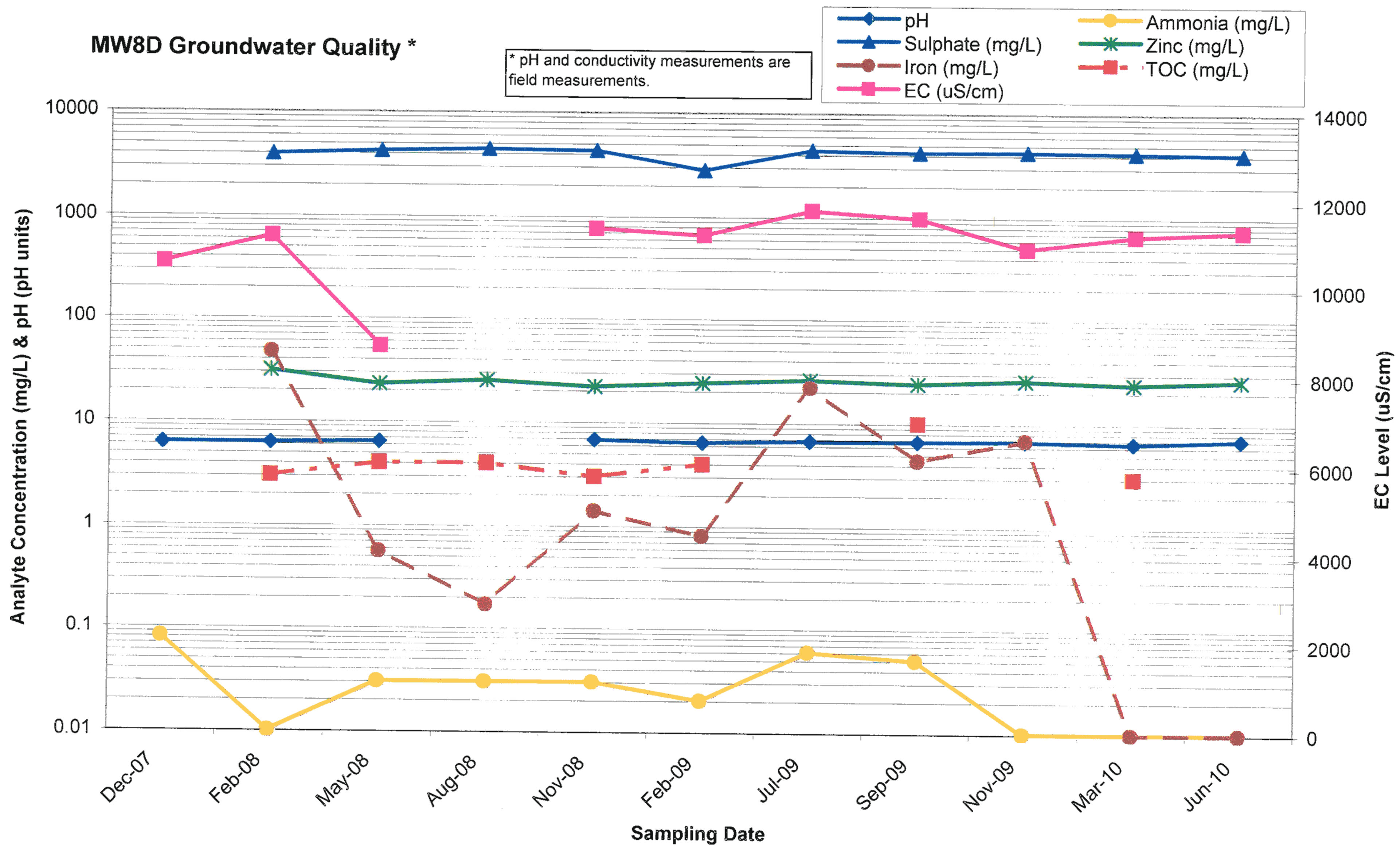


Landfill Void - WM6 Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
16000
14000
12000
10000
8000
6000
4000
2000
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Mar-05
Jun-05
Aug-05
Nov-05
Mar-06
May-06
Aug-06
Dec-06
Feb-07
Apr-07
Aug-07
Dec-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
Jul-09
Sep-09
Nov-09
Mar-10
Jun-10
Sampling Date

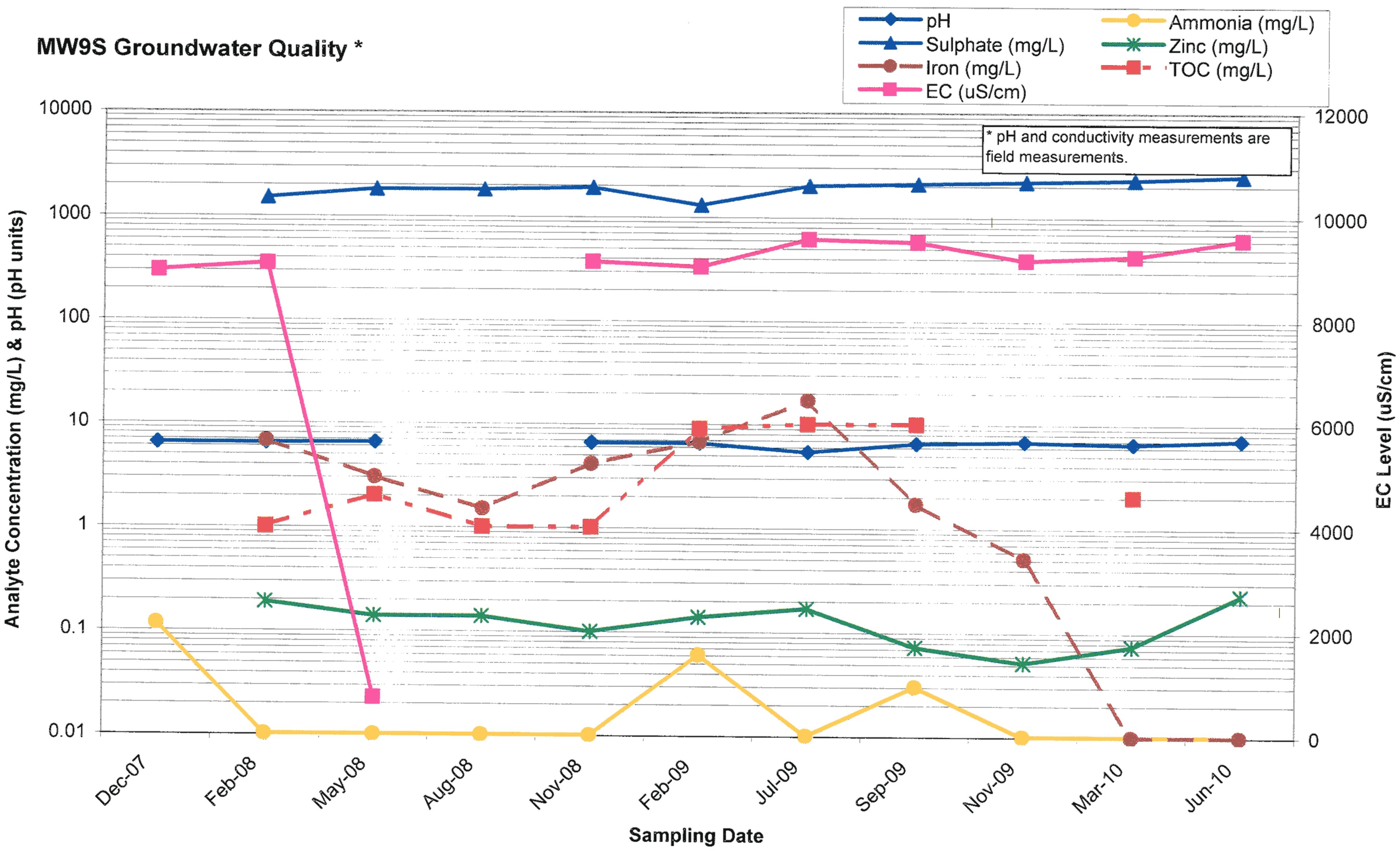


Landfill Void - WM7 Groundwater Quality *
* pH and conductivity measurements post May 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
14000
12000
10000
8000
6000
4000
2000
0
Aug-03
Nov-03
Feb-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Feb-07
May-07
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Nov-09
Feb-10
May-10
Sampling Date

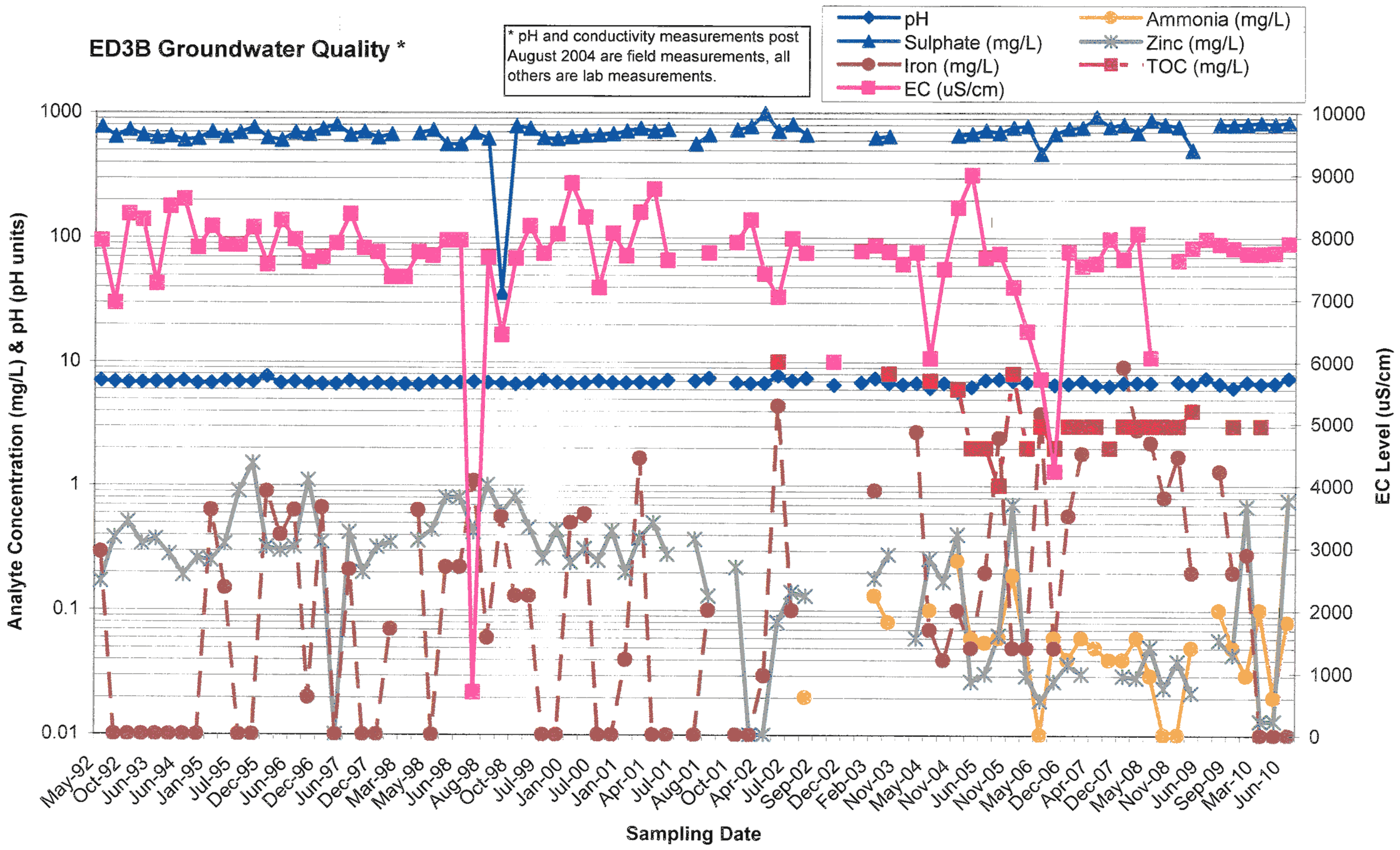

MW8S Groundwater Quality *
* pH and conductivity measurements are field measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
13000
12800
12600
12400
12200
12000
11800
11600
11400
11200
Well dry
Well dry
Dec-07
Feb-08
27 - 30/05/2008
Aug-08
Nov-08
Feb-09
Jul-09
Sep-09
Nov-09
Mar-10
Jun-10
Aug-10
Sampling Date



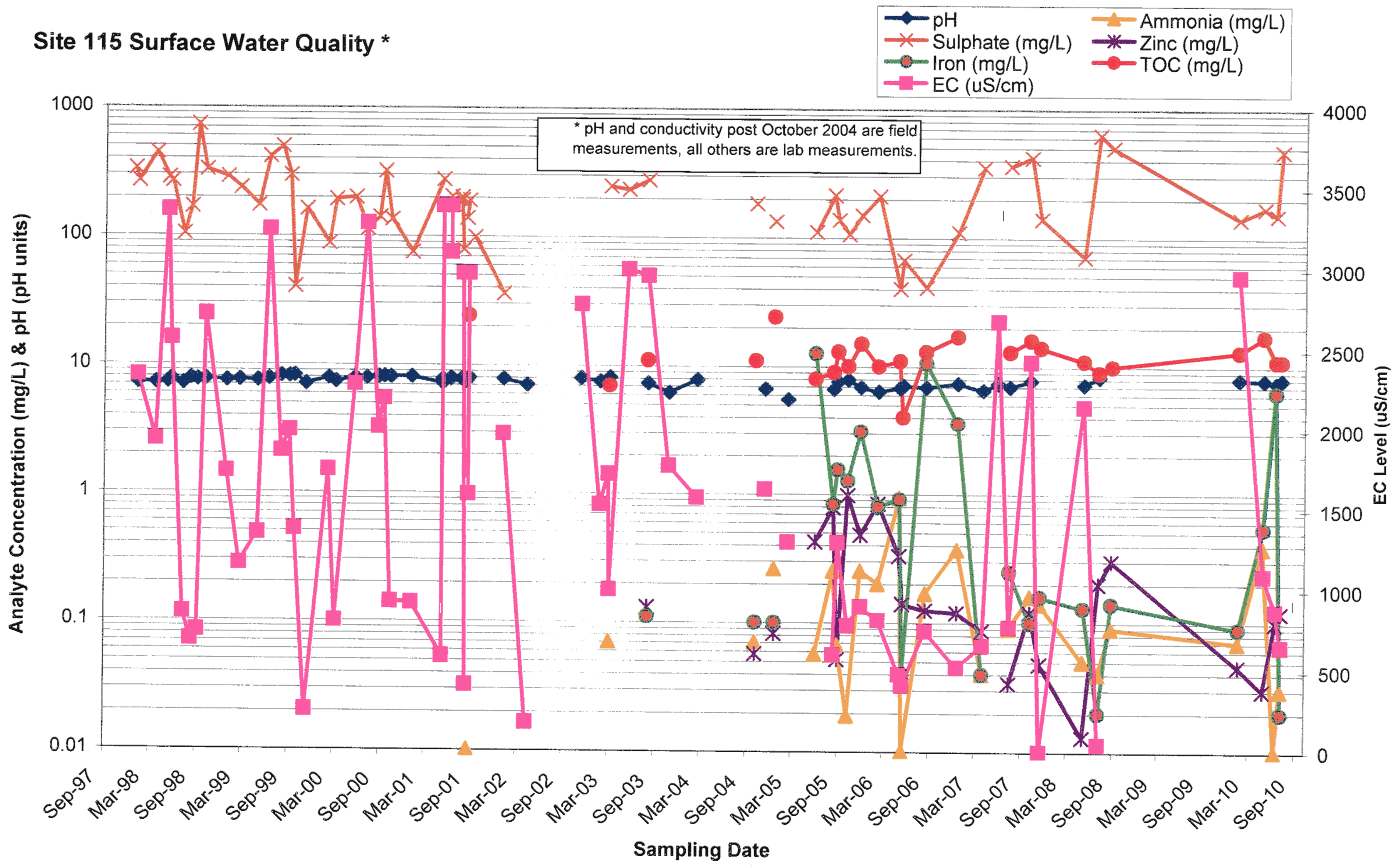
MW8D Groundwater Quality *
* pH and conductivity measurements are field measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
14000
12000
10000
8000
6000
4000
2000
0
Dec-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
Jul-09
Sep-09
Nov-09
Mar-10
Jun-10
Sampling Date

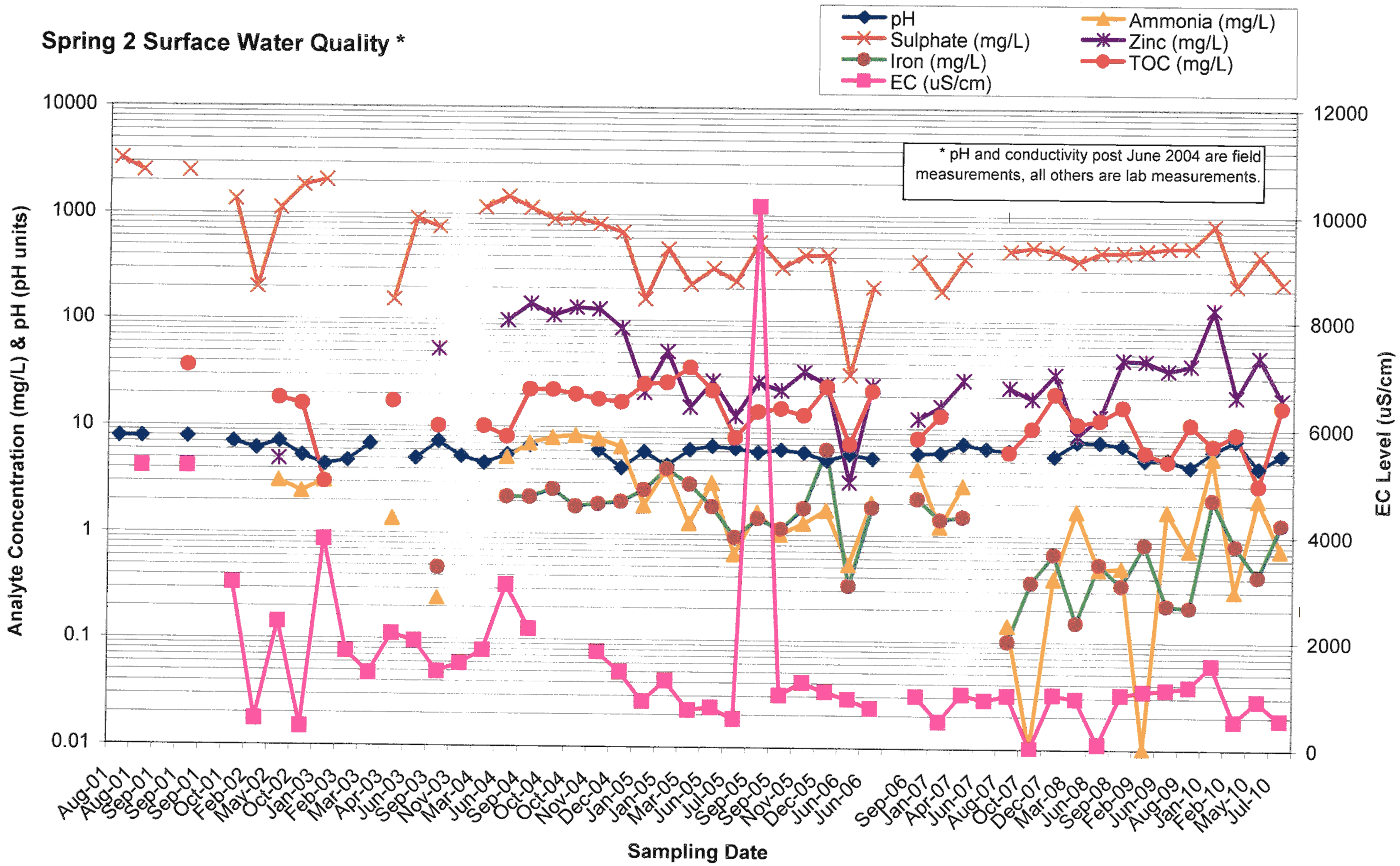


MW9S Groundwater Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity measurements are field measurements.
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
12000
10000
8000
6000
4000
2000
0
Dec-07
Feb-08
May-08
Aug-08
Nov-08
Feb-09
Jul-09
Sep-09
Nov-09
Mar-10
Jun-10
Sampling Date

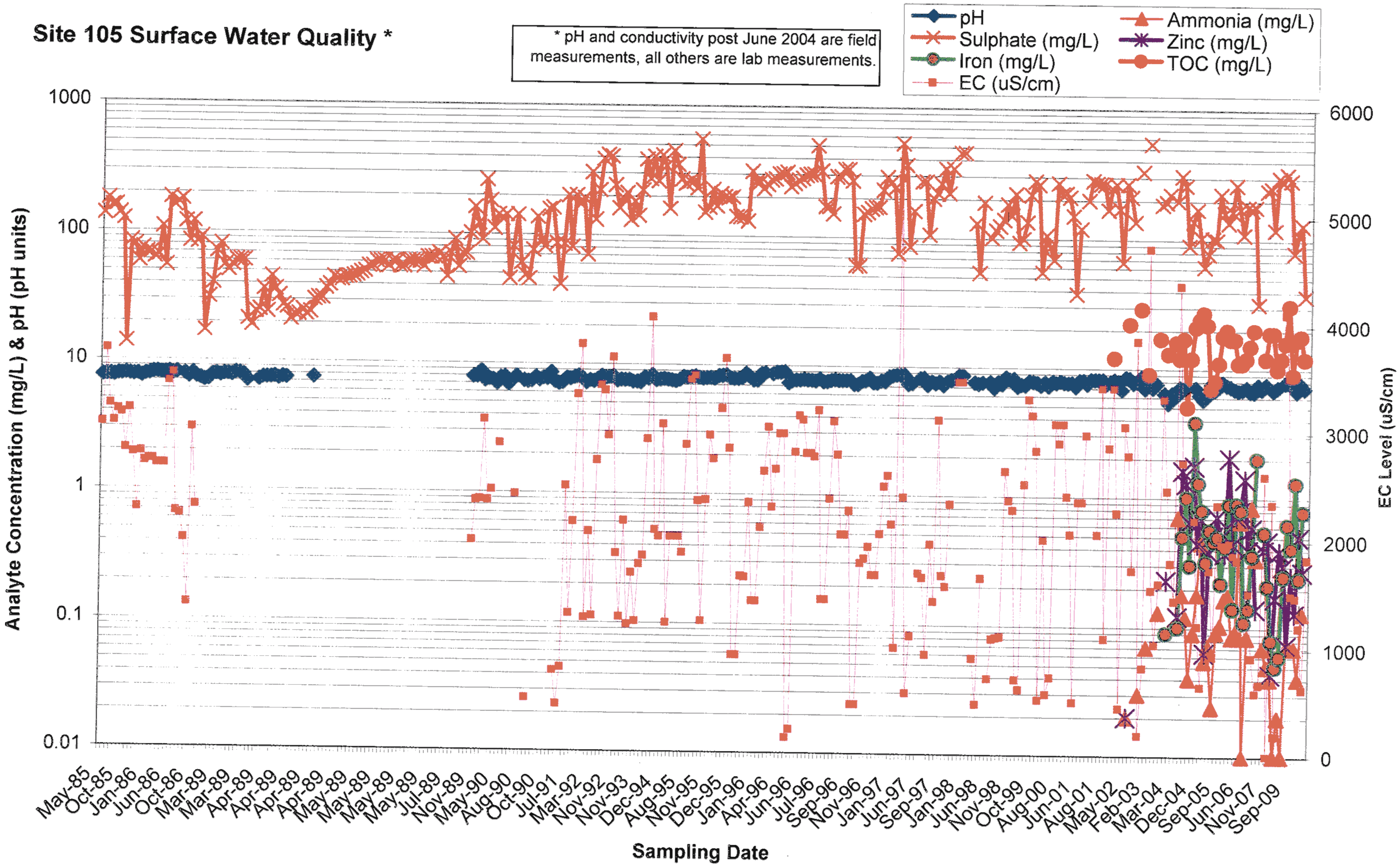

ED3B Groundwater Quality *
* pH and conductivity measurements post August 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
May-92
Oct-92
Jun-93
Jun-94
Jan-95
Jul-95
Dec-95
Jun-96
Dec-96
Jun-97
Dec-97
Mar-98
May-98
Jun-98
Aug-98
Oct-98
Jul-99
Jan-00
Jul-00
Jan-01
Apr-01
Jul-01
Aug-01
Oct-01
Apr-02
Jul-02
Sep-02
Dec-02
Feb-03
Nov-03
May-04
Nov-04
Jun-05
Nov-05
May-06
Dec-06
Apr-07
Dec-07
May-08
Nov-08
Jun-09
Sep-09
Mar-10
Jun-10
Sampling Date

APPENDIX E

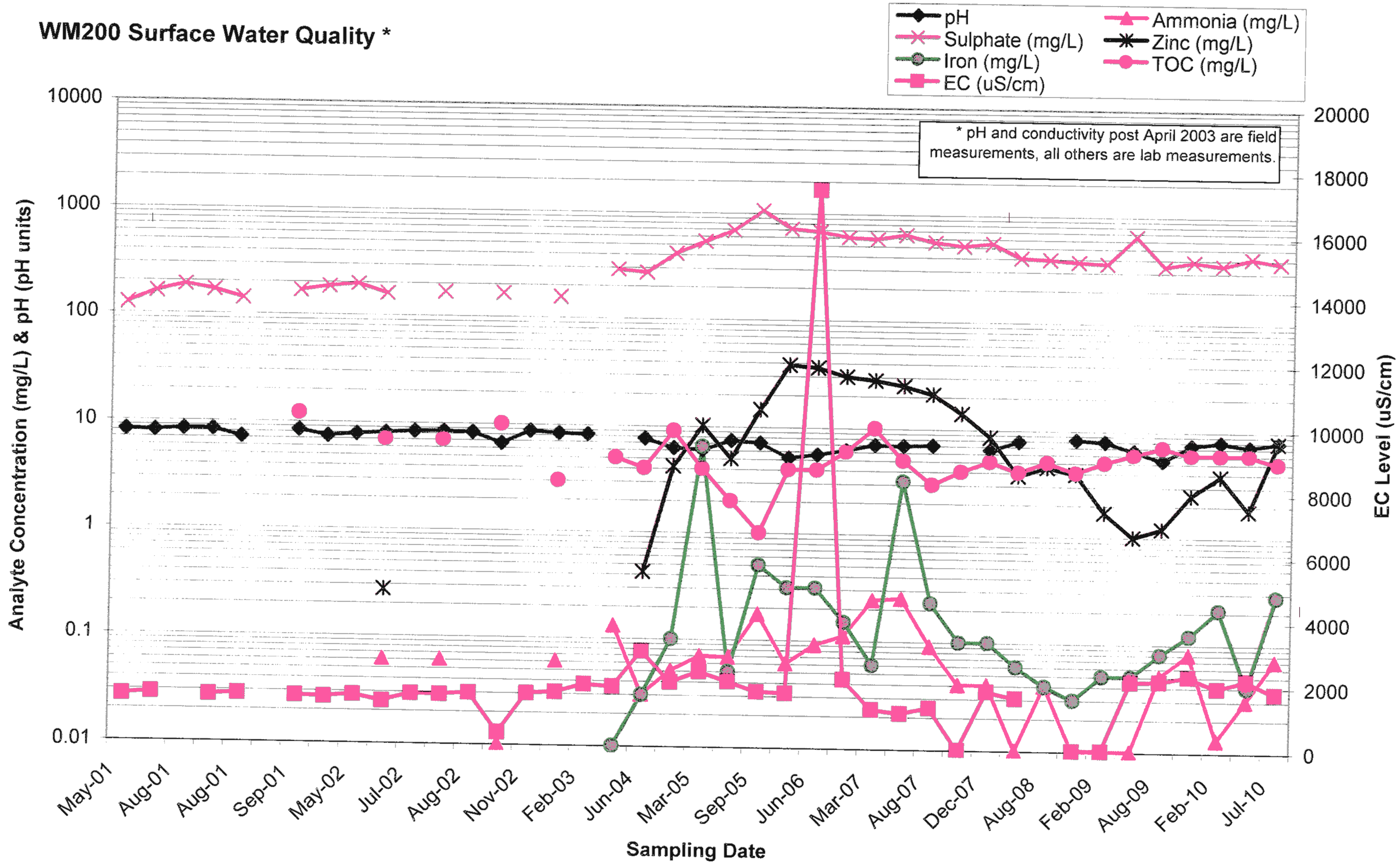

Site 115 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity post October 2004 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
4000
3500
3000
2500
2000
1500
1000
500
0
Sep-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Sampling Date



Spring 2 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity post June 2004 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
12000
10000
8000
6000
4000
2000
0
Sampling Date
Aug-01
Aug-01
Sep-01
Sep-01
Sep-01
Oct-01
Feb-02
May-02
Oct-02
Jan-03
Feb-03
Mar-03
Apr-03
Jun-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Oct-04
Oct-04
Nov-04
Dec-04
Jan-05
Jan-05
Mar-05
Jun-05
Jul-05
Sep-05
Sep-05
Nov-05
Dec-05
Jun-06
Jun-06
Sep-06
Jan-07
Apr-07
Jun-07
Aug-07
Oct-07
Dec-07
Mar-08
Jun-08
Sep-08
Feb-09
Jun-09
Aug-09
Jan-10
Feb-10
May-10
Jul-10

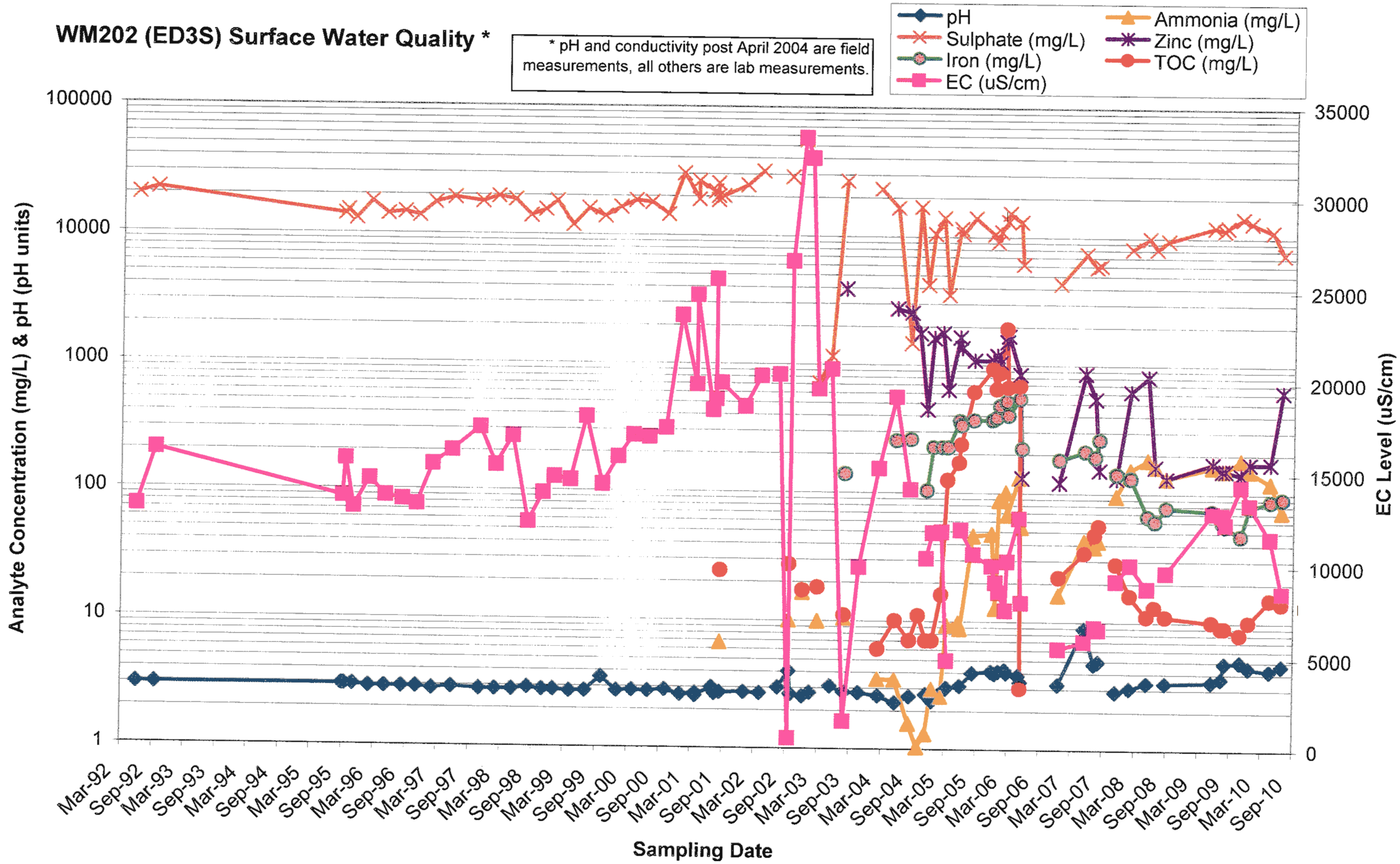


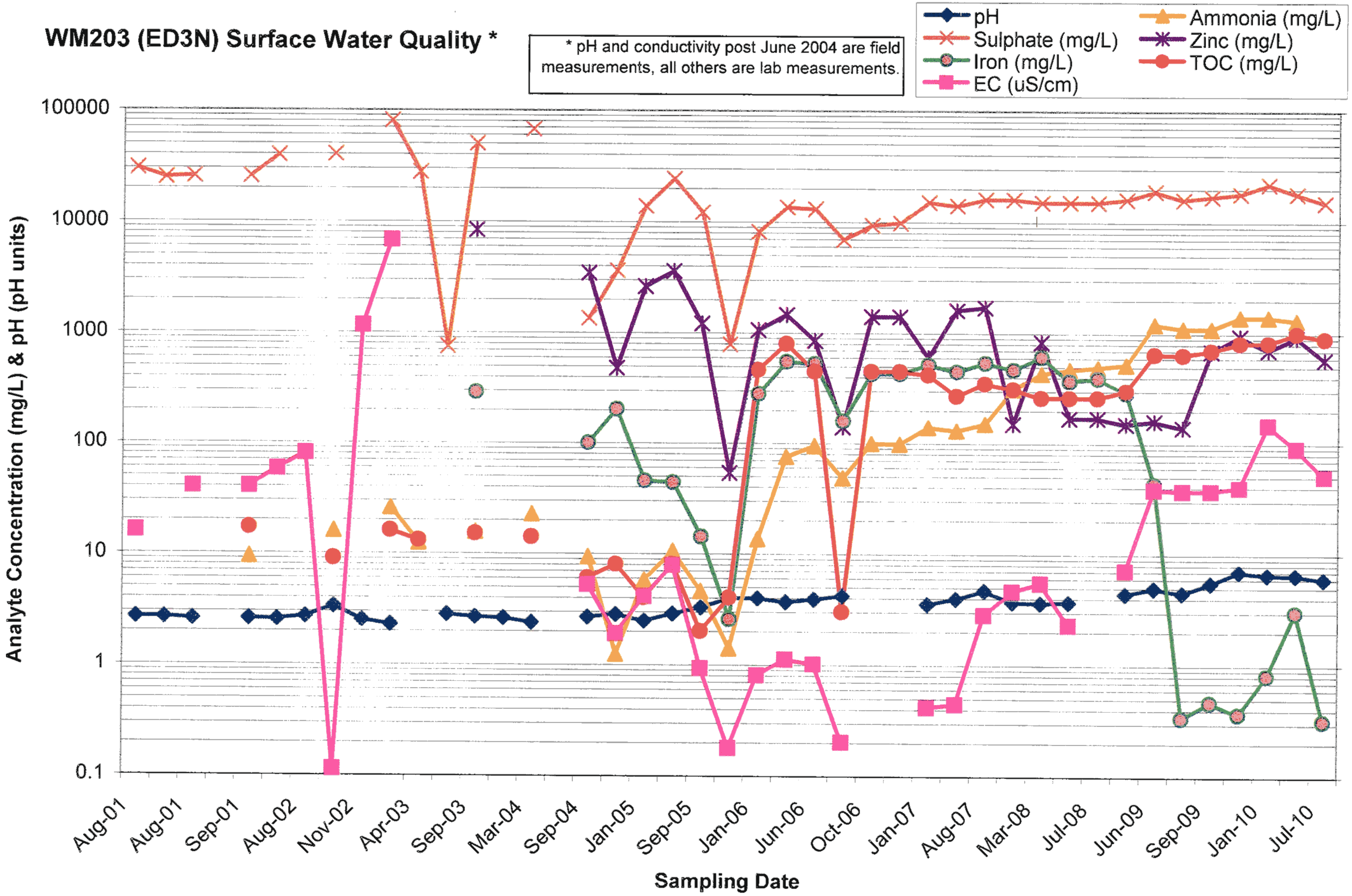
Site 105 Surface Water Quality *
* pH and conductivity post June 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
6000
5000
4000
3000
2000
1000
0
May-85
Oct-85
Jan-86
Jun-86
Oct-86
Mar-89
Mar-89
Apr-89
Apr-89
Apr-89
Apr-89
May-89
May-89
May-89
Jul-89
Nov-89
May-90
Aug-90
Oct-90
Jul-91
Mar-92
Nov-92
Nov-93
Dec-94
Aug-95
Nov-95
Dec-95
Jan-96
Apr-96
Jun-96
Jul-96
Sep-96
Nov-96
Jan-97
Jun-97
Sep-97
Jan-98
Jun-98
Nov-98
Oct-99
Aug-00
Jun-01
Aug-01
May-02
Feb-03
Mar-04
Dec-04
Sep-05
Jun-06
Nov-07
Sep-09
Sampling Date

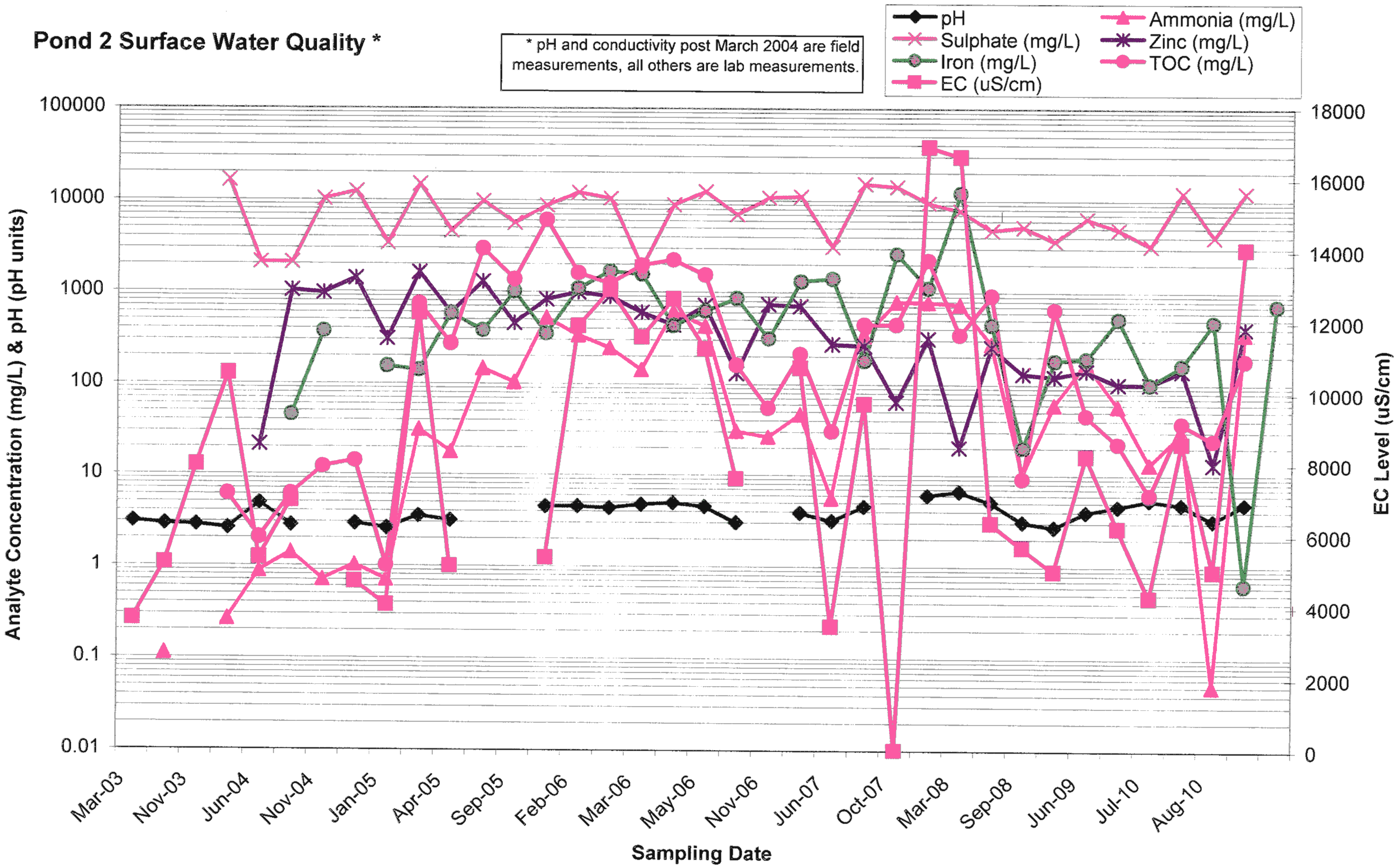


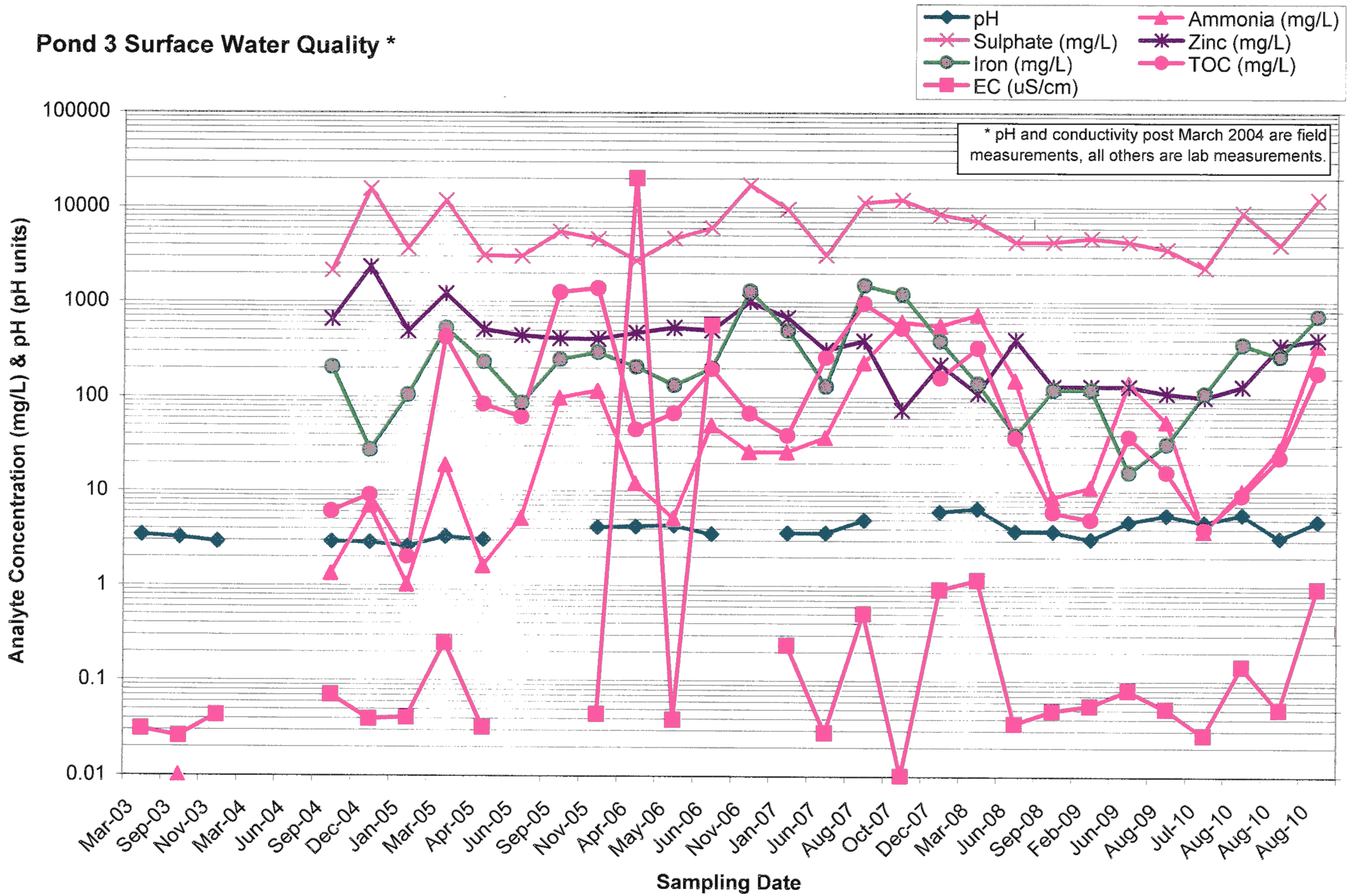
WM200 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity post April 2003 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
May-01
Aug-01
Aug-01
Sep-01
May-02
Jul-02
Aug-02
Nov-02
Feb-03
Jun-04
Mar-05
Sep-05
Jun-06
Mar-07
Aug-07
Dec-07
Aug-08
Feb-09
Aug-09
Feb-10
Jul-10
Sampling Date

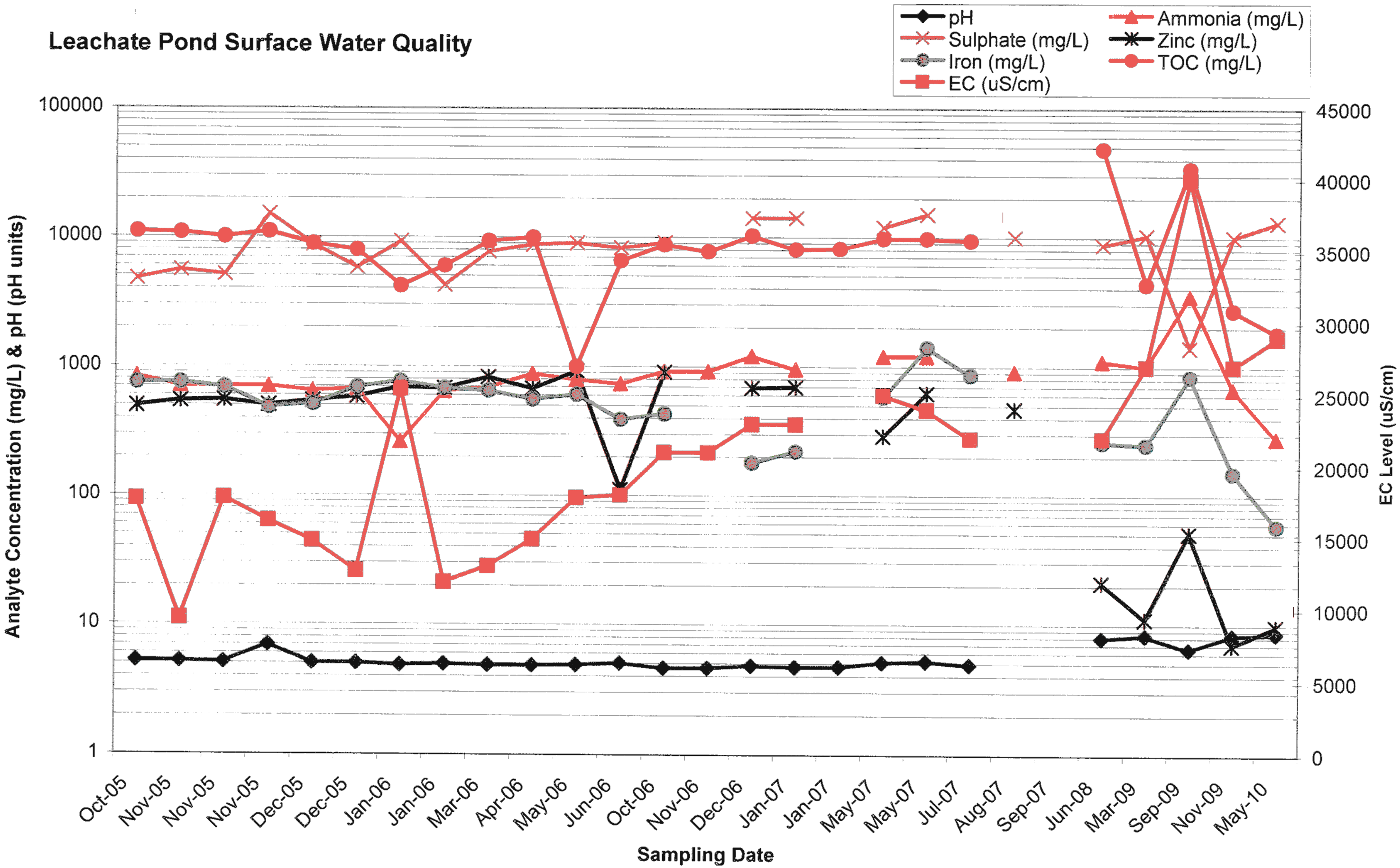

WM201 Surface Water Quality *
* pH and conductivity post April 2003 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
1600
1400
1200
1000
800
600
400
200
0
Aug-01
Aug-01
Sep-01
Sep-01
May-02
Jan-03
Feb-03
Apr-03
Jun-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Oct-04
Oct-04
Nov-04
Dec-04
Jan-05
Mar-05
Apr-05
Jun-05
Jul-05
Sep-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Jan-07
Apr-07
Sep-07
Nov-07
Dec-07
Jun-08
Aug-08
Oct-09
May-10
Jul-10
Aug-10
Sampling Date


WM202 (ED3S) Surface Water Quality *
* pH and conductivity post April 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
EC Level (uS/cm)
35000
30000
25000
20000
15000
10000
5000
0
Mar-92
Sep-92
Mar-93
Sep-93
Mar-94
Sep-94
Mar-95
Sep-95
Mar-96
Sep-96
Mar-97
Sep-97
Mar-98
Sep-98
Mar-99
Sep-99
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Sampling Date

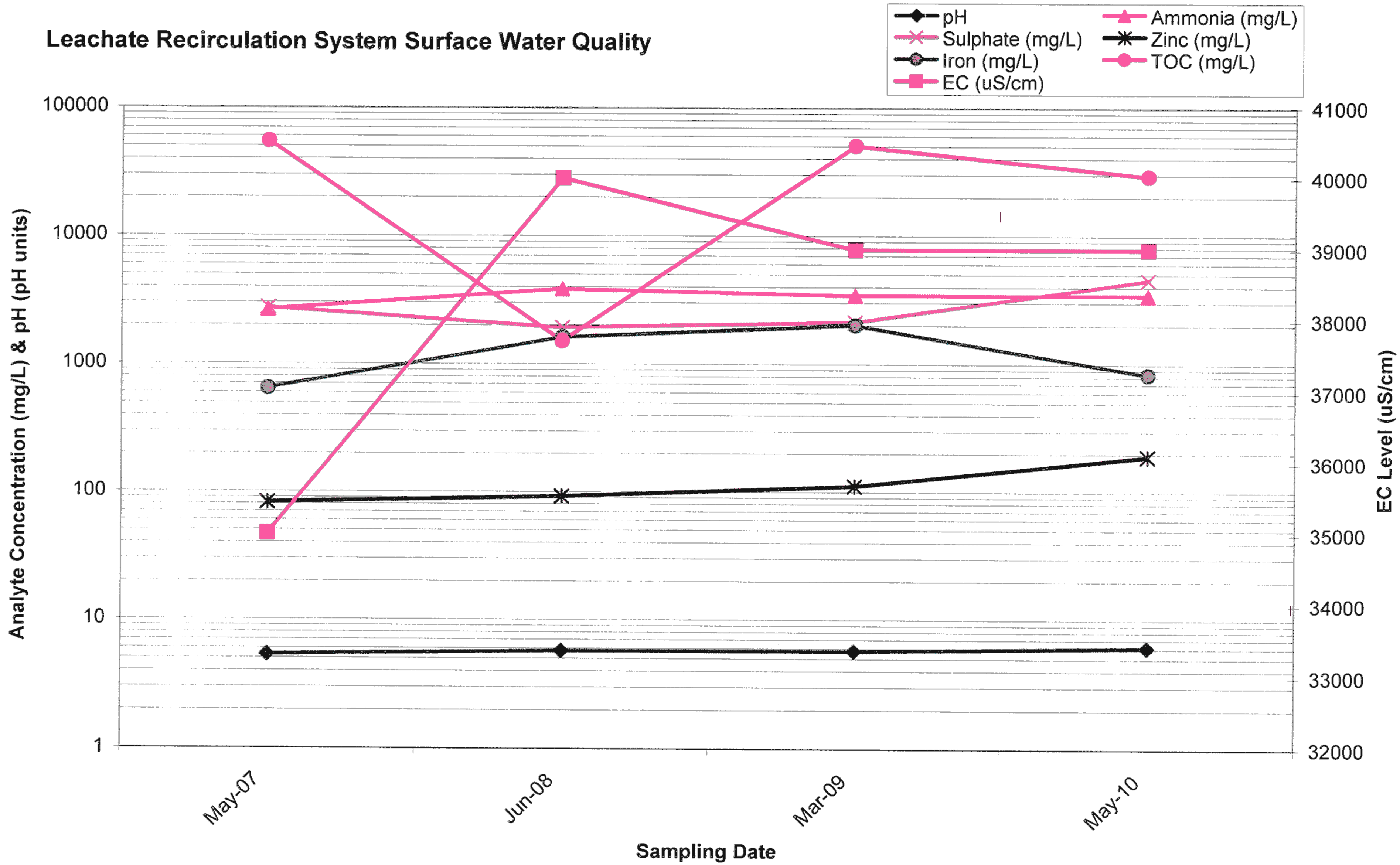

WM203 (ED3N) Surface Water Quality *
* pH and conductivity post June 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
EC Level (uS/cm)
60000
50000
40000
30000
20000
10000
0
Aug-01
Aug-01
Sep-01
Aug-02
Nov-02
Apr-03
Sep-03
Mar-04
Sep-04
Jan-05
Sep-05
Jan-06
Jun-06
Oct-06
Jan-07
Aug-07
Mar-08
Jul-08
Jun-09
Sep-09
Jan-10
Jul-10
Sampling Date


Pond 2 Surface Water Quality *
* pH and conductivity post March 2004 are field measurements, all others are lab measurements.
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Mar-03
Nov-03
Jun-04
Nov-04
Jan-05
Apr-05
Sep-05
Feb-06
Mar-06
May-06
Nov-06
Jun-07
Oct-07
Mar-08
Sep-08
Jun-09
Jul-10
Aug-10
Sampling Date


Pond 3 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity post March 2004 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Mar-03
Sep-03
Nov-03
Mar-04
Jun-04
Sep-04
Dec-04
Jan-05
Mar-05
Apr-05
Jun-05
Sep-05
Nov-05
Apr-06
May-06
Jun-06
Nov-06
Jan-07
Jun-07
Aug-07
Oct-07
Dec-07
Mar-08
Jun-08
Sep-08
Feb-09
Jun-09
Aug-09
Jul-10
Aug-10
Aug-10
Aug-10
Sampling Date

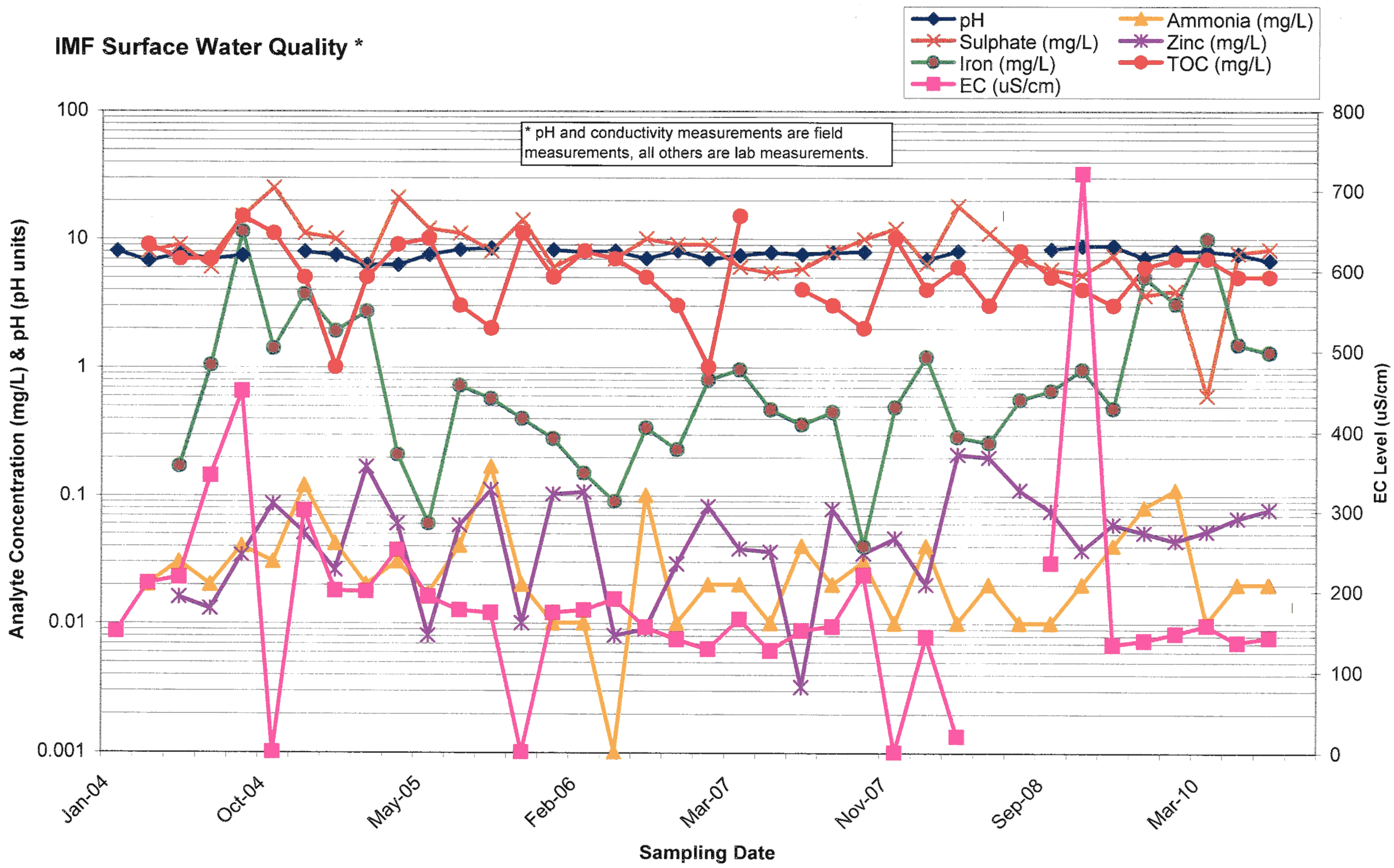


Leachate Pond Surface Water Quality
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
Analyte Concentration (mg/L) & pH (pH units)
100000
10000
1000
100
10
1
EC Level (uS/cm)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Oct-05
Nov-05
Nov-05
Nov-05
Dec-05
Dec-05
Jan-06
Jan-06
Mar-06
Apr-06
May-06
Jun-06
Oct-06
Nov-06
Dec-06
Jan-07
Jan-07
May-07
May-07
Jul-07
Aug-07
Sep-07
Jun-08
Mar-09
Sep-09
Nov-09
May-10
Sampling Date

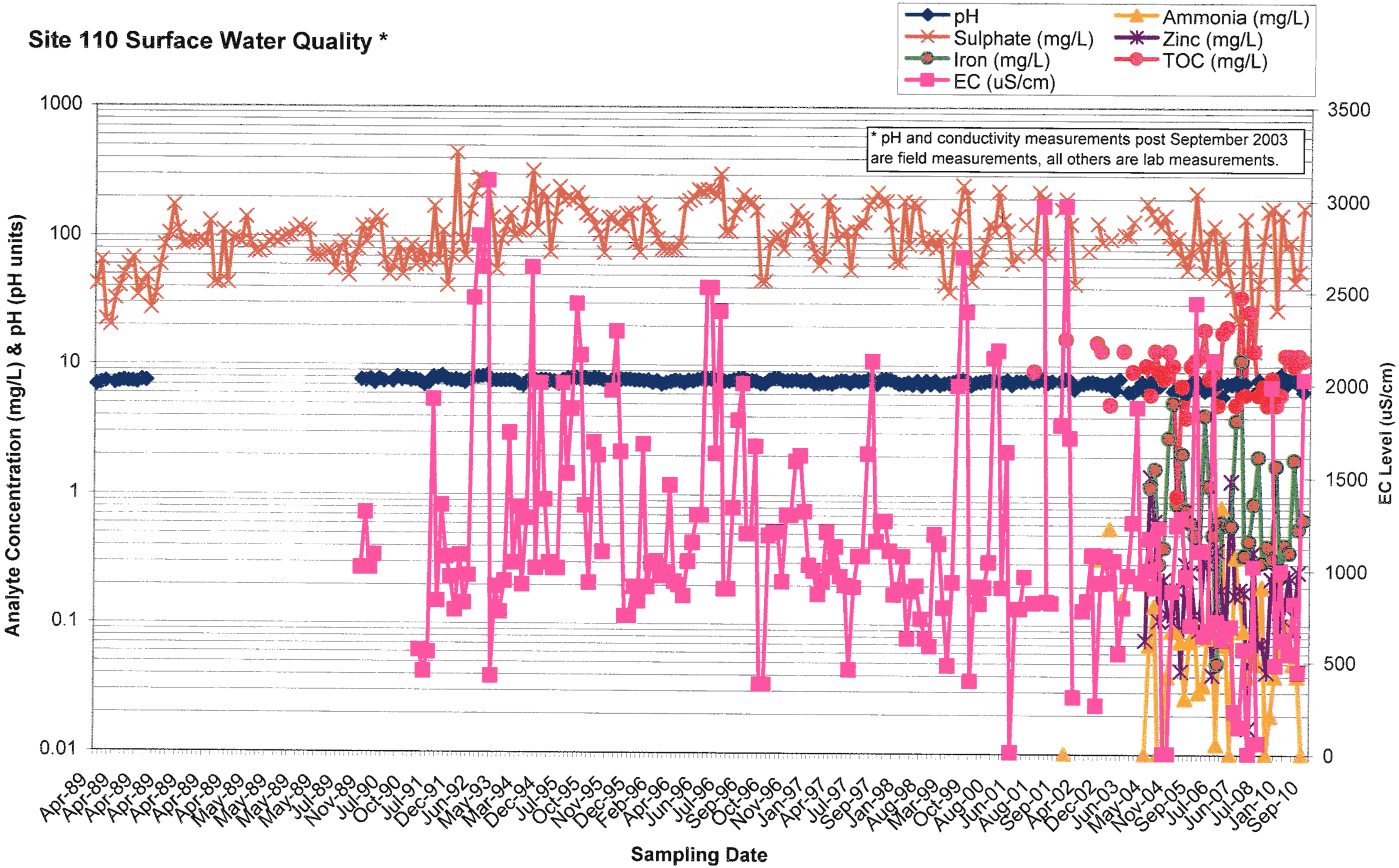


Leachate Recirculation System Surface Water Quality
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
100000
10000
1000
100
10
1
Analyte Concentration (mg/L) & pH (pH units)
41000
40000
39000
38000
37000
36000
35000
34000
33000
32000
EC Level (uS/cm)
May-07
Jun-08
Mar-09
May-10
Sampling Date

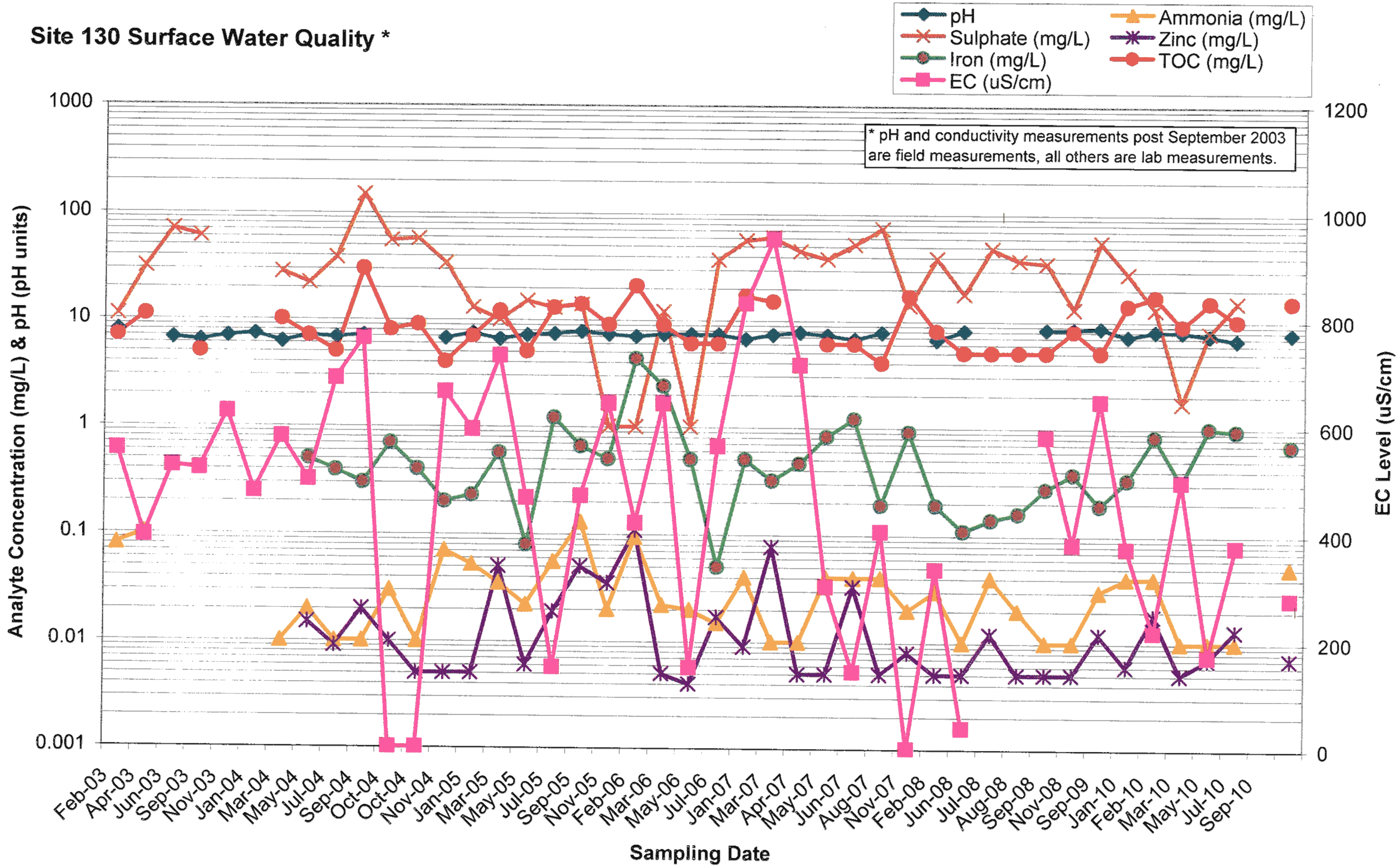
APPENDIX F

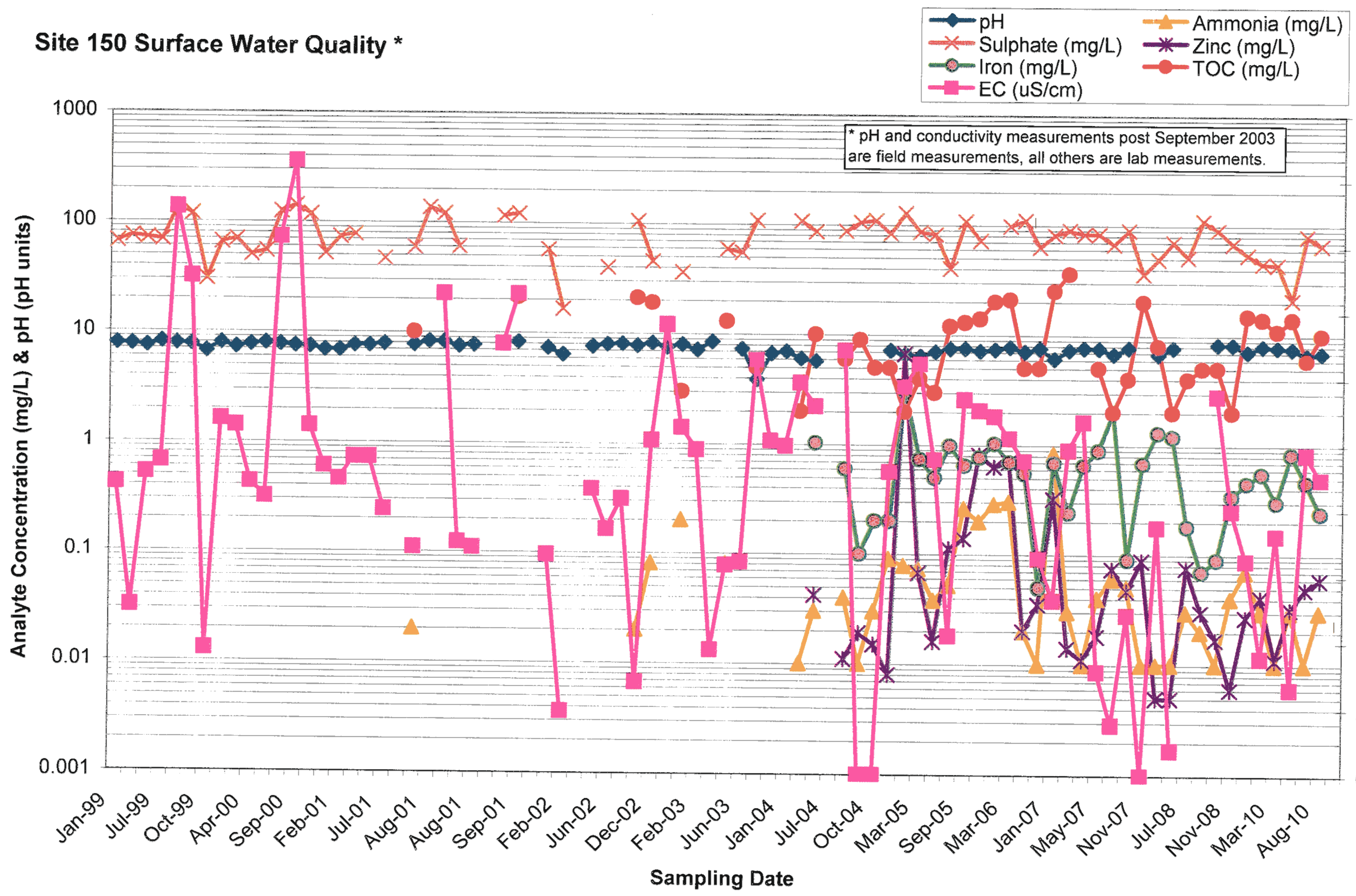


IMF Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity measurements are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
800
700
600
500
400
300
200
100
0
Jan-04
Oct-04
May-05
Feb-06
Mar-07
Nov-07
Sep-08
Mar-10
Sampling Date



Site 110 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity measurements post September 2003 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
EC Level (uS/cm)
3500
3000
2500
2000
1500
1000
500
0
Apr-89
Apr-89
Apr-89
Apr-89
Apr-89
Apr-89
Apr-89
May-89
May-89
May-89
May-89
Jul-89
Nov-89
Jul-90
Oct-90
Jul-91
Dec-91
Jun-92
May-93
Mar-94
Dec-94
Jul-95
Oct-95
Nov-95
Dec-95
Feb-96
Apr-96
Jun-96
Jul-96
Sep-96
Oct-96
Nov-96
Jan-97
Apr-97
Jul-97
Sep-97
Jan-98
Aug-98
Mar-99
Oct-99
Aug-00
Jun-01
Aug-01
Sep-01
Apr-02
Dec-02
Jun-03
May-04
Nov-04
Sep-05
Jul-06
Jun-07
Jul-08
Jan-10
Sep-10
Sampling Date


Site 130 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity measurements post September 2003 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
1200
1000
800
600
400
200
0
Feb-03
Apr-03
Jun-03
Sep-03
Nov-03
Jan-04
Mar-04
May-04
Jul-04
Sep-04
Oct-04
Oct-04
Nov-04
Jan-05
Mar-05
May-05
Jul-05
Sep-05
Nov-05
Feb-06
Mar-06
May-06
Jul-06
Jan-07
Mar-07
Apr-07
May-07
Jun-07
Aug-07
Nov-07
Feb-08
Jun-08
Jul-08
Aug-08
Sep-08
Nov-08
Sep-09
Jan-10
Feb-10
Mar-10
May-10
Jul-10
Sep-10
Sampling Date



Site 150 Surface Water Quality *
pH
Sulphate (mg/L)
Iron (mg/L)
EC (uS/cm)
Ammonia (mg/L)
Zinc (mg/L)
TOC (mg/L)
* pH and conductivity measurements post September 2003 are field measurements, all others are lab measurements.
Analyte Concentration (mg/L) & pH (pH units)
1000
100
10
1
0.1
0.01
0.001
EC Level (uS/cm)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-99
Jul-99
Oct-99
Apr-00
Sep-00
Feb-01
Jul-01
Aug-01
Aug-01
Sep-01
Feb-02
Jun-02
Dec-02
Feb-03
Jun-03
Jan-04
Jul-04
Oct-04
Mar-05
Sep-05
Mar-06
Jan-07
May-07
Nov-07
Jul-08
Nov-08
Mar-10
Aug-10
Sampling Date

APPENDIX G

Appendix G:
Summary Particulate Dust Monitoring 2009 - 2010

	Site Name	ALS Batch Code	Date	Total Solids	Soluble Matter	Insoluble Solids	Combustibles	Ash Residue	Calculated Rainfall
				g/m2/mth	g/m2/mth	g/m2/mth	g/m2/mth	g/m2/mth	mm
East Void	DG22	EN0901832	Sep-09	29.9	4.1	25.8	2.8	23	86
	DG22	EN0902043	Oct-09	3.3	1	2.3	0.4	1.9	1
	DG22	EN0902231	Nov-09	5	0.4	4.6	0.7	3.9	18
	DG22	EN1000045	Dec-09	2.9	0.1	2.8	0.3	2.5	89
	DG22	EN1000207	Jan-10	7.9	2.9	5	0.6	4.4	23
	DG22	EN1000564	Feb-10	4.2	1.8	2.4	0.5	1.9	114
	DG22	EN1000772	Mar-10	2	0.8	1.2	0.2	1	57
	DG22	EN1001247	Apr-10	1.2	0.3	0.9	0.1	0.9	13
	DG22	EN1001441	May-10	4.2	3.1	1.1	0.1	1	104
	DG22	EN1001596	Jun-10	2.6	0.9	1.7	0.3	1.4	31
	DG22	EN1001920	Jul-10	2.6	0.7	1.9	0.2	1.7	87
	DG22	EN1002188	Aug-10	3.5	1.9	1.6	0.1	1.6	80
			Minimum	***1.2***	***0.1***	***0.9***	***0.1***	***0.9***	***1***
			Maximum	***29.9***	***4.1***	***25.8***	***2.8***	***23***	***114***
			Average	***5.8***	***1.5***	***4.3***	***0.5***	***3.8***	***58.6***
			StdDev	***7.8***	***1.3***	***6.9***	***0.7***	***6.2***	***39.5***
West Void	DG24	EN0901832	Sep-09	30.1	3.3	26.8	3	23.8	86
	DG24	EN0902043	Oct-09	3.2	0.9	2.3	0.4	1.9	1
	DG24	EN0902231	Nov-09	6.3	0.8	5.5	0.7	4.8	16
	DG24	EN1000045	Dec-09	4.6	1.9	2.7	0.3	2.4	102
	DG24	EN1000207	Jan-10	12.9	2.7	10.2	0.8	9.4	13
	DG24	EN1000564	Feb-10	2.7	0.3	2.4	0.6	1.8	114
	DG24	EN1000772	Mar-10	4.3	1.9	2.4	1.3	1.1	50
	DG24	EN1001247	Apr-10	0.9	0.3	0.6	0.1	0.5	10
	DG24	EN1001441	May-10	3.4	2.3	1.1	0.2	0.9	104
	DG24	EN1001596	Jun-10	2.3	0.9	1.4	0.4	1	32
	DG24	EN1001920	Jul-10	3.1	1.6	1.5	0.3	1.2	86
	DG24	EN1002188	Aug-10	2.2	1.5	0.7	0.1	0.7	74
			Minimum	**0.9**	**0.3**	**0.6**	**0.1**	**0.5**	**1**
			Maximum	**30.1**	**3.3**	**26.8**	**3**	**23.8**	**114**
			Average	**6.3**	**1.5**	**4.8**	**0.7**	**4.1**	**57.3**
			StdDev	**8.1**	**0.9**	**7.4**	**0.8**	**6.7**	**41.7**
Pylara	DG28	EN0901832	Sep-09	21.3	1.7	19.6	2.3	17.3	73
	DG28	EN0902043	Oct-09	1.4	0.5	0.9	0.5	0.4	1
	DG28	EN0902231	Nov-09	3	0.5	2.5	0.9	1.6	16
	DG28	EN1000045	Dec-09	3.4	1.2	2.2	0.6	1.6	84
	DG28	EN1000207	Jan-10	4.2	2.8	1.4	0.4	1	22
	DG28	EN1000564	Feb-10	4.2	2.7	1.5	0.7	0.8	114
	DG28	EN1000772	Mar-10	3.4	2.7	0.7	0.2	0.5	47
	DG28	EN1001247	Apr-10	0.8	0.3	0.5	0.2	0.3	11
	DG28	EN1001441	May-10	1.5	0.8	0.7	0.3	0.4	99
	DG28	EN1001596	Jun-10	1.1	0.8	0.3	0.2	0.1	22
	DG28	EN1001920	Jul-10	0.7	0.1	0.6	0.3	0.3	67
	DG28	EN1002188	Aug-10	1	0.9	0.1	0.1	0.1	63
			Minimum	***0.7***	***0.1***	***0.1***	***0.1***	***0.1***	***1***
			Maximum	***21.3***	***2.8***	***19.6***	***2.3***	***17.3***	***114***
			Average	***3.8***	***1.3***	***2.6***	***0.6***	***2.0***	***51.6***
			StdDev	***5.7***	***1.0***	***5.4***	***0.6***	***4.8***	***37.3***
Chinnery	DG18		Decommissioned in early 2007 as per EPA advice - construction of Intermodal Facility complete						

'<' removed from <LOR values

APPENDIX H

Appendix H1: 2009/10 sub-surface gas monitoring

GMBH1		Methane	Carbon Dioxide	Oxygen	Balance	Depth to Water
		%	%	%		m
30/10/2009	Before purge	0.0	0.0	20.6	79.3	9.73
	After purge	0.0	0.0	20.8	79.1	
23/02/2010	Before purge	0.0	12.2	11.2	76.5	9.37
	After purge	0.0	0.0	21.1	78.8	
15/05/2010	Before purge	0.0	8.0	17.5	75.1	8.98
	After purge	0.0	0.0	20.5	79.4	
30/07/2010	Before purge	0.0	10.4	4.7	84.6	8.9
	After purge	0.0	0.0	20.0	79.8	

GMBH2		Methane	Carbon Dioxide	Oxygen	Balance	Depth to Water
		%	%	%		m
30/10/2009	Before purge	0.1	0.0	20.8	78.9	15.29
	After purge	0.0	0.0	20.8	79.1	
23/02/2010	Before purge	0.0	2.9	18.6	78.4	15.35
	After purge	0.0	0.0	21.2	78.8	
15/05/2010	Before purge	0.0	3.0	18.5	78.3	15.25
	After purge	0.0	0.0	20.3	79.7	
30/07/2010	Before purge	0.0	3.0	18.1	78.8	15.2
	After purge	0.0	0.0	20.2	79.7	

GMBH4		Methane	Carbon Dioxide	Oxygen	Balance	Depth to Water
		%	%	%		m
30/10/2009	Before purge	0.0	0.0	20.5	79.3	13.58
	After purge	0.0	0.0	20.5	79.4	
23/02/2009	Before purge	0.0	5.4	0.2	94.4	13.5
	After purge	0.0	0.0	21.0	79.1	
14/05/2010	Before purge	0.0	2.7	20.1	78.5	13.25
	After purge	0.0	0.0	20.3	79.6	
30/07/2010	Before purge	0.0	4.8	3.0	92.0	13.04
	After purge	0.0	0.0	19.9	79.8	

Appendix H2: 2009/10 surface gas monitoring

VEOLIA ENVIRONMENTAL SERVICES

Date 10/12/2009

	1	2	3	4	5
A	0	0.1	0.1	0	0
B	0.2	0.2	0.1	0	0.1
C	0.5	0.5	0.1	0.2	0.3
D	0.3	0.1	0.3	0.1	0.3
E	0.2	0.1	0.2	0.1	0.3

Average	0.18
Min	0
Max	0.5

Date 12/02/2010

	1	2	3	4	5
A	0	0	0.2	0	0.1
B	0	0.2	0.2	0	0.2
C	0.1	0.1	0.5	0.2	0.2
D	0.1	0.1	0.6	0.1	0.4
E	0.1	0.3	0.5	0.4	0.3

Average	0.20
Min	0
Max	0.6

Date 7/06/2010

	1	2	3	4	5
A	0	0.1	0.1	0	0
B	0.1	0.2	0.2	0.1	0
C	0.1	0.1	0	0.2	0
D	0.1	0	0	0	0.1
E	0	0	0.1	0	0.1

Average	0.06
Min	0
Max	0.2

Date 27/08/2019

	1	2	3	4	5
A	0	0.1	0	0	0
B	0	0.1	0	0	0
C	0	0	0	0	0.1
D	0.1	0.2	0	0	0
E	0	0	0	0.1	0

Average	0.03
Min	0
Max	0.2

Yearly	
Minimum	**0**
Mean	**0.12**
Maximum	**0.6**

APPENDIX I

Appendix I: 2009/10 Landfill Gas Flare and Engine Results

Monitoring Point 5 - Gas Extraction Booster - Prior to LFG Destruction

Pollutant	Units of measure	Frequency	Mean
Carbon dioxide	mg/m3	Yearly	42.05
Dry Gas Density	%	Yearly	99
Moisture Content	%	Yearly	25.44
Molecular weight of stack gases	gr/grmole	Yearly	Not Applicable
Oxygen	%	Yearly	0.01
Temperature	Deg C	Yearly	24.83
Volatile Organic Compounds	mg/m3	Yearly	9.25
Volumetric Flow rate	m3/sec	Yearly	928.25

Monitoring Point 7 - Landfill Gas Flare

Pollutant	Units of measure	Frequency	Mean
Temperature	Deg C	Yearly	965.75
Residence Time	Seconds	Continuous	3

Monitoring Point 8 - Landfill Gas Engine Exhaust Point

Generator 1

Pollutant	Units of measure	Frequency	Mean
Carbon dioxide	%	Yearly	13.3
Carbon monoxide	mg/m3	Yearly	1073
Dry Gas Density	mg/m3	Yearly	1.36
Moisture Content	%		5.3
Molecular Weight of Stack Gases	gr/grmole	Yearly	30.5
Nitrogen Oxides	mg/m3	Yearly	400
Oxygen	%	Yearly	8.2
Sulfuric acid mist as SO3	mg/m3	Yearly	10.4
Sulphur dioxide	mg/m3	Yearly	<3
Temperature	Deg C	Yearly	475
Velocity	m/sec	Yearly	46.4
Volatile Organic Compounds	mg/m3	Yearly	1.74
Volumetric Flow rate	m3/sec	Yearly	1.59

Generator 2

Pollutant	Units of measure	Frequency	Mean
Carbon dioxide	%	Yearly	13.4
Carbon monoxide	mg/m3	Yearly	799
Dry Gas Density	mg/m3	Yearly	1.36
Moisture Content	%		5.4
Molecular Weight of Stack Gases	gr/grmole	Yearly	30.5
Nitrogen Oxides	mg/m3	Yearly	411
Oxygen	%	Yearly	8.4
Sulfuric Acid mist as SO3	mg/m3	Yearly	4.23
Sulphur dioxide	mg/m3	Yearly	<3
Temperature	Deg C	Yearly	368
Velocity	m/sec	Yearly	41.7
Volatile Organic Compounds	mg/m3	Yearly	0.086
Volumetric Flow rate	m3/sec	Yearly	1.61

APPENDIX J

Monitoring Point 54 - ED3 Volumes 2009 - 2010

Date	ED3S	ED3N	ED3N Lagoon 1	ED3N Lagoon 2	ED3N Lagoon 3	Total Volume ED3 System
	Volume ML	Volume ML	Volume ML	Volume ML	Volume ML	
Oct-09	50	31.47	13.05	5.15	0.00	94.52
Oct-09	50	31.86	16.06	4.91	0.00	97.92
Dec-09	50	28.37	15.98	3.77	0.00	94.35
Jan-10	50	24.56	14.14	1.72	0.00	88.70
Feb-10	50	29.09	14.37	1.77	0.00	93.46
Mar-10	50	30.31	16.22	1.30	0.00	96.53
Apr-10	50	30.56	16.14	0.98	0.00	96.70
May-10	50	30.31	15.90	1.53	0.00	96.21
Jun-10	50	33.20	16.24	5.20	0.00	99.44
Jul-10	50	33.75	16.45	5.42	1.19	100.20
Sep-10	80	36.01	16.53	5.70	9.05	132.54
Minimum	50	24.56	13.05	0.98	0.00	88.70
Mean	52.73	30.86	15.55	3.40	0.93	99.14
Maximum	52	57.9	13.3	13.3	13.3	132.54

APPENDIX K

APPENDIX K: 2009/10 non-compliances[1]

Woodlawn Bioreactor, EPL No. 11436

1. Gas monitoring

Fully compliant.

2. Meteorological

Fully compliant.

3. Dust monitoring

Fully compliant.

4. Surface water monitoring

Fully compliant.

5. Leachate quality monitoring

Fully compliant.

6. Groundwater monitoring

MB1, MB4, MB6, ED3B, WM1, WM4, WM5, WM6, MW8D, MW9SMB2, MB3, MB10 and MB14 were not analysed for BTEX in the reporting period. Annual monitoring is stipulated in EPL No. 11436.

P38 was not sampled quarterly as required by EPL No. 11436. Three quarterly sampling events occurred but a fourth sampling event did not take place as the monitoring point was deemed unsafe.

MW8S and GW10S were not sampled quarterly as required by EPL No. 11436. The wells were dry so no sampling was possible.

Intermodal Facility, EPL No. 11455

1. Surface water monitoring

Sites 110, 130 and 150 were only analysed for total Kjeldahl nitrogen, oil and grease, total suspended solids, phosphorus once in the 2009/10 reporting period (instead of the required six times).

Ambient air monitoring was not carried out.

[1] From non-compliance reports for 2009/10 prepared by Veolia Environmental Services