In situ chemical oxidation using unactivated sodium persulphate at a former fuel storage facility

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of this thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Petroleum hydrocarbon (PHC) contamination poses a serious threat to aquifer systems worldwide. Accidental releases of PHCs due to gasoline spills and leakage from underground storage tanks can often result in PHC subsurface contamination. The main compounds of concern associated with gasoline spills are benzene, toluene, ethylbenzene and xylenes (BTEX), trimethylbenzenes (TMBs) and naphthalene, due to their high mobility and potential human health risks.

Sodium persulphate is one of the newest oxidants to gain widespread use for in situ chemical oxidation (ISCO), however its effectiveness in treating PHCs is not fully understood. In this study, the ability to use unactivated sodium persulphate as a remediation tool in treating dissolved and residual BTEX contamination was tested during a bench-scale laboratory study and within a pilot-scale field investigation. In both cases unactivated sodium persulphate was used at a concentration of 100 g/L.

A laboratory-scale degradation potential batch test was conducted to assess the efficacy of unactivated sodium persulphate to oxidize petroleum hydrocarbon contaminated groundwater in conjunction with aquifer material from a field site. Data from the control reactions indicated that persulphate was stable for the entire 35-day experimental period and that the decrease in PHC concentrations for most of the samples followed a first-order degradation.

The behaviour and ability for sodium persulphate to oxidize dissolved and residual BTEX contamination was further evaluated in a controlled pilot scale field study. 200 kg of sodium persulphate was dissolved in 2000 L of water and injected into the subsurface. Electrical conductivity (EC), pH, sodium, persulphate, sulphate and BTEX concentrations were all monitored throughout the 158-day study period.

Field research showed that there was a strong correlation between EC and sodium concentrations. Hence, this relationship allowed for real-time EC measurements to be used to effectively predict the extent of the injectate.

Based on the calculated aqueous density of sodium persulphate at a concentration of 100g/L, predicted simulation model results and observed tracer field results, density effects were present and played a very important role in the transport of the injectate.

The heterogeneous geology of the site also greatly influenced the transport of the injectate. The majority of the injectate appeared to have flowed out of the layers with higher hydraulic conductivity that intersected the upper and lower portion of the injection well's screen length. The extent of the injected slug in the layers with lower hydraulic conductivity located in the centre portion of the injection well's screen length was less in comparison.

In general, areas with elevated tracer, persulphate and sulphate concentrations, also showed a decrease in BTEX concentration. Four main responses were observed. Group 1 consists of sampling points where tracer levels were elevated along with a corresponding short-term decrease in dissolved BTEX. Group 2 consists of sampling points where elevated tracer levels was observed along with a long-term apparent decrease in dissolved BTEX. Group 3 consists of sampling points where the tracer was elevated however dissolved BTEX levels remained essentially at background levels. And finally, group 4 consists of sampling points where the tracer was not observed to be elevated hence no decrease in dissolved BTEX was observed.

Laboratory studies showed that the oxidation of BTEX compounds by unactivated sodium persulphate could be very successful. However, field study results showed that complexities such as heterogeneity of the field site and injectate density effects play a key role in the success of the remediation system.

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Chapter 1: Introduction

1.1 Overview

Petroleum hydrocarbons (PHCs) are one of the most abundant organic contaminants and pose imminent threat to aquifer systems worldwide (Wang et al, 2009). Gasoline is one of the most common sources of PHC contamination. Accidental releases, spills and leakage from underground storage tanks often result in PHC subsurface contamination (Nadim et al., 2000). Gasoline is a mixture of C_6 to C_{16} organic compounds that are comprised of aromatics, such as benzene, alkanes, alkenes, and cycloalkanes. Once this complex mixture of contaminates is in the environment, it can persist and release acutely toxic compounds (Lundegaard and Johnson, 2007). Toxic aromatic organic compounds include benzene, toluene, ethylbenzene and o-, m-, p- xylene (BTEX), in addition to three trimethylbenzene isomers and naphthalene. These soluble and relatively mobile compounds can travel within groundwater systems and can pose an adverse health effect if they come in contact with a receptor (Dean, 1985; ATSDR, 2011).

Serious health and ecological concerns have been raised over the adverse effects of release of these compounds into groundwater systems. Regulatory bodies such as Health Canada and US-EPA have established specific guidelines on the maximum concentration that can exist in natural systems (Health Canada, 2010).

Various *in situ* remediation technologies such as enhanced *in situ* biodegradation and air sparging have been developed. However, stratigraphic and geochemical subsurface heterogeneities, physical limitations and contaminant characteristics significantly limit the success of most of these technologies (Nadim et al. 2000; Kunucku, 2007).

In situ chemical oxidation (ISCO) offers an alternative to existing technologies and presents an aggressive option for remediation of PHCs by itself or as an important phase within a series of remedial steps (Tsitonaki et al, 2010). Recently, persulphate has emerged as a potentially useful oxidant for the remediation of PHCs. While its effectiveness has been demonstrated in bench-scale laboratory investigations (Sra, 2010), there is limited peer-reviewed literature reporting its usefulness and application at a real field site.

1.2 *In situ* chemical oxidation

ISCO is based on a well-established concept used in water and wastewater treatment where chemical oxidants are added to polluted waters to eliminate target contaminants and thereby improve water quality (Ksibi, 2006; Vlyssides, 2003). During chemical oxidation, the oxidation state of the contaminant is increased and in return, electrons are transferred resulting in the reduction of the chemical oxidant.

ISCO technology involves the injection of an oxidant into the contaminated subsurface zones in order to reduce the organic contaminant mass through chemical oxidation. These oxidants should be very reactive towards target contaminants and persistence enough to allow sufficient time for mixing with contaminants in the subsurface (Watts 2006; Crimi, 2007).

Permanganate (MnO^{4-}) has been extensively researched at bench and field-scale (Huling and Pivetz, 2006; Schnarr, 1998; Siegrist et. al, 2001; ITRC, 2001). Permanganate has been shown to be effective in the oxidation of chlorinated ethenes, such as TCE and PCE, and is relatively persistent in the subsurface. However, permanganate is limited in its ability to oxidize PHCs, substituted alkanes, fuel-related contaminants and oxygenates (ITRC, 2005a, b; Watts and Teel, 2006; Huling and Pivetz, 2006). Furthermore, permanganate also oxidizes non-target chemicals. Permanganate is also rapidly consumed by Natural Organic Matter (NOM) and reduced organic and inorganic species, which compete with the target chemicals for oxidant. This interaction is referred to as the natural oxidant interaction (NOI) or natural oxidant demand (NOD) (Watts 2006). Some aquifer materials with high NOI exert a significant permanganate demand which may be 10 to 100 times greater than the theoretical requirement of the target contaminant (Mumford et al., 2004; NFESC, 2004), thus driving up the remediation costs (Haselow et al., 2003).

1.3 Persulphate

Peroxydisulphate ($S_2O_8^{2-}$), often called persulphate, is most commonly used in the Total Organic Carbon (TOC) analysis of water (Watts 2006). However, persulphate is now the newest oxidant to gain widespread use for ISCO (Tsitonaki et al, 2010).

The persulphate anion is the most powerful oxidant of the peroxygen family of compounds and one of the strongest oxidants used in remediation (Block, 2004; FMC fact sheet, 2001). The standard oxidation - reduction potential for the persulphate reaction is 2.1 V, much higher in comparison to permanganate anion (E_0 =1.7V). In addition to direct oxidation, persulphate can be induced to form sulphate radicals, thereby providing free radical reaction mechanisms. Under such reaction conditions, free sulphate radicals are formed that exhibit one of the strongest aqueous oxidizing species with a redox potential equal to 2.6V (Tsitonaki et al, 2010).

Recent lab and bench-scale studies of persulphate have demonstrated its ability to degrade chlorinated solvents and BTEX compounds (Crimi and Taylor, 2007; Liang et al., 2009; Sra, 2010). However, peer-reviewed literature on its interaction with aquifer materials is limited compared to more established oxidants such as potassium permanganate. Hence, interactions at a field-scale necessitate a comprehensive analysis.

In addition, persulphate is highly water soluble, relatively stable in near-neutral aqueous solutions, has a minimal impact on soil microorganisms, and possess the potential for migrating tens of meters down gradient from the point of injection, which makes its use advantageous over other chemical oxidants (Watts and Teel, 2006; Tsitonaki et al., 2008).

Persulphate is usually used in the form of sodium, potassium, or ammonium salts. The most preferred form used in ISCO is sodium persulphate, as it has the highest water solubility (73g/100g of H_20) and the least problematic residual products such as sulphate (Block, 2004, Huling & Pivetz, 2006).

1.4 Project objective

Laboratory and pilot scale field research conducted by Sra et al. showed that unactivated persulphate at 20 g/L was able to significantly reduce BTEX, TMBs, and naphthalene over a 28-day lab experiment. It was demonstrated that groundwater concentrations of BTEX, TMBs, and naphthalene were also reduced, however to a lesser degree, during pilot scale field-testing. This study builds on that research and attempts to evaluate the ability for unactivated persulphate at a much higher persulphate concentration of 100g/L to effectively degrade BTEX, TMBs, and naphthalene concentrations in both dissolved and residual phase within a laboratory study and at a real field site.

Chapter 2: Laboratory studies

A bench scale laboratory study was conducted prior to the start of the field study. The object of the laboratory study was to examine the degree to which petroleum hydrocarbons would be oxidized in the presence of unactivated sodium persulphate at a concentration of 100g/L.

2.1 Chemicals and materials used

Sodium persulphate ($Na_2S_2O_8$) powder from Aldrich Chem. Co with purity equal to or greater than 98% was used throughout the laboratory experiments. Deionized (DI) water from the organic-geochemistry laboratory at the University of Waterloo was used to prepare solutions.

A 6L sample of petroleum-impacted groundwater was collected from the site monitoring well MW501 a day before the start of the experiment and preserved with sodium azide. The collected groundwater was then analyzed for representative petroleum hydrocarbon compounds such as BTEX, TMBs, and Naphthalene. The concentrations of these compounds are reported in Appendix A.

Soil was also collected from a borehole located within the target zone at the field site. The soil used in the laboratory studies came from a depth of 8.5m to 9m. Analysis of this soil sample indicated insignificant levels of BTEX, TMBs and Naphthalene were present as shown in Appendix A.

2.2 Laboratory experiments: Methods

A variety of analytical methods were used in the analysis of each compound. The full analytical method for each compound of interest is discussed in Appendix B.

2.2.1 Natural Oxidant Interaction (NOI) test

A bench-scale test was conducted to quantify the NOI of the field site soil. The NOI of a soil can give insight into the consumption of an oxidant due to reactions that are unrelated to degradation of the contaminant of concern. A NOI measurement is a direct estimate of the oxidant consumption by organic and inorganic components in the soil or water matrix. Hence, this information is critical in assessing the appropriate chemical dosage needed for field injection. The NOI is experimentally determined for each field site for a given oxidant.

Initially, five, 35mL samples containing approximately 9 grams of uncontaminated soil from borehole 603 was prepared in 40mL vials. Another five samples containing no soil were put aside.

Each sampling set contained 1 active sample and 1 control sample. The active sample consisted of 9 grams of clean uncontaminated soil from the site, sodium persulphate and contaminated groundwater collected from the site. The control sample contained sodium persulphate and contaminated groundwater. Two additional control samples containing sodium persulphate and deionized (DI) water were prepared. Each active sample contained a sodium persulphate concentration of 100 g/L.

After the addition of all the compounds, the samples were shaken manually and stored in a dark chamber. Before each sampling episode samples were re-shaken and allowed to settle before being analyzed. Sodium persulphate was analyzed after each sampling episode at days 0, 1, 3, 18 and 22 (see Table 1).

2.2.2 pH buffering capacity of soil

The buffering capacity of a soil is its ability to modulate or buffer the pH from significantly increasing or decreasing. The pH buffering capacity test was conducted to determine if pH could have decreased and so if acid catalyzation could have occurred in the first 26 days of the degradation potential batch test. This could have been responsible for the observed degradation of BTEX, TMBs and Naphthalene.

An Orion pH meter (Model 290A) was used to measure pH. The electrode was calibrated against pH buffers of 4, 7, and 10. The reproducibility was within 3%, 9 of out 10 times.

Similar to Section 2.1, a 6L sample of petroleum-impacted groundwater was collected from MW501 a day before the start of the experiment and was preserved with sodium azide. Soil was collected from the field site from borehole 603 from a depth of 8.5m to 9m and sodium persulphate powder with 98% purity was used.

Four samples were prepared as follows: Sample #1 contained groundwater, sodium persulphate, and 9 grams of uncontaminated soil. Sample #2 contained DI water, sodium persulphate and 9 grams of uncontaminated soil. Sample #3 contained groundwater and sodium persulphate. Sample control contained only groundwater. Each sample was then monitored for pH for 26 days.

2.2.3 Degradation potential batch test

A laboratory-scale degradation potential batch test was conducted to assess the efficacy of unactivated sodium persulphate to degrade petroleum hydrocarbon contaminated groundwater in conjunction with aquifer material from the site. Concentrations of BTEX and persulphate were regularly monitored throughout the experiment.

The active samples in the experiment used unactivated sodium persulphate at concentration of 100 g/L, which is the concentration that was injected during the pilot scale field study at the site.

6 L of groundwater from MW501 was collected a day before the start of the experiment and was preserved with sodium azide. After the addition of all the compounds into the groundwater, the samples were shaken manually and stored in a dark chamber to await sampling.

Quantification of persulphate was performed in duplicate on 0.1 mL aqueous aliquot (Sra, 2010). For all samples containing aquifer materials, the mass of persulphate exceeded the stoichiometric requirement for persulphate to oxidize the PHCs.

Per sampling episode, there were three sets of control samples and three sets of active samples, all analyzed in triplicate. Each set of samples contained three individual samples. The first set of control samples contained uncontaminated soil from the site and deionized water. The second control set contained contaminated groundwater from the site and DI water. The third control set contained uncontaminated soil, contaminated groundwater, and DI water.

In addition, three sets of active samples were established. The first active sample consisted of clean uncontaminated soil from the site with DI water and sodium persulphate. The second sample had contaminated groundwater from the site and sodium persulphate. The last sample contained uncontaminated soil, contaminated groundwater, and sodium persulphate. Sampling for uncontaminated soil with deionized water was done on days 0 and 35, while all other types were sampled on days 0, 1, 7, 14, 21 and 35 (see Table 2).

2.3 Laboratory experiment: Results and discussion

2.3.1 Natural Oxidant Interaction (NOI) test

As shown in Table 3, the active sample containing uncontaminated soil, groundwater and sodium persulphate showed minimal consumption of persulphate compared to the control sample containing groundwater and sodium persulphate. From this, it is inferred that the aquifer required negligible amounts of persulphate to overcome the natural oxidant interaction of sodium persulphate.

2.3.2 pH buffering capacity of soil

As shown in Table 4 and Figure 1, sample 1, sample 2 and sample control (groundwater only) experienced only minor decreases in pH. Sample 3 experienced a significant decrease in pH especially in the first day.

H^+ was expected to be generated during persulphate degradation as shown in Equation 1. In aqueous samples, a decrease of pH to < 3 occurred within 4 days, at which point acid-catalyzed oxidation could be induced (Kolthoff and Miller, 1951; House, 1962; Goulden and Anthony, 1978; Peyton, 1993). However, the aquifer material exhibited a large pH buffering capacity that prevented the pH of the solution from dropping below 5 during the 26-day experiment.

$C_8H_{10} + 21Na_2S_2O_8 + 16H_2O \rightarrow 8CO_2 + 42Na^{+} + 42SO_4^{2-} + 42H^{+}$ (Equation 1)

This pH buffering capacity is mostly due to the presence of carbonate minerals in the sand. All aquifer samples effervesced (bubbled) strongly when 10% hydrochloric acid was applied. It is expected that the buffering capacity of the aquifer material from the site would be able to maintain the solutions pH at near neutral levels as persulphate decomposes.

2.3.3 Degradation potential batch test

Normalized persulphate concentrations over time from the degradation potential batch test experiments conducted at sodium persulphate concentrations of 100 g/L are shown below in Figure 2 and 3. Each data point represents the average from triplicate analyses.

The graphs in Figure 2 show representative degradation curves for both the active groundwater and soil sample. Data from the control samples indicate persulphate was stable for the entire 35-day experimental period. The degradation potential batch test was conducted at room temperature (~20 ºC). The lack of reaction is consistent with the observations of House (1962) who concluded that, at this temperature, the rate for the reaction is too slow for there to be significant (<10%) persulphate degradation in the controls during the first 35 days (House, 1962).

The decrease in PHC concentrations for all chemicals except benzene, 1,2,3 TMB, F2 and F3 fractions followed a first-order kinetic degradation, which is consistent with the decomposition of persulphate in the presence of soil with a pH buffering capacity sufficient to prevent acid catalysis (Kolthoff and Miller, 1951; Kolthoff et al., 1951; House, 1962; Berlin, 1986; Johnson et al., 2008; Sra, 2010).

Benzene, 1,2,3 trimethylbenzene, F2 and F3 PHC fractions exhibited atypical degradation curve as shown in Figure 3. Benzene (Figure 3a) demonstrated a non-stable control for both the groundwater and soil sample. Benzene had a significantly slower degradation rate in both the groundwater and soil + groundwater compared to other compounds.

1,2,3 trimethylbenzene (Figure 3b) follows a degradation curve similar to ones in Figure 2 however, 1,2,3 trimethylbenzene's concentration for the groundwater sample after 7 days increased to concentrations 1.5 times higher than initial.

F2 and F3 PHC fractions as illustrated in Figure 3c and 3d showed that the concentration in the groundwater samples increased 1.5 times and 5 times higher than initial levels respectively.

First-order oxidation rate coefficients determined from the degradation potential batch test are listed in Table 5. Benzene had the lowest degradation rates while 1.3.5 TMB showed the highest degradation rate.

Chapter 3: Site description

3.1 Site location

The field site is a former fuel storage facility in southwest Ontario. This site was a bulk fuel storage and distribution facility for more than 50 years prior to its decommissioning in 1998. During decommissioning, underground storage tanks and associated piping were removed.

3.2 Study area set-up

The instrumentation within the study area at the site is shown in plan view in Figure 4. It is approximately 3.5 meters in length, 4 meters in width and from 5m to 13m below ground surface (see section view in Figure 5).

The study area has five multi-level monitoring wells and one, 2-inch injection well. The 300 series monitoring wells were installed to a maximum depth of 13 mbgs with a 20cm screen interval every 1m from 3 to 13 mbgs. The 400 series monitoring wells were installed to a maximum depth of 9.5 mbgs with a 50cm screen interval every 50cm from 5 to 9.5 mbgs. The injection well 501 was fully screened from approximately 6 to 8 mbgs. No sand pack was used around the injection wells screen interval. Instead, native soil was allowed to collapse around the screen interval causing a natural seal. Sand was used to fill in above the screen interval between depths 5 – 6 mbgs followed by a bentonite seal from 5 – 0.5 mbgs. Borehole logs for all the monitoring and injection well are shown in Appendix C. Groundwater was monitored across a fence-line equipped with 4 multilevel sampling points (monitoring well 302, 303, 401 and 402) for over 6 months post-injection.

Core from 9 boreholes were collected from this study area and used to analyze organic and inorganic concentration as well as used to map the local stratigraphy.

3.3 Site hydrogeology

3.3.1 Fluctuating groundwater level

The site historically had a seasonal water table fluctuation of 5 meters, from 2 meters below ground surface (mbgs) to 7 mbgs as shown in Figure 7. However, as shown in Figure 7, groundwater fluctuations were not as pronounced in 2009 and hence during the duration of this field study.

3.3.2 Stratigraphy

The regional geology as interpreted by Map 2556, Quaternary Geology of Ontario, Southern Sheet (Barnett et. al., 1991; Aqua-Terre, 2009) shows the site is comprised of moderately stony till with sandy-silt to silt matrix, and glaciofluvial outwash deposits of sand and gravel.

Local stratigraphy of the site, as recorded during borehole drilling, is comprised of fill (sand and gravel) to a depth of approximately 3.0 to 4.5 mbgs. The fill is underlain by a heterogeneous mixture of sand, gravelly sand, and sand and gravel with varying amounts of cobbles and silt. Borehole-logs are provided in Appendix C and cross-sections depicting the site stratigraphy are shown in Figure 5. Figure 8 below illustrates the degree of heterogeneity of the field site.

3.4 Petroleum hydrocarbon contamination

The study area is contaminated with PHCs that are predominantly F1 and F2 fractions (PHCs with 6 to 10 carbon atoms are referred as F1 and PHCs with 10 to 16 carbon atoms are F2). F1and F2 fractions account for approximately 73% and 26% of the total PHC contamination within the study respectively. The typical vertical distribution of the dissolved phase groundwater contamination is shown in Figure 9 while residual soil contaminant distribution is shown in Figure 10. Residual PHC soil contamination is generally found between the historical high and low water table levels, with the highest concentration of PHCs around 7 mbgs.

3.5 Hydraulic conductivity determination and average groundwater velocity

Slug, sieve and permeameter analyses were conducted by Holtze (M.Sc. in progress). Holtze estimated the average hydraulic conductivity for each unit, as shown in Figure 11.

Holtze (M.Sc., in progress) reported that lateral groundwater movement at the site is relatively slow (approximately 2 – 5 cm/day) and there is no vertical gradient that could induce vertical flow within the targeted zone.

Based on laboratory porosity measurements and grain size analysis, Holtze (in progress) reports an average porosity of 0.32, while the grain size distribution ranges from poorly sorted silty sand and sand and gravel layers to well sorted sand.

3.6 Site conceptual model

Figure 11 illustrates the site conceptual hydrogeological model (based on Holtze with the following modifications). Upon inspection of the borehole log for the injection well, MW501, the screen length between 6.7m to 7.5m is within the deepest sand layer. Thus, the injection screen is within three units: Unit A, the upper sand and gravel, unit B, the sand and lower sand and unit C, the gravel unit.

The site conceptual hydrogeological model gives us the framework to be able to generalize the complex geology of the site and discuss its implications pertaining to the transport phenomenon of the injectate.

Chapter 4: Injection of sodium persulphate (oxidant)

A sodium persulphate solution was injected via well 501, screened between 6 to 8 meters below ground surface (mbgs). This is at the same location and depth as a previous nitrate injection study (Holtze, M.Sc. in progress). The injection of the oxidant was accomplished with the aid of Vertex Environmental Inc. and SNC-Lavalin.

200 kg of sodium persulphate ($Na_2S_2O_8$) (Klozur, FMC) was dissolved in 2000L of distilled municipal tap water. The injectate solution was prepared on-site by transferring water from a large holding tank into 2 smaller 100 L mixing tanks, as shown in Figure 12, where appropriate amounts of oxidant were added to produce a sodium persulphate solution of 100 g/L. Subsequently, the mixing tank's exit valve was connected to injection well 501 allowing the solution to flow through the well screen via gravity at an approximate injection rate of 10 L/min taking approximately 3 hours to complete.

The water table at the time of injection was at 6.3 mbgs, which is 30cm below the top of the injection screen of MW50l. Hence, a significant portion of the injected water may have flowed out the top of the well screen into the unsaturated zone. The upper portion of the injection screen situated within the unsaturated zone was within the high hydraulic conductivity upper sand and gravel unit (Unit A).

4.1 Groundwater monitoring (electrical conductivity and pH)

Electrical conductivity was monitored on average every 12 days after injection. This bulk parameter was used to monitor the distribution of the injected water and dilution of the remedial solution.

pH was also monitored because, as demonstrated in the soil buffering capacity experiment and from literature, acids are generated when persulphate and PHC react, which in return can lower the pH. If the pH of the system is below 3, acid-catalyzed oxidation reactions may occur.

4.1.1 Electrical conductivity and sodium relationship

The electrical conductivity (EC) of a water sample is dependent on the concentration of dissolved salts. As the concentration of ions in solution increases the electrical conductivity also increases.

The injectate had a much higher EC (up to 55 mS/cm) than background groundwater (approximately 1.5 mS/cm) levels. Subsequently, field EC measurements were used to estimate the proportion of injectate in groundwater samples. Sodium concentrations were occasionally measured to confirm the proportion of injectate and so it was of interest to determine if a meaningful relationship between electrical conductivity and sodium existed.

4.2 Groundwater sampling

4.2.1 Groundwater sampling: Inorganic

Sodium from the sodium persulphate solution was used as a conservative tracer indicating the flow path and dilution of the remedial solution. Persulphate was monitored to determine if the active oxidizing agent in the ISCO system was present. Sulphate was monitored to determine the extent of persulphate decomposition.

Inorganic samples were collected in 20 mL glass vials using a peristaltic pump. Prior to collecting the sample at least 2 well volumes (400 mL) of groundwater were purged from each monitoring well. Two vials were collected: One for sodium analysis and the other for sulphate and persulphate analysis.

4.2.2 Groundwater sampling: Organic

Organic samples were collected to determine the impact of oxidation on target hydrocarbons. They were collected in 40 mL glass vials using a sampling manifold positioned before the peristaltic pump. This technique minimizes losses due to sorption to the flexible tubing in the pump head and avoids exposing the sample to the atmosphere and consequently resulting in losses due to volatilization (Einarson 2001, Freitas and Barker, 2008).

Prior to sampling, a minimum volume of 400 mL (approximately 2 well volumes) of groundwater was purged from the peristaltic pump. The vials were completely filled to minimize headspace and preserved on site with 0.4 mL of 10% sodium azide solution (v/v). Each glass vial was fitted with Teflon® lined septa to ensure a proper airtight seal. Samples were then stored in a cooler lined with ice packs to keep samples cool and out of direct sunlight.

Organic samples were taken and analyzed for BTEX, TMBs, Naphthalene, F1, F2, and F3 fractions.

4.3 Soil sampling

4.3.1 Soil sampling: Organics

Pre-injection soil cores were collected prior to installation of monitoring wells 501, 401, 402, 301, 302 and 303 located as shown in Figure 4. Pre-injection samples were collected using a hollow stem augur with a continuous sampler. Specific subsamples were taken from the core on average every 20 cm.

Approximately 4 g of soil was collected from a freshly exposed soil sampler at each point using a 5 mL syringe with the tip removed (Hewitt, 1996). Using this method, the desired quantity of sub-sampled soil was extracted. The syringe was then wiped clean with a paper towel and the plug of soil was immediately dispensed into a 40 mL glass vial containing the pre-weighted 5 mL of extracting agent (methylene chloride). The glass vials were capped with Teflon®-lined septa to reduce the loss due to volatilization.

Initial cores taken during the installation of the injection well and monitoring wells were used to calculate the pre-injection residual PHC (BTEX, TMBs, Naphthalene) mass in the study area.

Post-injection soil cores were collected at about 30 cm intervals from boreholes 701, 702, 703, and 704, 154 days after injection using a hollow stem auger with a hammered split spoon sampler.

Soil cores were taken as close as possible (< 0.8m) to pre-injection boreholes in order for comparisons of pre and post injection results. These cores were used to calculate post-injection PHC residual contamination (BTEX, TMBs, Naphthalene).

4.3.2 Soil sampling: Inorganics

Soil cores taken at the end of the study period were also used to monitor post-injection inorganic species in the aquifer pore volume where monitoring wells did not exist.

Post-injection soil samples were collected as described in Section 4.3.1 with the following modifications. Each glass vial contained 20 mL of pre-weighed DI water instead of methyl chloride. The groundwater held in tension within the pore volume of the soil was diluted in the 20mL of DI water and later analyzed.

4.4 Field data quality control

A number of field quality control samples were collected, including field duplicates and trip blanks. Sulphate, persulphate and sodium field duplicates were randomly collected and analyzed. In general, field duplicates were taken approximately every 20 samples or at a minimum, once per field event. Organic sample field duplicates were collected for every sample and one duplicate was analyzed every 10 to 20 samples.

Trip blanks, to show whether a sample vial was contaminated during travel or storage, of de-ionized water were held in glass vials from the same sample lot as the field samples and kept with the other samples at all times.

4.5 Estimated total BTEX and theoretical treatability based on stoichiometry

It is estimated that the target area has a total volume of 84 m^3, and contained approximately 39 kg of BTEX. This is based on PHC soil data collected prior to start of the experiment. Appendix D shows this calculation.

Based on the stoichiometry of the reaction as shown in Equation 1, each mole of xylenes would require 21 moles of persulphate. So, 200kg of sodium persulphate would be required to degrade 4.2kg of xylene. Assuming xylene is representative of the entire TPH mass at the site, the 4.2kg reduction would account for a 6% decrease in residual BTEX contamination within the target zone. Thus, there would be insufficient persulphate available for oxidation of a major portion of the residual TPHs.

However, if only the dissolved PHCs were oxidized (see Appendix E), 200kg of sodium persulphate could oxidize the PHCs in 160 m^3 (approximately 6 times the pore volumes of the entire study) of groundwater containing up to 25 mg/L of BTEX contamination. The residual PHCs are the target for the ISCO and so, while some short-term clean-up of groundwater can be anticipated, most of the residual PHCs are expected to remain.

Chapter 5: Results and discussion

This study examined the ability for sodium persulphate to treat nine selected gasoline compounds and bulk PHC fractions within the field. Oxidation mechanisms or pathways were not investigated and it was assumed decreases of organic concentrations were indications of complete destruction without any intermediate by products.

Oxidant transport

5.1 Geochemical results

Historical electrical conductivity measurements were compiled from the last 11 months (Aqua Terre Solutions Inc, 2009) and were shown to be within 15% of the average electrical conductivity measurements collected 8 days before sodium persulphate injection. The similarity between the two data sets indicates that, in the absence of any treatment, electrical conductivity is consistent within the site.

5.1.1 Electrical conductivity and sodium correlation

Sampling data, which included both electrical conductivity and sodium, were tabulated and graphed as shown in Figure 13. Based on this graph, Equation 3 was produced with a correlation coefficient of 0.98.

Na (mg/L) = 319.14 EC (mS/cm) - 460.06 (Equation 3)

Figure 13 shows that most EC and Na values fall within a narrow range. By excluding the upper two data points at high EC and Na concentrations and only considering the most typical lower range data the correlation coefficient decreases to 0.91 (Figure 14, Equation 4). Equation 4 is considered better able to represent field measurements and trends.

Na (mg/L) = 172.4 EC (mS/cm) - 75.343 (Equation 4)

The strong correlation between EC and sodium concentrations can be attributed to the high proportion of Na^+ generated when sodium persulphate dissolves. Furthermore, sodium is persistent within groundwater systems and is not significantly affected by processes like sorption or transformation. These characteristics make sodium a very good hydrogeological tracer of the remedial solution. Through the monitoring of electrical conductivity (EC), the highly electrically conductive slug of injectate was tracked through the subsurface. The background EC ranged from 1 mS/cm to 2 mS/cm, while the injectate's EC measured in the well was about 37 mS/cm. This strong electrical conductivity indicator allowed for indirect determination of the injectate concentration within the subsurface, including approximate arrival time at wells, rate of injectate dissipation and the general transport phenomenon at a site.

5.1.2 Electrical conductivity and persulphate + sulphate correlation

A good correlation was also anticipated between electrical conductivity and the anions in the remedial solution, namely persulphate and its breakdown product, sulphate. Groundwater analyses that included electrical conductivity, persulphate and sulphate were tabulated and graphed as shown in Figure 15. Based on this graph, the Equation 5 was produced with a correlation coefficient of only 0.43.

Persulphate + Sulphate (moles/L) = 7.7013 EC (mS/cm) - 9.0669 (Equation 5)

Unlike the electrical conductivity vs. sodium relationship, a poor correlation was demonstrated between electrical conductivity values and the equivalent moles/L of persulphate & sulphate and so this relationship was not used.

5.1.3 Tracer profiles at individual monitoring points

The first post-injection monitoring episode was conducted hours after the sodium persulphate injection. Electrical conductivity breakthrough curves at individual monitoring points are displayed in Figure 16.

Injection well 501 was monitored for electrical conductivity 14 times throughout the 157-day study period. The electrical conductivity on day 1 was measured at 37 mS/cm, approximately 28 times more than background levels. The injection well returned to background electrical conductivity levels within approximately 60 days after injection.

Upgradient, monitoring well 301 showed no instances of elevated electrical conductivity at shallow depths (MW301-6 and MW301-8) throughout the study period. MW301-9 and MW301-11 showed elevated levels of electrical conductivity when first sampled 80 days after injection. Thus, it appears that any injectate that migrated upgradient towards monitoring well 301 only did so at deeper depths.

Downgradient, monitoring well 302 showed increased electrical conductivity at all depths sampled. The shallowest depth sampled (MW302-6) showed the largest increase of electrical conductivity: up to eleven times the background levels at that depth. MW302-7 and MW302-9, respectively, showed five and six times elevated levels of electrical conductivity compared to background. Within approximately 60 days after injection, electrical conductivity had returned to background levels at all three sampling points.

MW 401-9 showed an increase in electrical conductivity of six times the background levels where as monitoring point 401-7 showed an increase of only 2.5 times the background.

Monitoring well 402 showed increased electrical conductivity response only at the deepest points. MW402-8 and MW402-9 showed elevated electrical conductivity of 5 and 8 times background, respectively; shallow monitoring wells (MW402-5, MW402-6, and MW402-7) showed no significant increase in electrical conductivity throughout the monitoring period.

5.2 Density effects: Model method and results

The limited extent of the injectate slug was somewhat surprising. Perhaps the dense injectate had migrated downward, below most monitoring points. The SALTFLOW finite element model (Molson & Frind 2004) was used to determine if a solution injected at 100g/L would experience significant density effects within homogenous medium (model assumptions and parameters are given in Appendix F). An injection of 2000L of a sodium persulphate solution of 100 g/L (density of 1.063 g/mL) was simulated along with the injection of a solution with the same density as the groundwater. The conceptual model constructed contained the following: A defined volume of injection solution containing 100 g/L or 0 g/L of sodium persulphate was emplaced within the source zone as shown by the black square in Figure 17. The numerical simulation of the sodium persulphate evolution from this emplaced source zone was measured with a flow gradient of 0.005, porosity of 0.3 and a uniform hydraulic conductivity of 1 x 10^{-5} m/s. Model assumptions included: saturated flow, isothermal, homogeneous, isotropic, uniform viscosity, 3D symmetric system where chemical reactions are neglected.

Model results suggest that after 100 days the center of mass of the 100 g/L injectate would sink about 3m at 3 meters downstream from the injection well in a homogeneous system with horizontal groundwater flow.

In this simulation, the system was assumed to be homogeneous. In reality, high hydraulic conductivity layers would have important effects on the transport regime, especially with density dependent flow, as shown in Molson et al. (2008).

Field results show that wells MW401 and MW402, located directly downstream from the injection, and well MW301, located upstream from the injection had the greatest electrical conductivity response at the deepest monitoring point. This is consistent with model predictions that the injectate would migrate downwards over time.

5.3 Initial geometry and migration of injectate

Figure 18 and Figure 19 are based on tracer results and illustrates the interpretation of the injectate flow regime within the study area. Figure 18 shows the idealized shape of a plume where the oxidant was injected under fully saturated conditions into a homogeneous media with a density equal to groundwater. Figure 19 shows the inferred non-idealized shape of the oxidant plume based on electrical conductivity and sodium field results.

The idealized injected water or “slug” extent was based on an injection of 2000 L without density effects and neglecting dispersion, into a saturated homogenous, isotropic aquifer with uniform porosity of 0.3. The injectate is assumed to spread radially (groundwater advection during injection is ignored) over a vertical distance equal to the length of the injection screen. As a result, the idealized shape of the injectate slug is cylindrical with radius of 2 m (Appendix G). This idealized slug would then move through the target zone until it was fully consumed.

However, based on tracer measurements, the shape of the injectate slug appears quite different as illustrated in Figure 19, the majority of the injectate appeared to have flowed out of the high hydraulic layer that intersect the injection well’s screen length between 6 - 6.7 and 7.5 - 8 mbgs. The extent of the injected slug in the lower hydraulic conductivity layers like the lower sand unit B was less. Density effects and the heterogeneous geology of the site greatly influenced the shape of the injectate.

Downgradient monitoring wells observed a greater EC response at the deepest monitoring points. Both MW401 and MW402 showed electrical conductivity levels to be approximately 1.5 times greater in the deepest monitoring point compared to the next deepest in each well. Hence, it is believed that the majority of the injectate migrated downwards below the deepest monitoring points and continued to descend within unit C (the lower high hydraulic conductivity sand and gravel unit) due to the injectate’s density. This is consistent with model predictions that the injectate would migrate downwards over time.

In subsequent groundwater monitoring episodes, tracer concentrations decreased over time as shown in Figure 16 and after approximately 60 days the electrical conductivity response from all monitoring depths has returned to near background levels. It is presumed that the injectate at this point had migrated out of the target zone and continued to dissipate over time.

<u>Treatability of PHCs</u>

5.4 pH monitoring

Groundwater samples collected throughout the study area ranged in pH from 5.5 to 7.1 throughout the study period. Figure 20 shows the relative stability in pH in monitoring well 501 over 300 days before injection and 157-days after the injection. It is assumed that MW501 is representative of the stability in pH across all the monitoring wells throughout the study period.

The stability in pH of the groundwater at the site was expected based on results from the pH-buffering test (Section 2.3.2.), which showed that the buffering capacity of the soil was high enough to prevent the decline the pH over the 157-day study. Hence, due to the stability in the pH throughout the field study, it is presumed that there were no acid catalyzed reactions present during the study period.

5.5 Field results: Groundwater and Soil samples

5.5.1 Groundwater sample: Injectate presence and extent of oxidation

Inorganic samples collected prior to sodium persulphate injection were compared to the average historical concentrations from the last 8 months. The average sulphate concentrations within the study area 8 days before sodium persulphate injection ranged from 0 to 45 mg/L with an average of 9 mg/L. This was close to the average sulphate concentration, which ranged from 0 to 15 mg/L with an average concentration of 5 mg/L observed over the previous 8 months. Similarity between the two data sets indicates that in the absence of any treatment, sulphate concentrations would have remained consistent within the site. There was no sodium or persulphate data collected prior to 8 days before injection.

Concentrations over time at individual monitoring points are shown in Figure 21. Where data is sparse, no lines were drawn between data points. Where frequent data are available, a trend line is shown.

Of all the monitoring wells, injection well 501 recorded the highest concentrations of persulphate, sulphate and sodium (7290 mg/L, 9200 mg/L, 9250, respectively on day 3). Based on sodium and electrical conductivity results, samples collected from this well, 3 days after the injection, contained approximately 60% injected water. Thus, as shown in Table 6, samples collected from MW501 at early time experienced the smallest degree of dilution. On day-79, persulphate, sulphate and sodium concentrations approached the pre-treatment levels, suggesting that the injected slug had left the vicinity of the injection well.

Monitoring well 301 at depth 301-6 showed increased levels of persulphate on day 3 and sodium and sulphate levels were slightly above background levels. It is hypothesized that electrical conductivity may have also been elevated between day 3 and day 80, based on elevated persulphate data. This predicted electrical conductivity line is shown in Figure 21. Sampling point 301-8 showed no increase in sulphate or persulphate throughout the study period, whereas sampling point 301-9 and 301-11 showed slight elevations in persulphate and sulphate between days 80 to 120.

Monitoring well 302 at points 302-6 and 302-7 showed similar responses in that persulphate, sulphate and sodium concentrations at early time were elevated well above background levels. By day-80, concentrations of persulphate, sulphate and sodium had returned to background levels indicating that the slug of injectate had passed by this location. The presence of elevated persulphate and sulphate at the same time indicates that there was an oxidation reaction occurring at these depths. MW302-9 showed no increased inorganic concentrations throughout the 157-day study period.

MW401-9 showed increased persulphate, sulphate and sodium concentrations compared to background level. However, the increase was not as pronounced as compared to the adjacent monitoring well 302. The presence of sulphate and persulphate at early time within MW401-9 suggest that an oxidation reaction occurred resulting in the decrease in persulphate concentrations and an increase in sulphate. Sampling point 401-7 showed little inorganic and electrical conductivity response with only slightly elevated persulphate and sulphate concentrations indicating that the injectate did not reach this point.

In general, points at monitoring well 402 showed increasing inorganic concentrations with depth. MW402-5 demonstrated elevated concentrations of persulphate whereas sulphate and sodium remained near background levels. MW402-6 and MW402-7 showed little increase in electrical conductivity and inorganic concentrations demonstrating the unlikely hood of the injectate having come into contact with this location of MW402. However, persulphate, sulphate and sodium concentrations of MW402-8 and MW402-9 were well above background, with persulphate concentrations up to 7190 mg/L on day-3. This indicates that an oxidation reaction occurred at this depth, which resulted in the production of sulphate above background levels.

Persulphate, sulphate, and sodium concentrations and electrical conductivity levels were the highest within the first 3 days from injection and in general by day 80 very little response was observed from the monitoring wells within the target zone. The highest observed percentage of injectate in a well (excluding the injection well) was only 20%. This value was determined from electrical conductivity values. This low number indicates that most of the injectate was missed by the monitoring well network either because, as the hydrogeological model suggests, the injectate sunk down to depths below the deepest monitoring wells, or because of infrequent sampling; data was simply not collected during days where the injectate might have been present.

5.5.2 Groundwater sample: Organics

The first post-injection sampling was conducted 3 days after sodium persulphate injection. BTEX concentrations in MW301 and MW302, 8 days before sodium persulphate injection was within 12% of the BTEX concentrations in MW301 and MW302 observed 18 months previously. The general similarity between BTEX concentrations over this period indicates that, in the absence of any treatment, the concentrations in the study area would have remained consistent.

Based on the calculated dilution corrected BTEX values, as shown in Appendix H, it was determined what portion of the decrease in BTEX concentrations in groundwater was due to dilution by injected water or due to oxidation. The difference between the dilution-corrected BTEX concentrations and the actual measured concentrations in Figure 22 yields the concentration loss due to oxidation. In addition to actual and corrected BTEX concentrations, electrical conductivity profiles at individual monitoring points are also shown in Figure 22. This figure illustrates examples when the presence of the injectate at the well points and reduction in BTEX concentrations are observed together.

Injection well MW501 showed significant decrease in BTEX concentrations while observing a significant increase in electrical conductivity. Field samples showed that BTEX concentrations had decrease by 7380 µg/L compared to background by day 3 and remained below background levels to the end of the study period. However, dilution corrected calculations show only a decline of 2500 µg/L of BTEX can be attributed to oxidation.

Monitoring well 301 at points 301-6 and 301-8 showed very little evidence that BTEX was oxidized at those depths throughout the study period. This is consistent with tracer data suggesting that the oxidant did not reach these locations. Conversely, MW301-9 and MW301-11 on day 80 showed elevated levels of electrical conductivity and a decrease in BTEX concentrations compared to pre-injection concentrations at these points. MW301-11 was 4790 µg/L lower than pre-injection background levels (8020 µg/L).

Monitoring well 302 at points 302-6 and 302-7 had the largest decrease in BTEX concentrations. Once dilution was taken into consideration, a decrease of approximately 8700 µg/L and 10,000 µg/L respectively were observed. Electrical conductivity values for corresponding sampling days show that a peak in electrical conductivity was followed by a decrease in dissolved BTEX concentrations. Unlike the other monitoring points in MW302, MW302-9 showed no significant decreases in BTEX throughout the study period even though the monitoring point observed elevated electrical conductivity.

MW401-7 and MW401-9 showed similar BTEX concentration degradation patterns with an initial and continued decrease compared to background levels over the 157-day study period. Very little of the decrease in BTEX concentrations is due to dilution as shown in Figure 22. MW401-9 saw an elevated response in EC where as 401-7 saw a constant level of elevated EC.

While only a decrease of 6800 μg/L μg/L was observed, monitoring well 402-5 showed the largest decrease in BTEX concentrations for MW402. MW402-6 and MW402-7 did not observed elevated levels of electrical conductivity and hence showed no or minimal decreases in BTEX concentrations. In spite of the fact that MW402-8 and MW402-9 observed a high electrical conductivity response, BTEX concentrations also remained relatively unchanged.

5.5.3 Soil sample: Injectate presence and extent of oxidation

Soil cores taken at the end of the study were used to determine post-injection sulphate, persulphate and sodium concentrations in the soil pore volume of boreholes 701, 702, 703 and 704. The groundwater was held in tension within the pore volume of the soil and was diluted in 40mL of DI water and later analyzed. For dilution calculation purposes, it was assumed that the water in the soil was initially 80% saturated (Appendix I). Figure 23, illustrates the vertical distribution of inorganic compounds present at each location.

In borehole 701, persulphate concentrations were below detection at all sampled depths. Sulphate concentrations were slightly elevated from background at shallow depths and increased in concentration with depth to a maximum concentration observed at approximately 11 mbgs. The limited sodium data available showed a similar response with highest concentrations observed at deepest depths. This is consistent with groundwater data collected, suggesting that an oxidation reaction may have occurred at these locations, which resulted in elevated sulphate and sodium levels.

Borehole 702 showed no significant increase in sodium concentrations within the pore volume of each soil sample. Sulphate concentrations remained near background concentrations but in general, had higher concentrations with increasing depth. Persulphate concentrations, except for two samples, remained zero at all depths. Persulphate samples collected at depths approximately 6.5 and 7.5 mbgs recorded persulphate concentrations of 142 and 95 mg/L respectively as shown in Figure 23. These detectable persulphate samples indicate that there may still have been an active oxidant still present at the time of the soil sampling.

Borehole 703 showed increased levels of sulphate concentrations at approximately 6.5 and 12 mbgs. Sodium showed a corresponding increase in concentration at 12 mbgs while in general sodium concentrations seemed to increase with depth. Persulphate remained zero at all depths. This suggests that the slug of oxidant perhaps reached these locations and that an oxidation reaction may have occurred resulting in elevated sulphate and sodium levels. The lack of elevated persulphate data in conjunctions with elevated sulphate data suggests that through an oxidation reaction the persulphate may have been consumed resulting in elevated sulphate.

Persulphate, sulphate and sodium concentrations in borehole 704 were not elevated and remained at background levels except for one persulphate sample that recorded a persulphate concentration of 152 mg/L at approximately 6 mbgs. This indicates that the extent of the injectate slug did not reach this far.

5.5.4 Soil sample: Organics

Residual BTEX concentrations in boreholes 501, 301, 302, 401 and 402 were measured prior to sodium persulphate injection and compared to residual BTEX concentrations in nearby (< 0.8m) boreholes 701, 702, and 703 post-injection. Each soil sample was considered to represent volume of aquifer material extending ½ the distance to the next nearest sample. The mass of BTEX in each representative volume of soil was calculated and summed to give an estimate of the total residual BTEX before and after injection (Appendix D). Selected post-injection soil BTEX concentration profiles are shown in Figure 24.

The variability of measured concentrations within each core (Figure 24) demonstrates that the distribution of residuals is very heterogeneous. Estimating total PCHs present in an area must have considerable (but unknown) uncertainty.

As shown in Section 3.5, the total residual BTEX mass of the study area prior to sodium persulphate injection was estimated to be approximately 40 kilograms. The total residual BTEX mass of the study area after sodium persulphate injection was estimated to be approximately 30 kilograms. However, this reduction in residual BTEX is stoichometrically impossible based solely on sodium persulphate oxidation. As shown in Appendix J the theoretical maximum that can be reduced based by 200 kg of sodium persulphate is only 4.2kg.

In addition, based on the theoretical BTEX treatability calculation, the amount of oxidant injected is capable of degrading approximately 6 times the total dissolved aromatics contamination containing up to 25 mg/L of PHC contamination within the target zone. This scenario could result in a dramatic decrease in groundwater BTEX levels initially, however, due to the large unaffected residual BTEX contamination in the soil as discussed above, groundwater BTEX levels would rebound to near-initial concentrations.

5.6 Field results: Treatability of dissolved phase BTEX

Groundwater results could be grouped into four general categories.

- Group 1: Consists of wells where injectate had arrived as indicated by elevated tracer along with a corresponding short-term decrease in dissolved BTEX.

- Group 2: Consists of wells where injectate was detected along with a longer-term apparent decrease in dissolved BTEX.

- Group 3: Consists of wells where the injectate was detected, however dissolved BTEX levels remained essentially at background levels.

- Group 4: Consists of wells where the injectate was not observed and hence no decrease in dissolved BTEX was observed as well.

Sampling points 501, 302-6 and 302-7 had elevated tracer concentrations and showed a short-term decrease in dissolved BTEX concentrations (Group 1). These sampling points are located within zones that have relatively high residual BTEX concentrations. Hence, at early time dissolved BTEX concentrations decrease due to oxidation from sodium persulphate. However, dissolution of BTEX from residuals caused dissolved BTEX concentrations to eventually increase back to background levels. This is referred to as the “rebound effect”.

Group 2 consists of monitoring points MW401-7 and MW401-9 where elevated tracer concentrations were observed together with an apparent long-term decrease in dissolved BTEX concentrations. In this case, two possible explanations could be given. Either these monitoring points contained dissolved hydrocarbon contamination from upgradient residual sources and no residual hydrocarbon contamination prior to injection. Hence, once the dissolved BTEX at these depths were oxidized due to the injectate, BTEX concentrations did not rebound due to the absence of residuals in these areas. Otherwise, residuals were present prior to injection and so once the oxidant arrived it oxidized all the residuals and dissolved phase contamination hence dissolved BTEX concentrations did not rebound to background levels.

Group 3 includes samples that have show that the tracer was present at the time of sampling however BTEX levels remained at background levels. This includes points 301-6, 302-9, 402-9 and 402-8. These groundwater samples were taken from sampling points located within a high hydraulic conductivity unit. Hence, it is possible that due to low residence times, the oxidant did not have enough time to react and oxidize the dissolved BTEX. In addition, it is also possible that a sample was collected right when the oxidant arrived and so there was not enough time for the oxidant to react fast enough and cause a reaction.

Group 4 includes samples where no elevated tracer concentrations were observed and hence no decrease in dissolved BTEX was observed as well. Samples MW402-7 and 402-6 demonstrate this. This result is not surprising because in these cases the oxidant was not able to reach areas containing either dissolved or residual contamination and hence no reduction in TPH was observed.

Chapter 6: Conclusions and recommendations

This study attempted to evaluate the ability for unactivated persulphate at a concentration of 100g/L to effectively degrade BTEX, TMBs, and naphthalene concentrations in both dissolved and residual phase within a laboratory study and at a real field site.

The bench scale laboratory study showed that the oxidation of BTEX compounds by sodium persulphate could be very successful at room temperature. “NOD” was minimal and pH was well buffered in the aquifer under study.

In the field study, the 2000L of 100g/L sodium persulphate injectate was not effectively delivered to the target areas. Complexities such as the effects of density on the injectate and field site geological heterogeneities were not fully appreciated, resulting in ineffective delivery of the oxidant. Simulation model results and field observations of injectate distribution suggest density effects played a very important role in the transport of the injectate.

Indications of at least short-term reduction of groundwater concentrations of target aromatics were found. In certain areas apparent long-term reduction of groundwater concentrations were also found. Furthermore, coring before and after remediation suggested at least local reduction in residual hydrocarbons was obtained. However, the limited mass of oxidant, the complex migration of the injectate in the aquifer, and the heterogeneous distribution of residual hydrocarbons confounded a reliable assessment of the remedial effect.

The installation of deeper monitoring wells could have captured a larger portion of the injectate slug. Thus giving more insight into the extent at which the injectate travelled, primarily due to density. In future research at this site, deeper monitoring wells should be located close to the injection well since as the hydrogeological model suggests that the injectate may sink up to 3m while travelling only 3m downstream approximately 100 days after injection.

In addition, in order to combat the effects of density, sodium persulphate can be injected at a lower concentration but more frequently. At this lower concentration, multiple injections would need to take place in order to produce similar BTEX reduction results and decrease density effects.

As field results show, the majority of the injectate travelled within discrete geological units. More injectate was present and at much higher concentrations in the higher K units as compared to the lower hydraulic conductivity units.

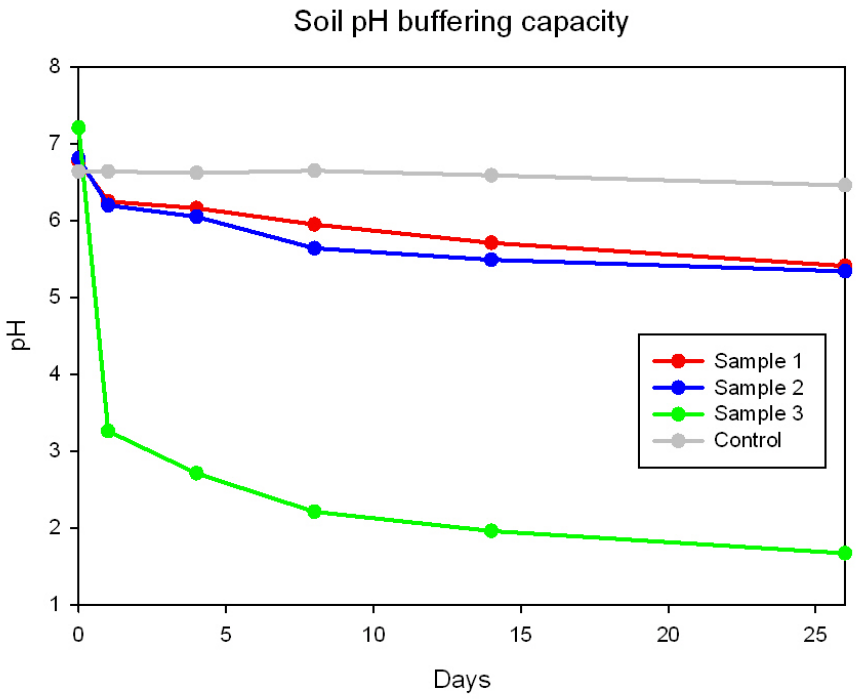
Multiple injection wells, screened only within each distinct geological unit could be installed in order to insure that the oxidant be released into the appropriate unit. Units with a lower hydraulic conductivity would have to be injected at lower pressures such that the injectate can be taken up by the formation.

In cases where the oxidant came in contact with dissolved BTEX, a temporary reduction in dissolved BTEX was observed. However, if significant amounts of BTEX residuals were present in the soil, dissolved BTEX concentrations rebounded back to pre-injection levels within months of injection. Therefore, the total petroleum hydrocarbon mass needs to be carefully estimated before implementing this technology because if the ultimate objective is to reduce the total (dissolved and residual) BTEX contamination, enough oxidant needs to be injected to facilitate the complete oxidation of BTEX from all phases. This would prevent dissolved phase BTEX concentrations from inevitably rebounding back to pre-injection levels.

More frequent monitoring and groundwater sampling is highly recommended especially in the first 2 months after injection. The majority of the injectate is thought to have passed by the first fence of monitoring wells within 2 months of the injection. Using electrical conductivity as a guide, regular inorganic and organic samples should be collected and analyzed to determine the presence and location of the injectate in addition to determine the extent in which BTEX is being oxidized.

Figures

Figure 1. Soil pH buffering capacity test



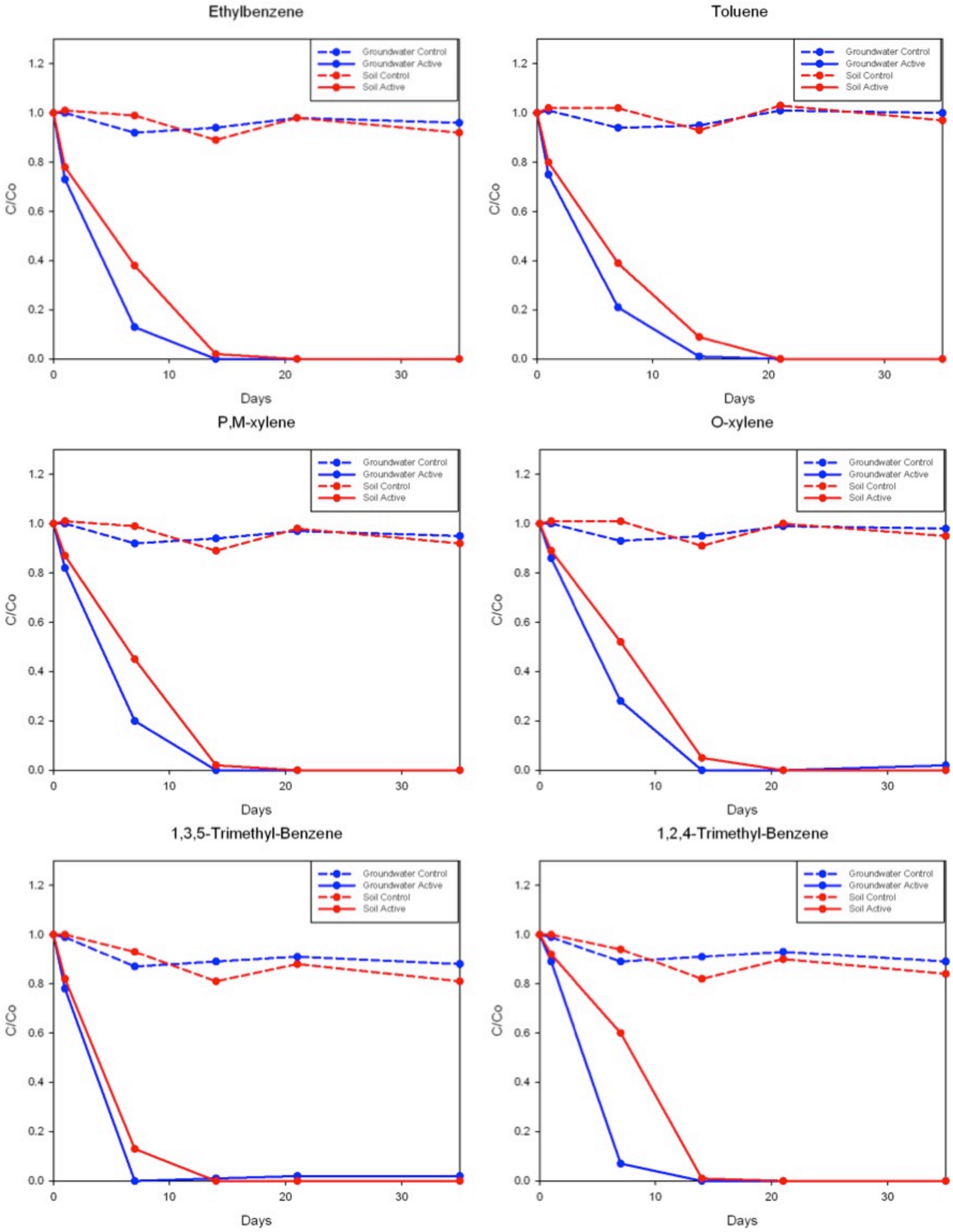
Sample 1:
GW, persulphate, soil

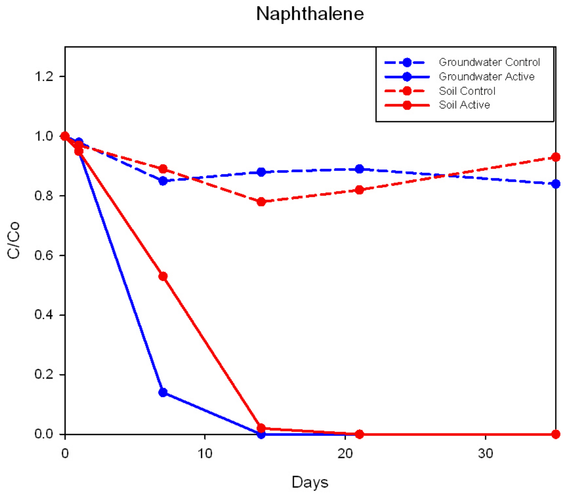
Sample 2:
DI, persulphate, soil

Sample 3:
GW, persulphate

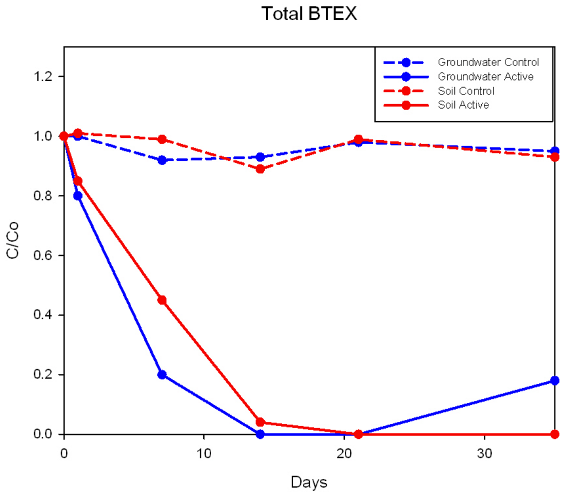
Control:
GW

Figure 2. Degradation curves from batch test

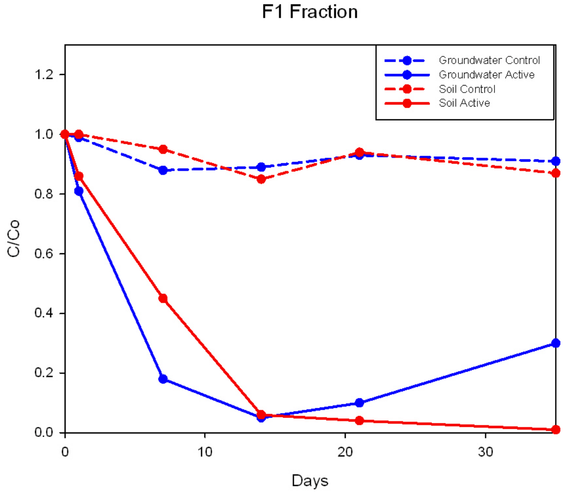




Naphthalene



Total BTEX



F1 Fraction

Figure 3. Atypical degradation curves from batch test

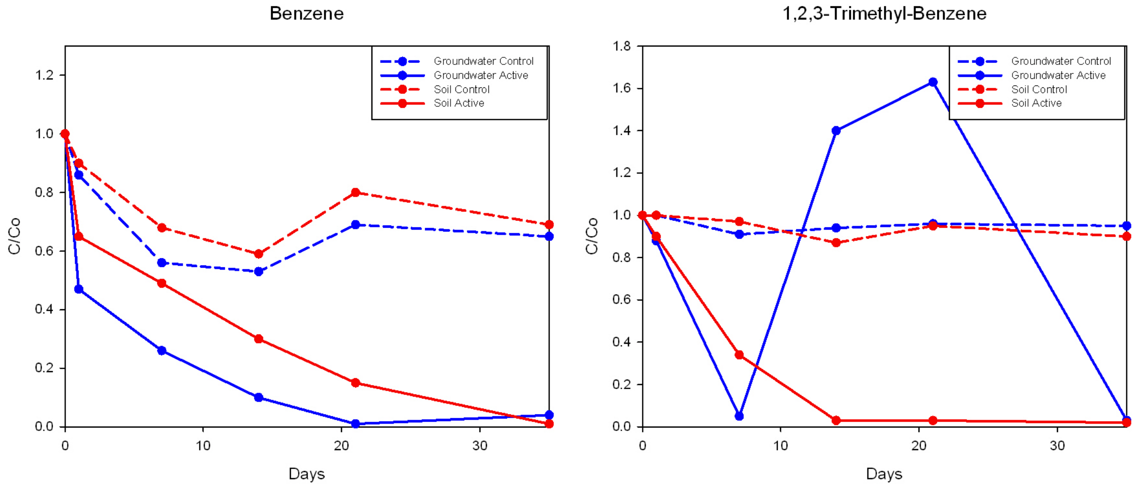


Figure 3a: Degradation curve (Benzene)

Figure 3b: Degradation curve (1,2,3 TMB)

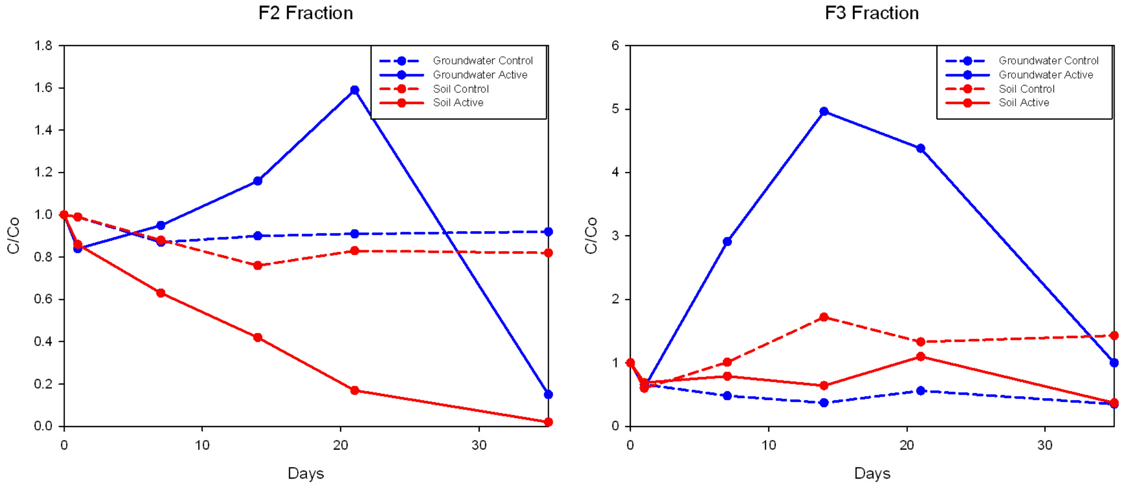


Figure 3c: Degradation curve (F2 Fraction)

Figure 3d: Degradation curve (F3 Fraction)

Figure 4. Site map (plan view)

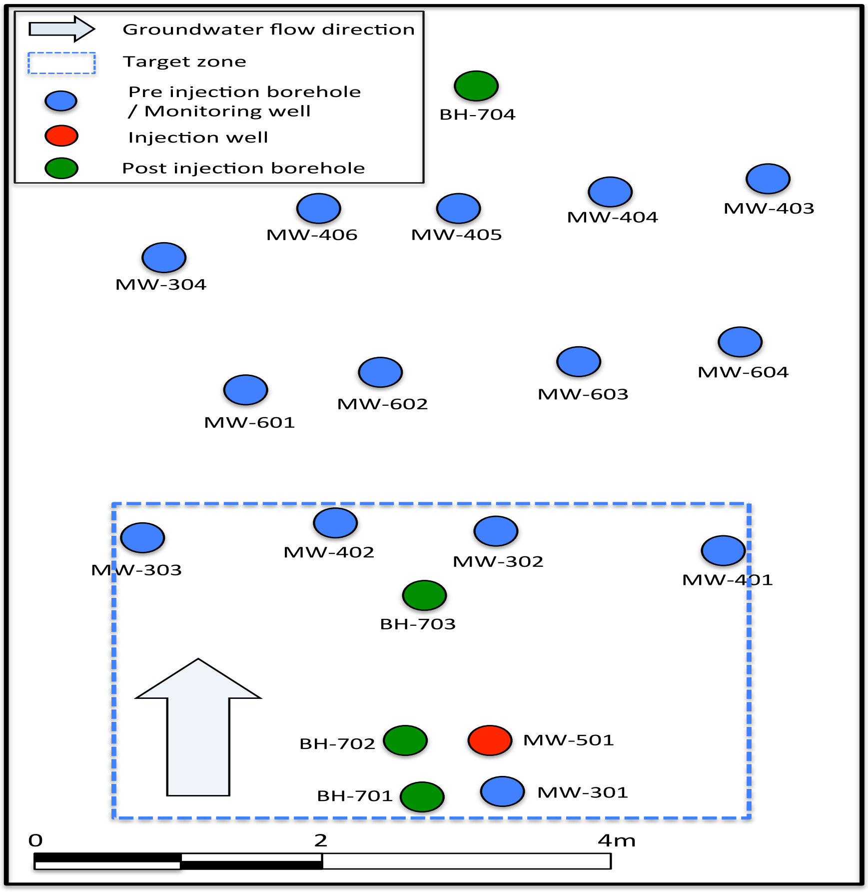
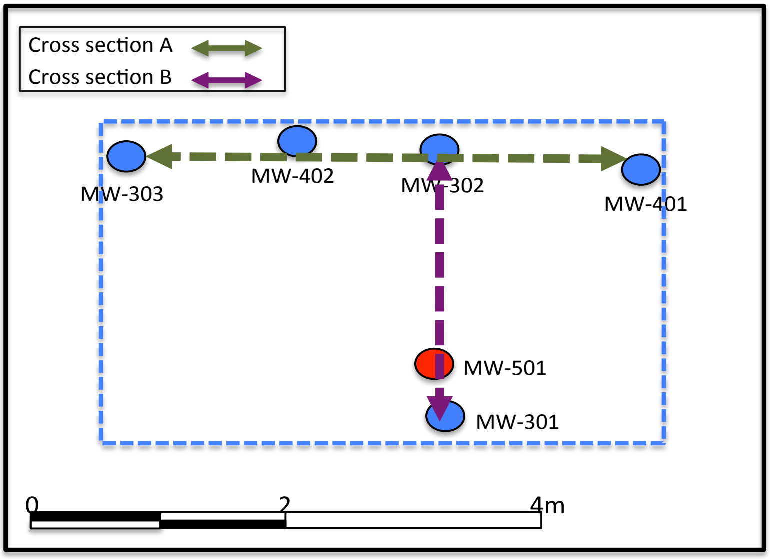
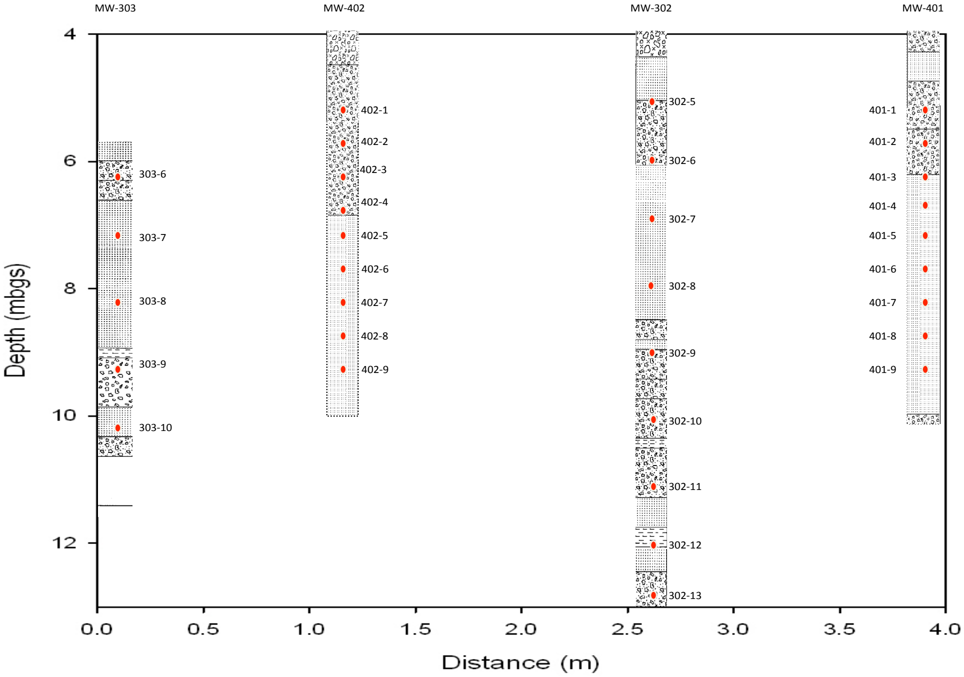


Figure 5. : Cross section of study area



Cross section A·



Cross section B:

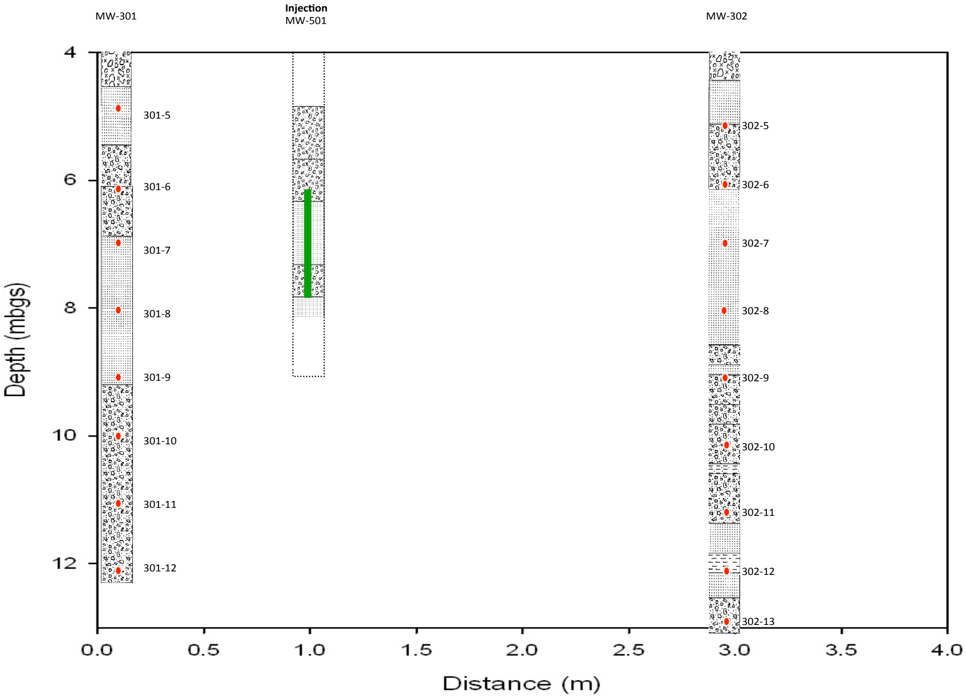


Figure 6. Picture of site showing study area and monitoring well network

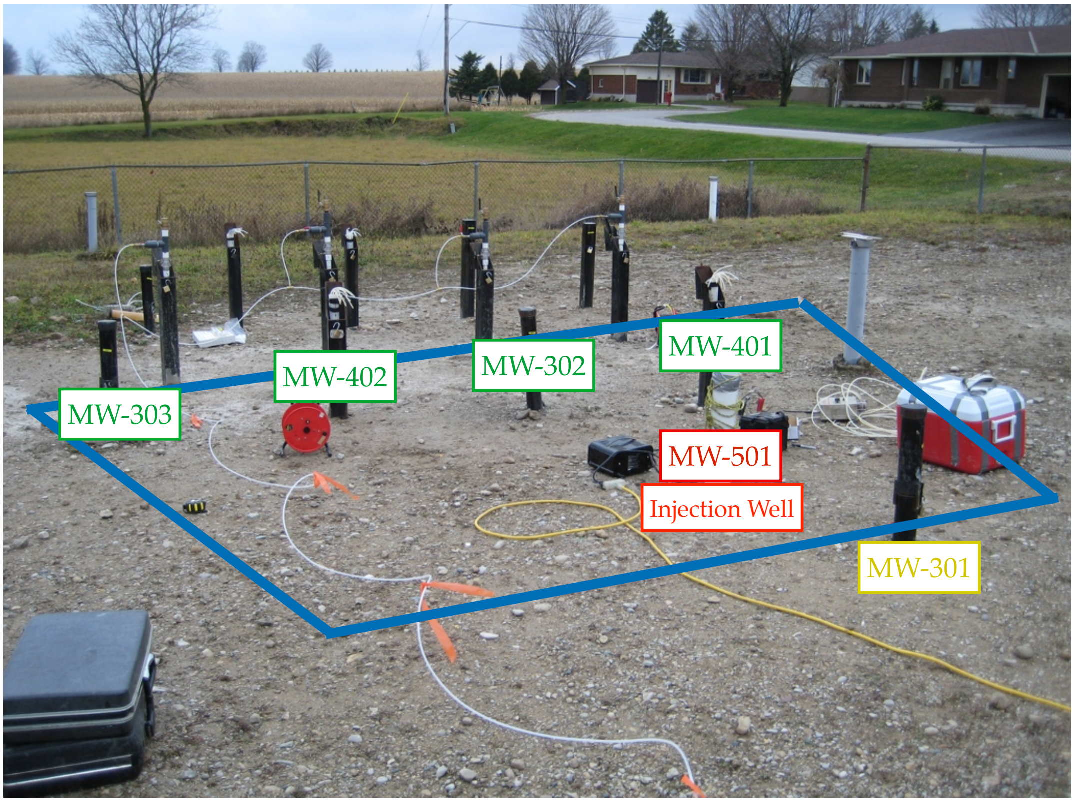


Figure 7. Historical groundwater level

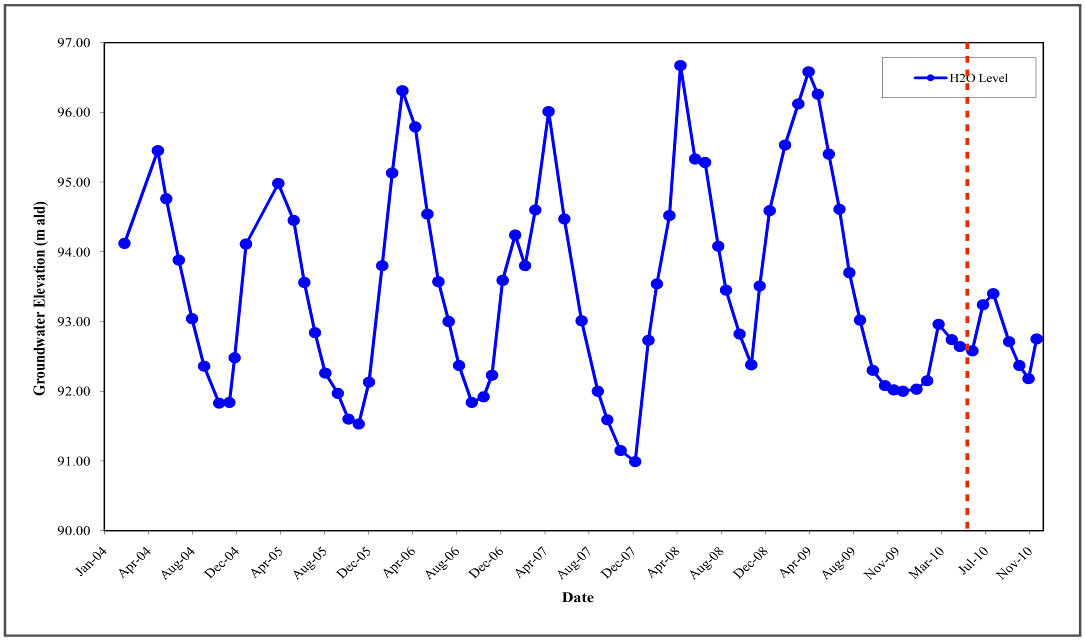


Figure 8. Heterogeneity within sore cores in the study area

Figure 9. Pre-injection distribution of the dissolved phase BTEX in MW401

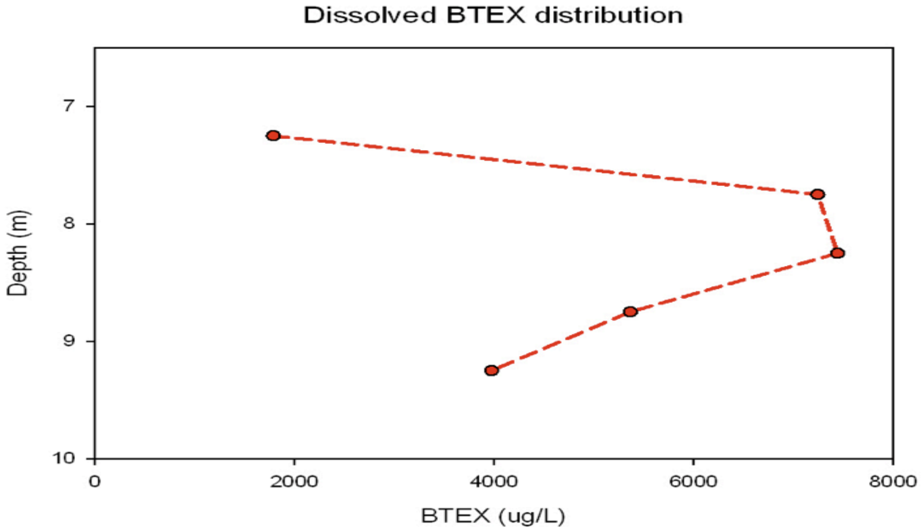


Figure 10. Pre-injection distribution of the dissolved phase BTEX in MW401

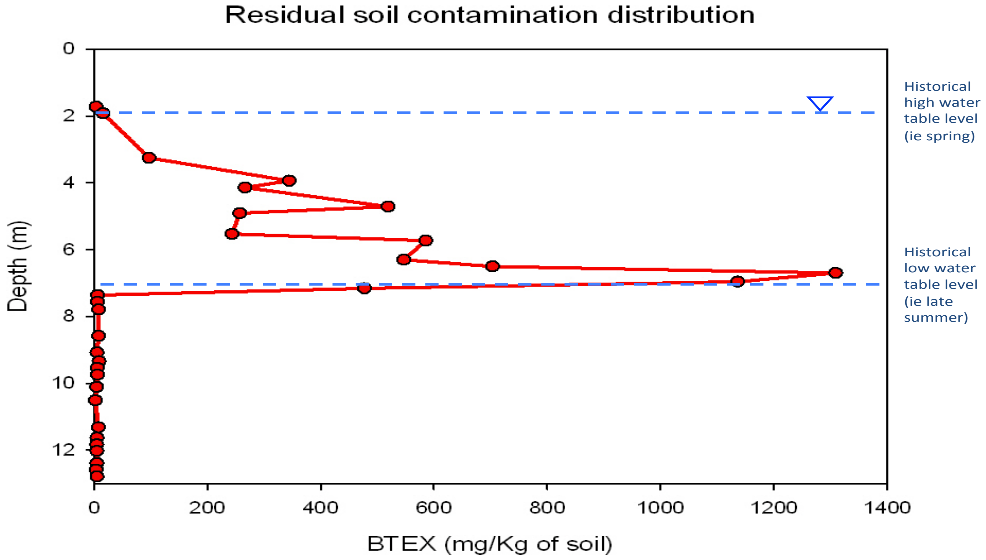


Figure 11. Hydrogeological conceptual model of site

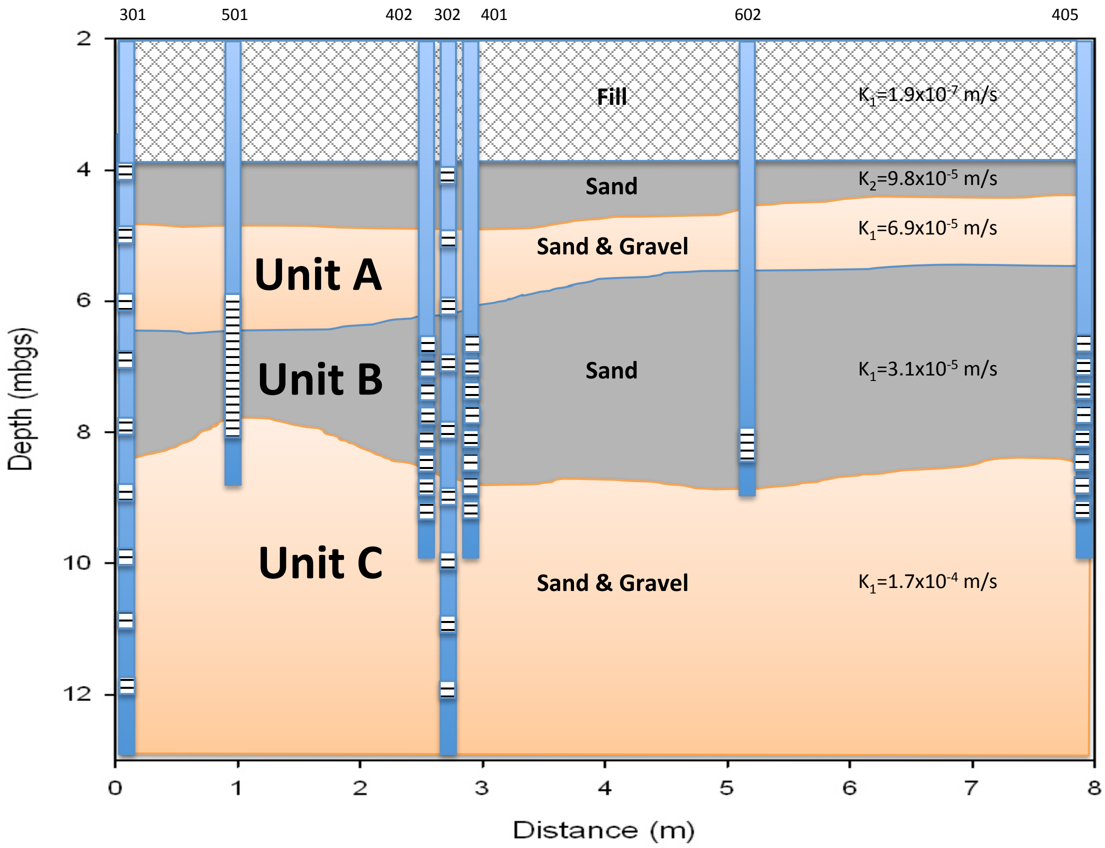


Figure 12. 100L mixing tanks, FMC sodium persulphate, 2-inch PVC injection well

Figure 13. Sodium vs electrical conductivity data.

The correlation line is: Na (mg/L) = 319.14 EC (mS/cm) - 460.06 with a r^2 value of 0.98

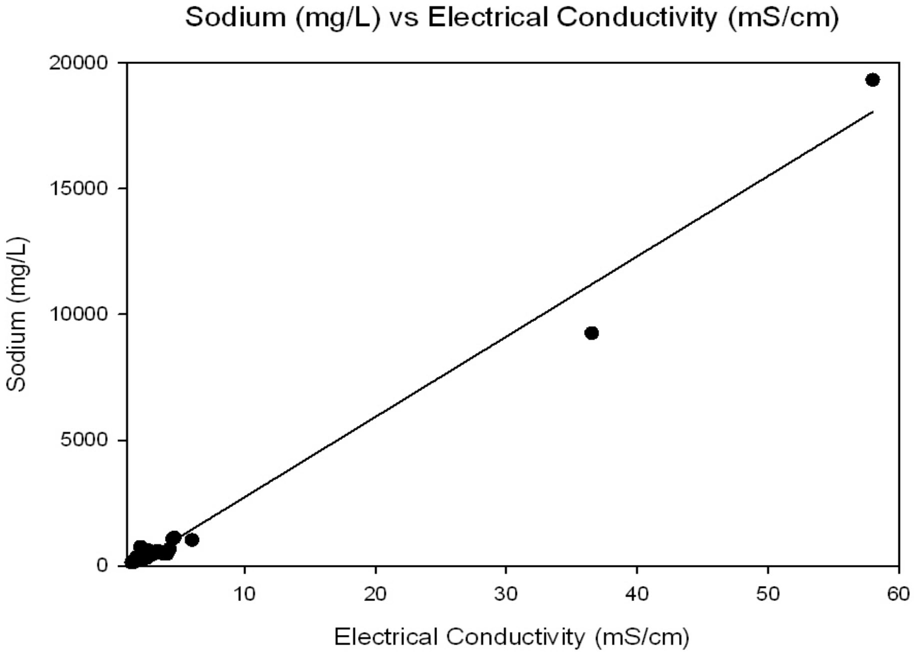


Figure 14. Sodium vs electrical conductivity data excluding two outlining points.

The correlation line is: Na (mg/L) = 172.4 EC (mS/cm) - 75.343 with a r^2 value of 0.91

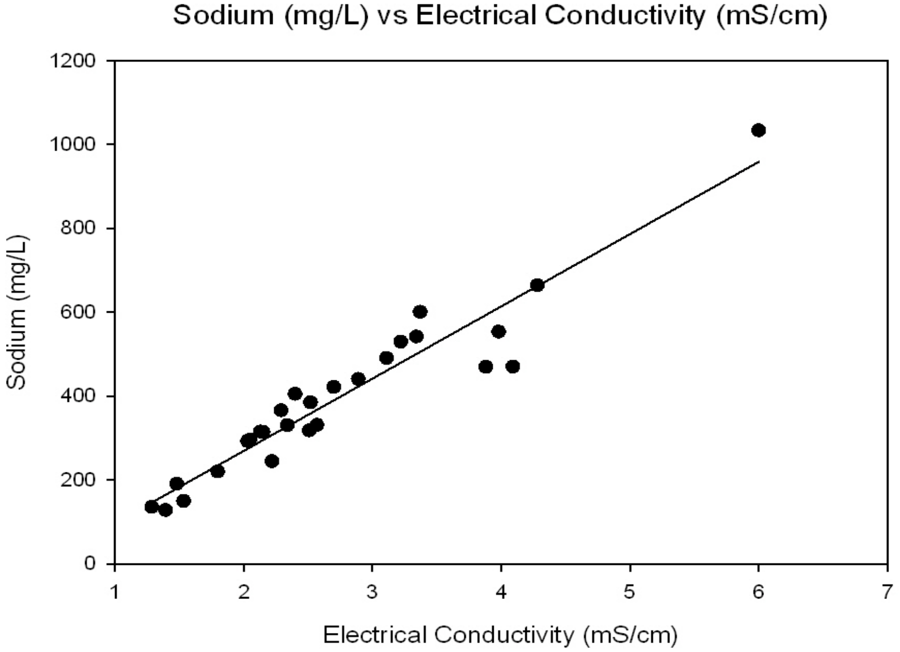


Figure 15. Persulphate + sulphate (moles/L) vs electrical conductivity data

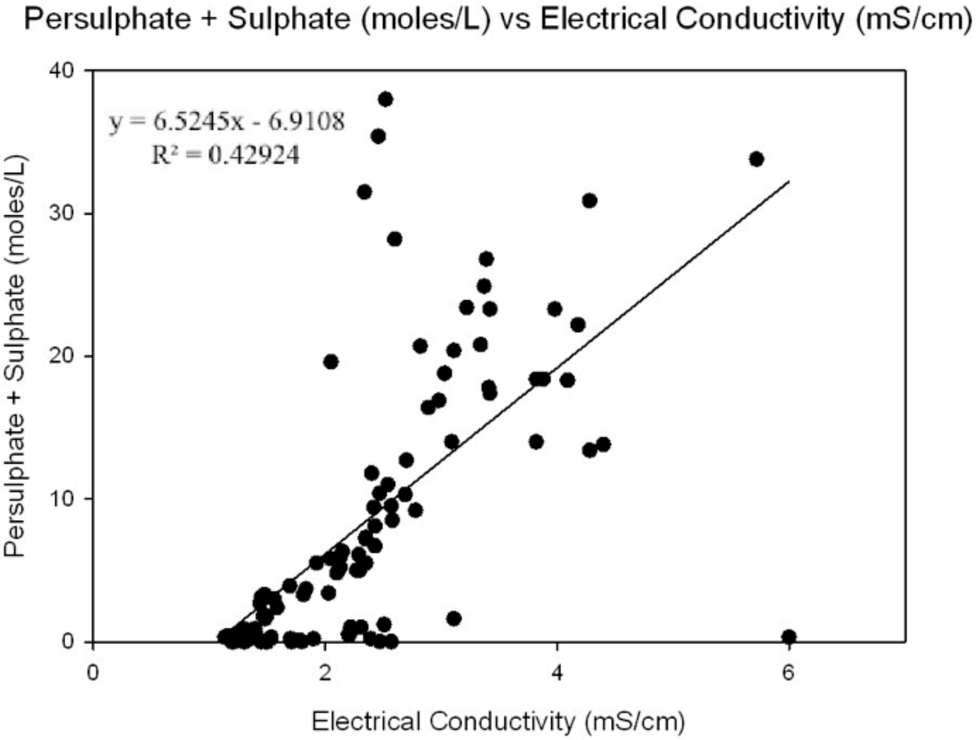
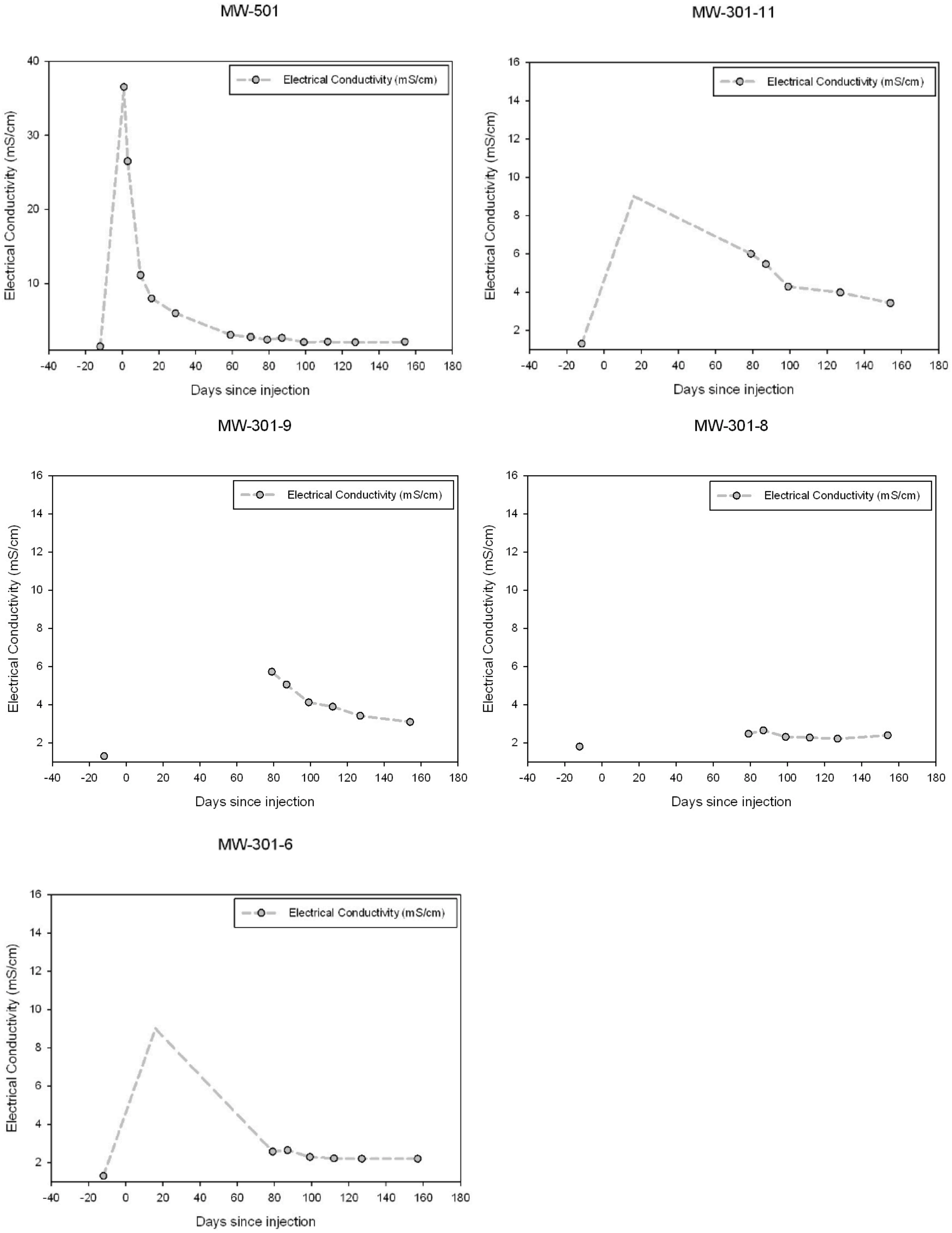
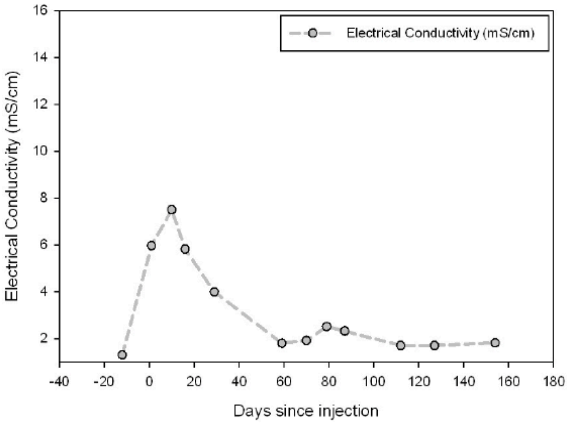
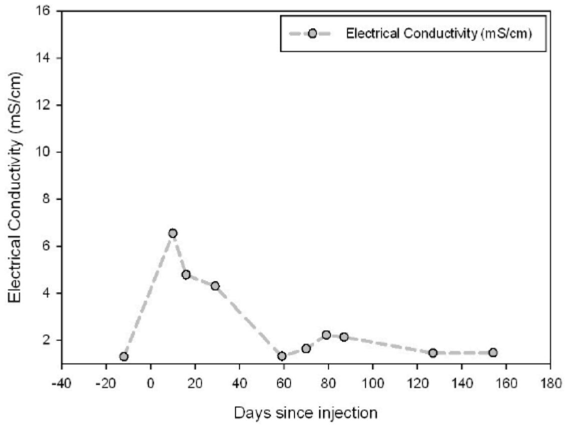
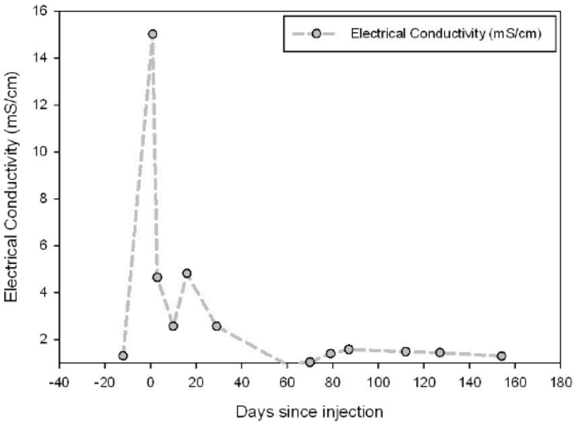


Figure 16. Electrical conductivity over time




MW-302-9


MW-302-7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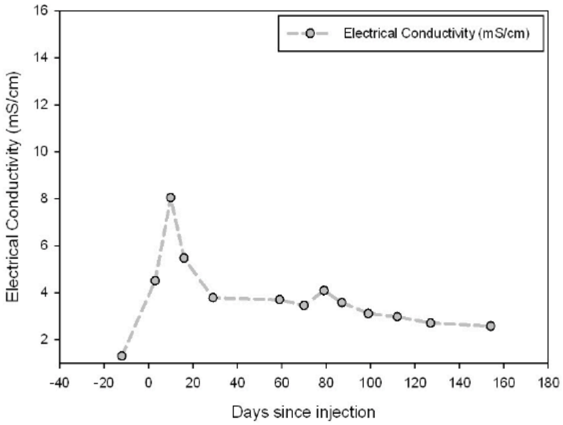
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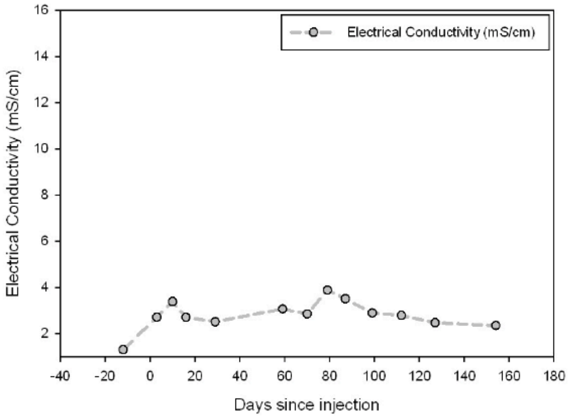
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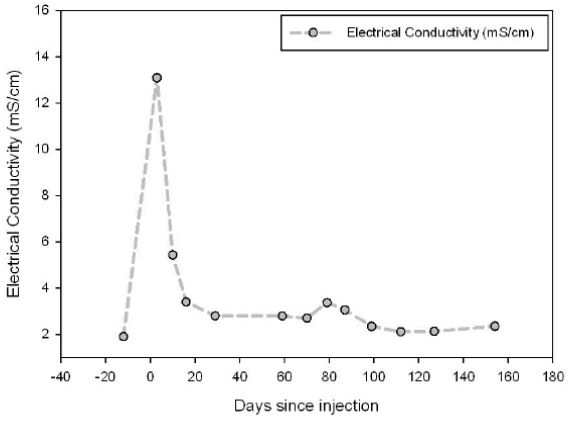
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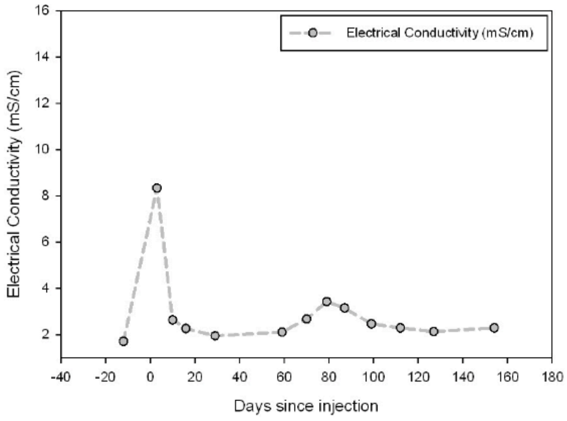
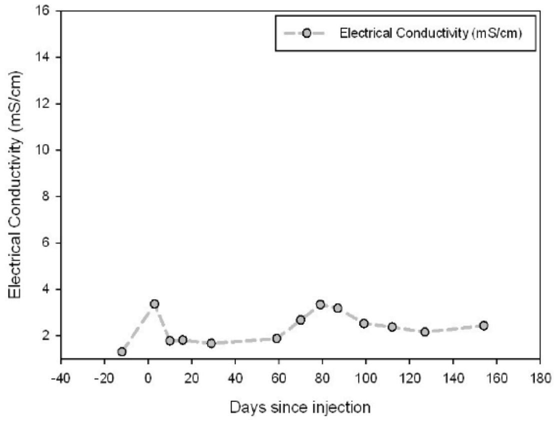

MW-402-8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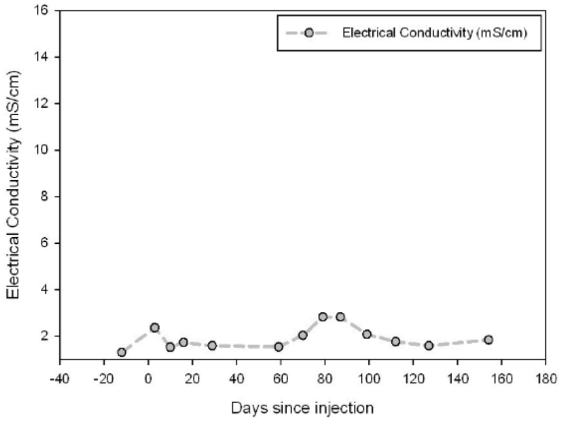
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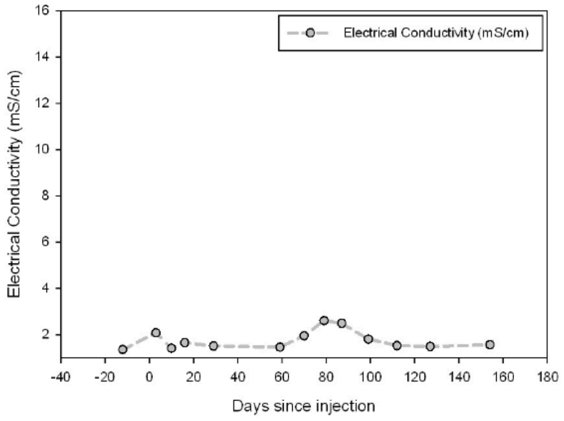
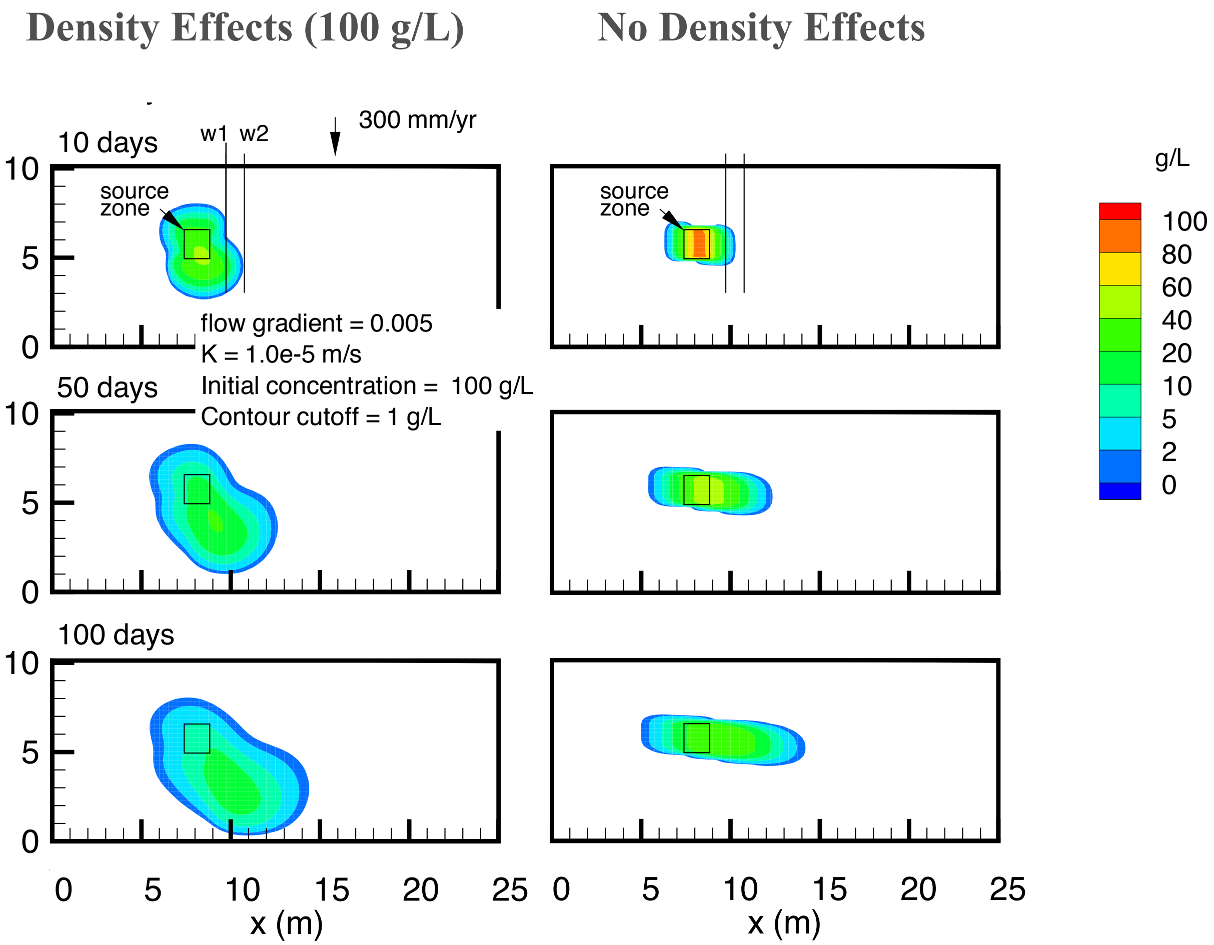

MW-402-5

Figure 17. Sodium persulphate density simulation (Molson, 2008)



Conceptual numerical simulations of persulphate evolution from an emplaced source zone: Effects of density on plume evolution (Molson, 2010)

Figure 18. Ideal injectate

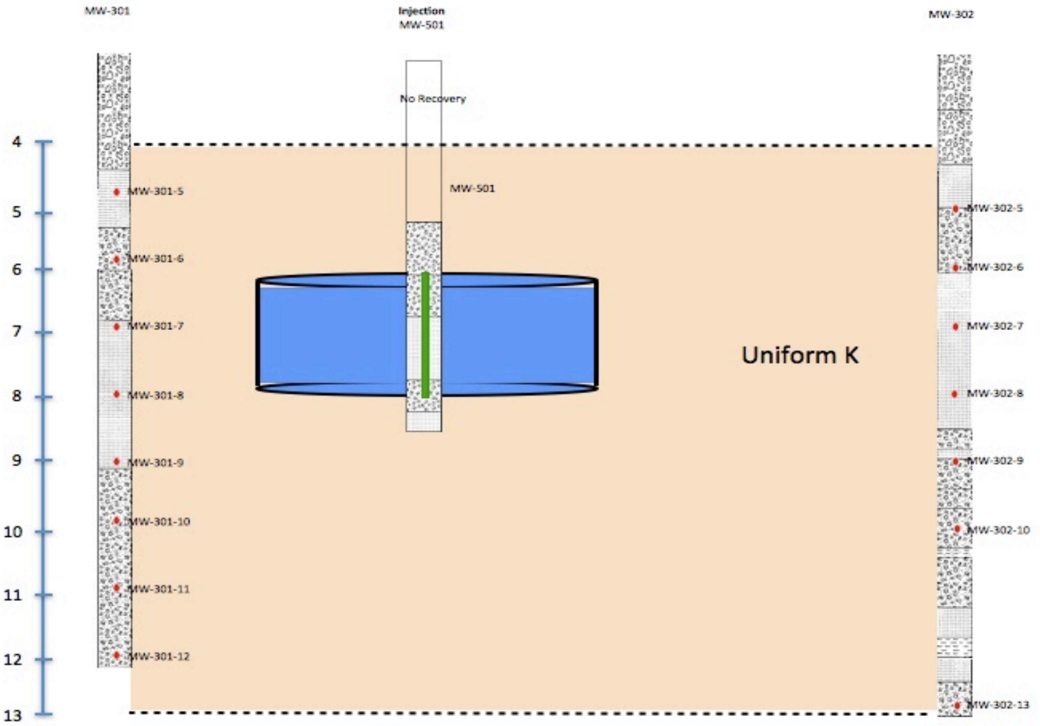


Figure 19. Non-ideal injectate

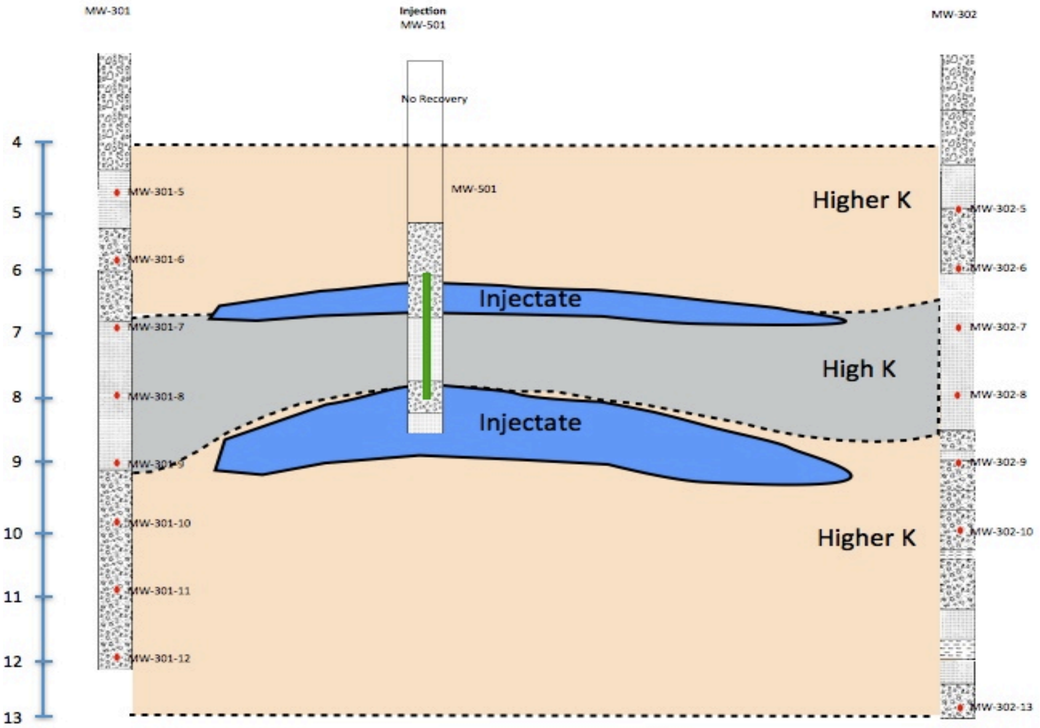


Figure 20. pH levels pre and post injection in MW501

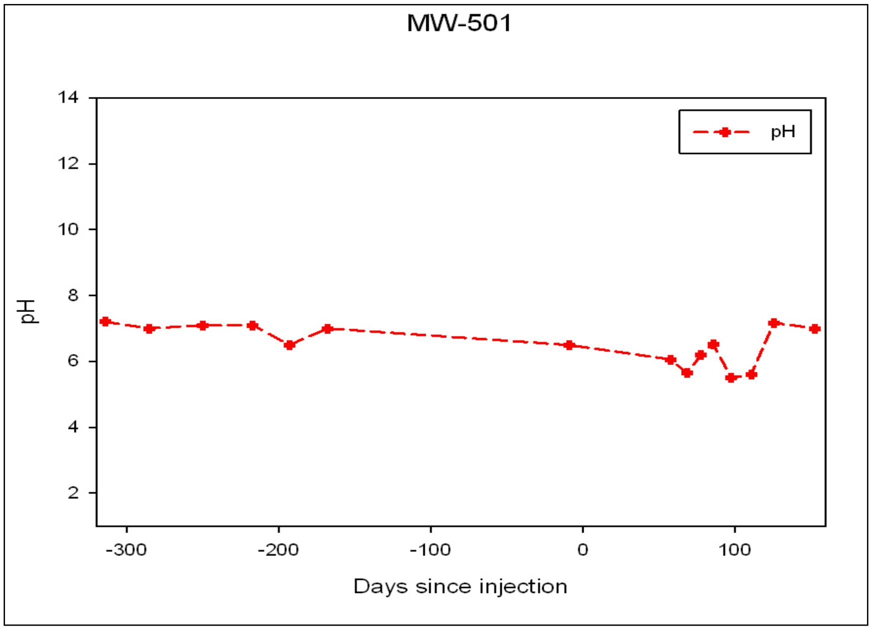
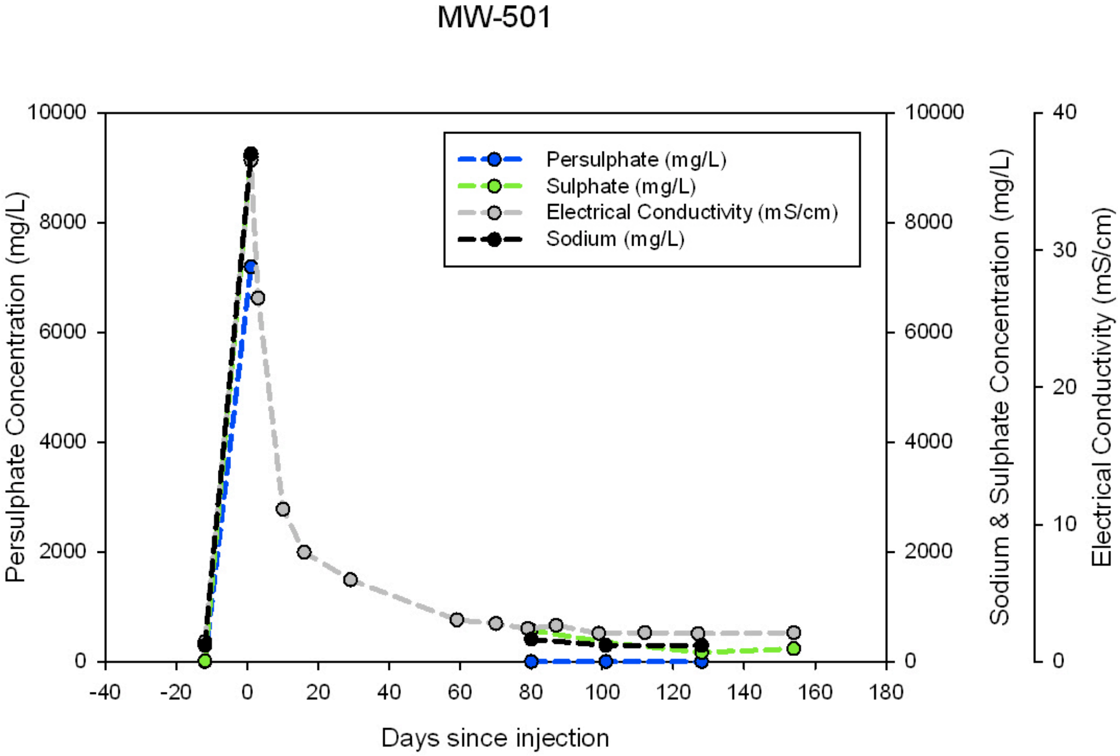
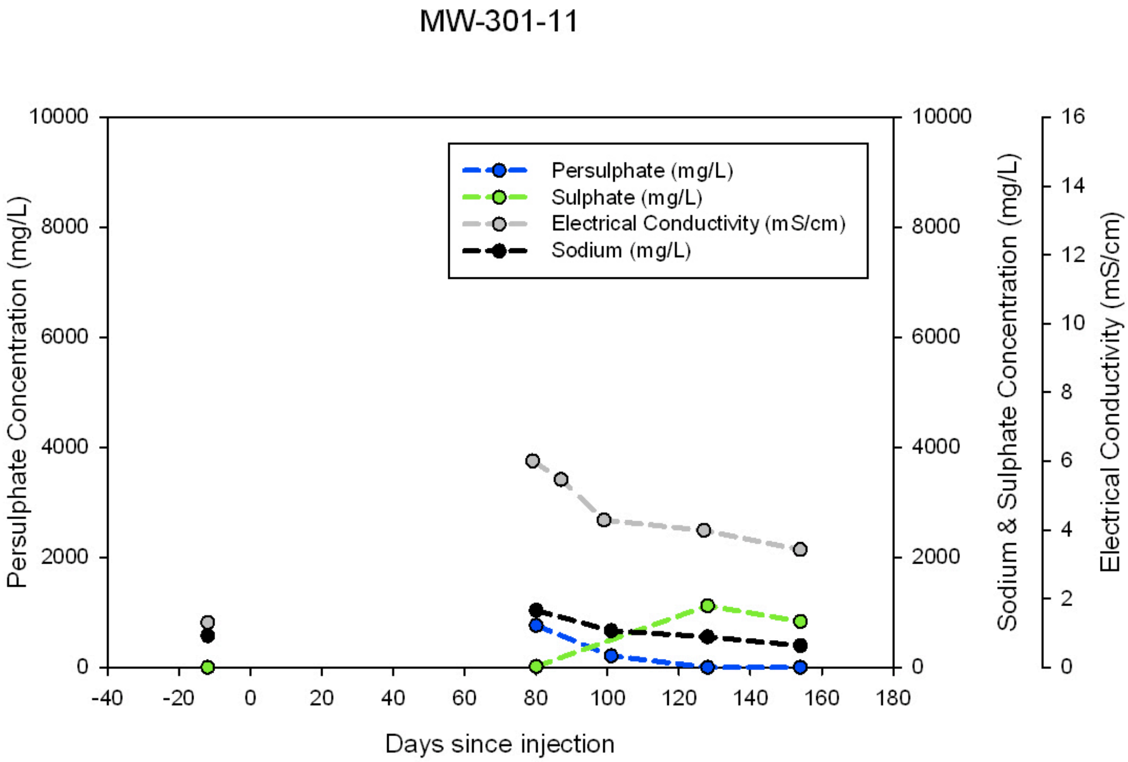
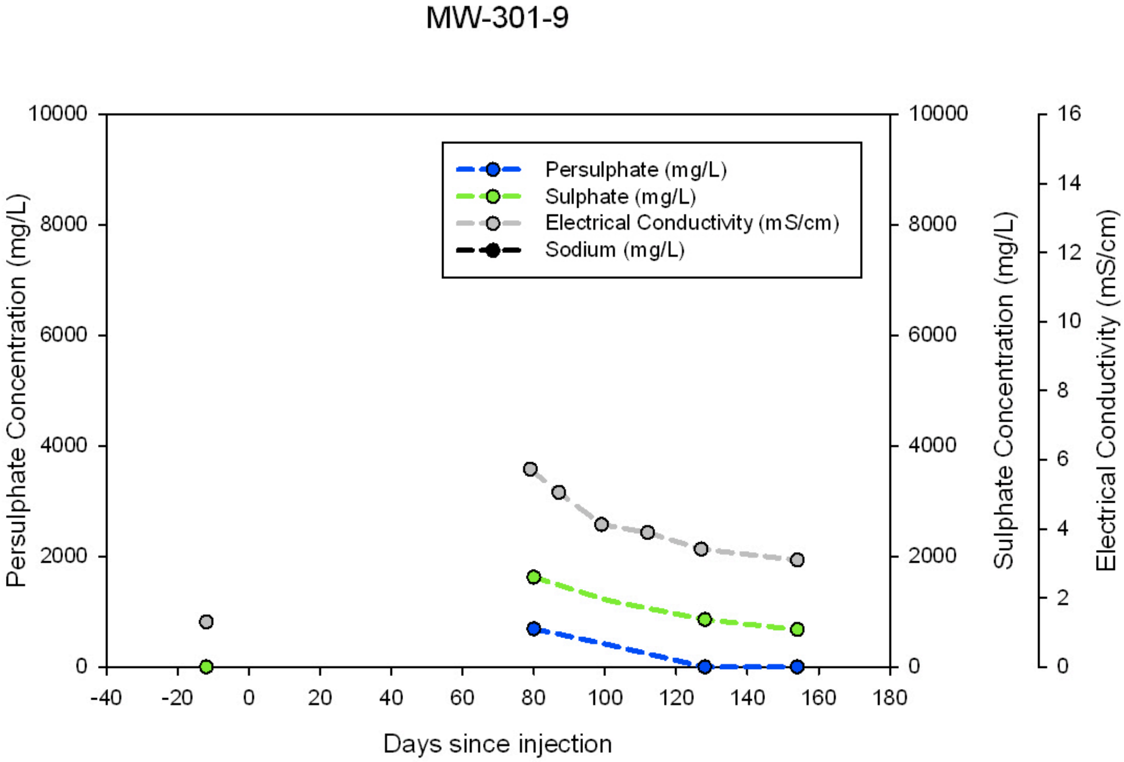
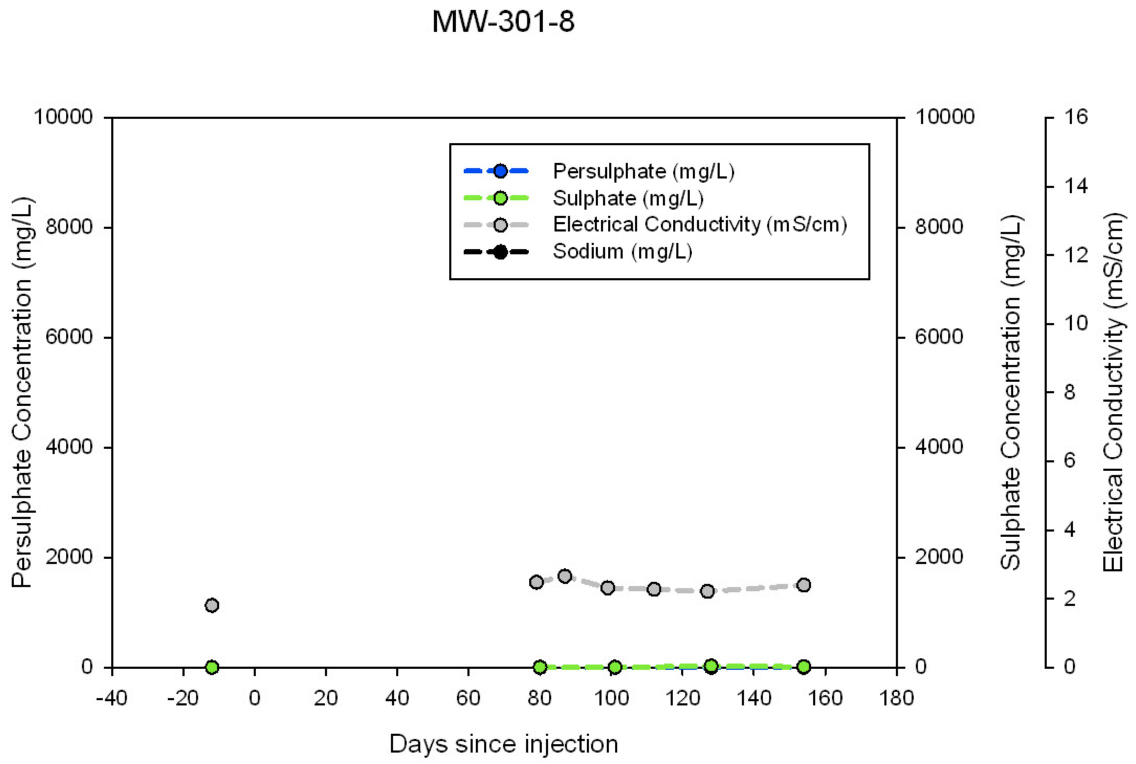


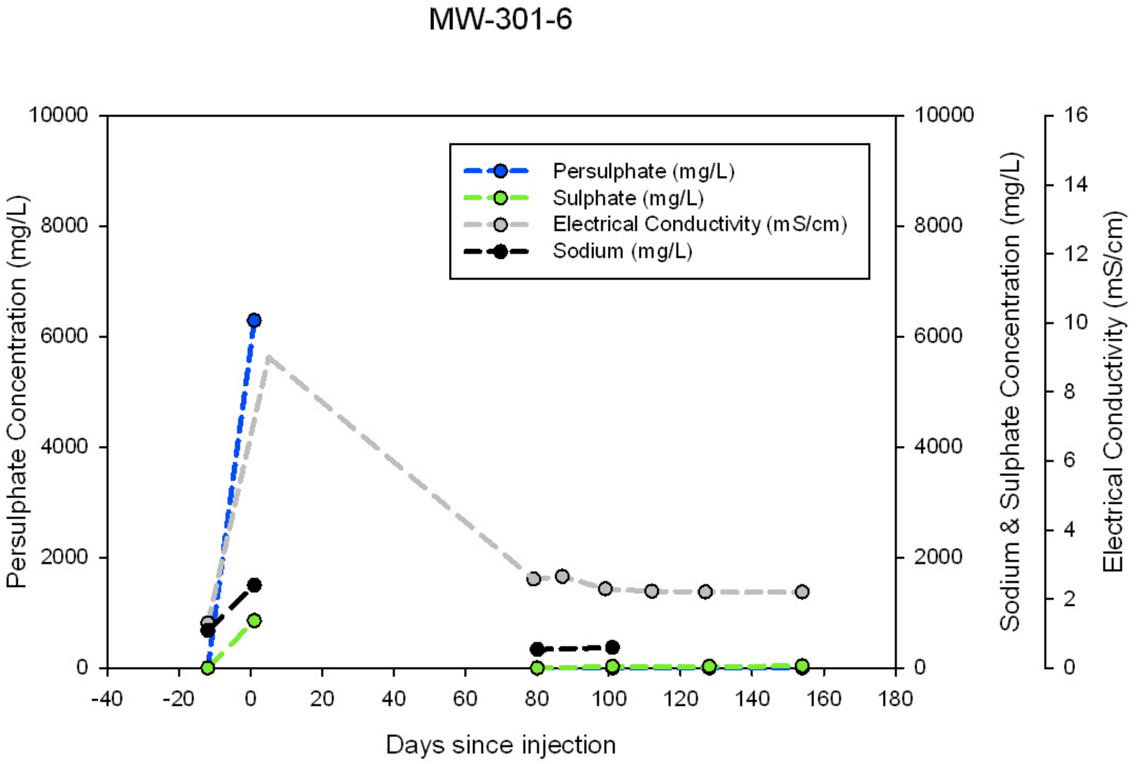
Figure 21. Persulphate, sulphate, sodium, and electrical conductivity levels over time



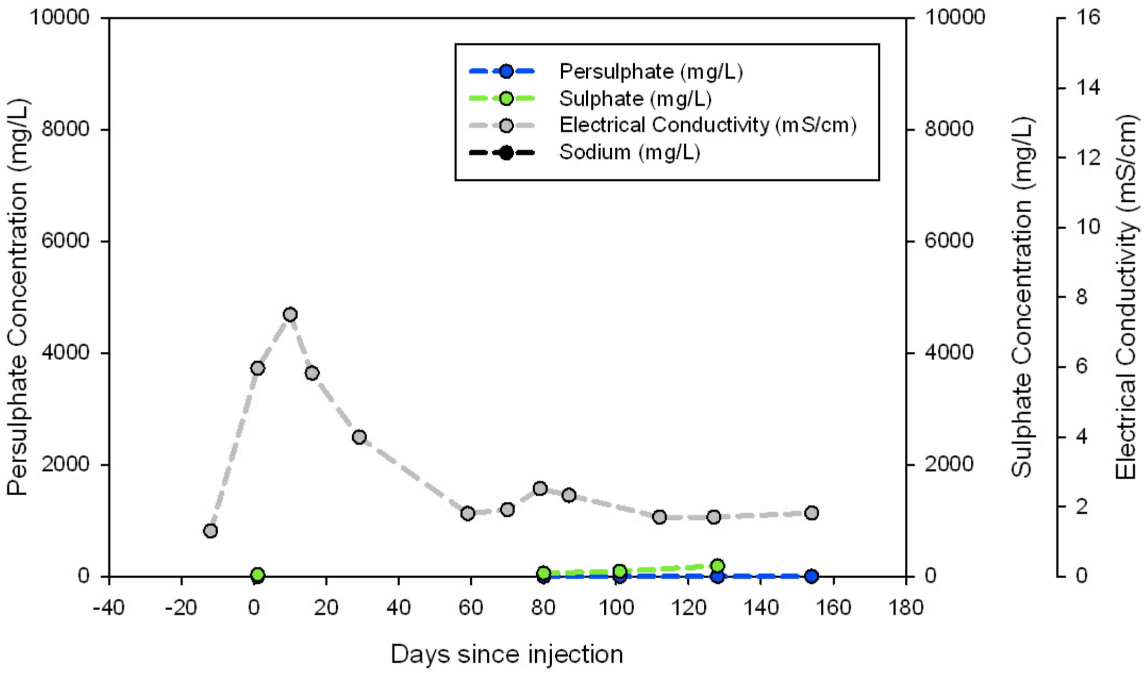

MW-301-11
Persulphate (mg/L)
Sulphate (mg/L)
Electrical Conductivity (mS/cm)
Sodium (mg/L)
Persulphate Concentration (mg/L)
Sodium & Sulphate Concentration (mg/L)
Electrical Conductivity (mS/cm)
Days since injection
10000
8000
6000
4000
2000
0
16
14
12
10
8
6
4
2
0
-40
-20
0
20
40
60
80
100
120
140
160
180


MW-301-9
Persulphate (mg/L)
Sulphate (mg/L)
Electrical Conductivity (mS/cm)
Sodium (mg/L)
Persulphate Concentration (mg/L)
Sulphate Concentration (mg/L)
Electrical Conductivity (mS/cm)
Days since injection
10000
8000
6000
4000
2000
0
16
14
12
10
8
6
4
2
0
-40
-20
0
20
40
60
80
100
120
140
160
180

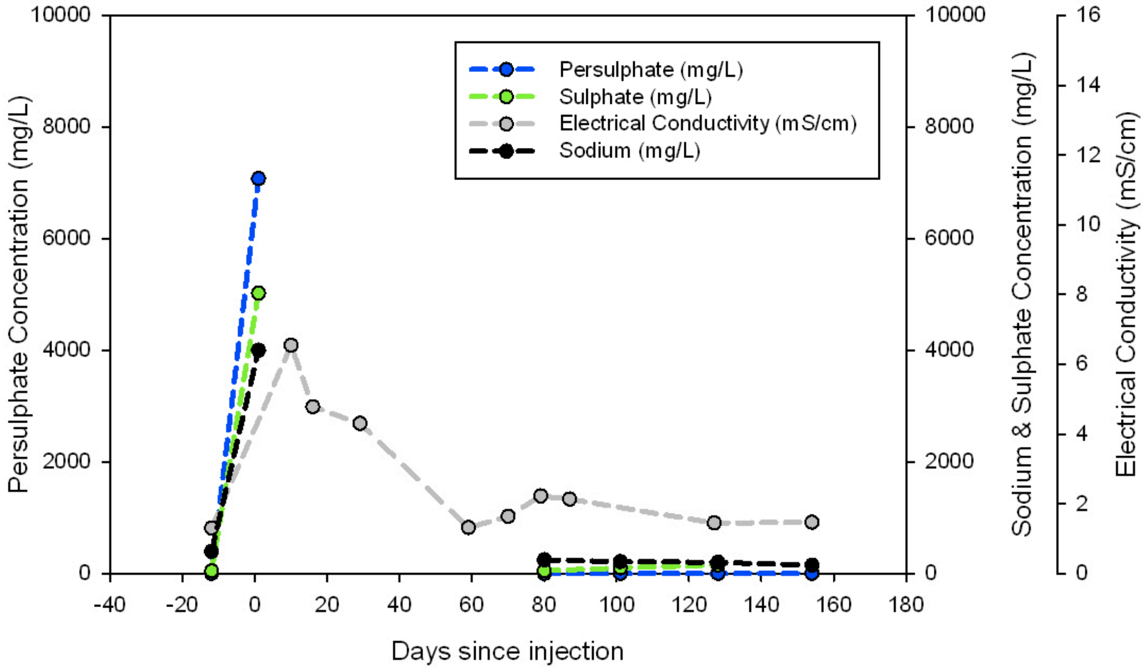

MW-301-8
Persulphate Concentration (mg/L)
Sulphate Concentration (mg/L)
Electrical Conductivity (mS/cm)
Days since injection
Persulphate (mg/L)
Sulphate (mg/L)
Electrical Conductivity (mS/cm)
Sodium (mg/L)
10000
8000
6000
4000
2000
0
16
14
12
10
8
6
4
2
0
-40
-20
0
20
40
60
80
100
120
140
160
180

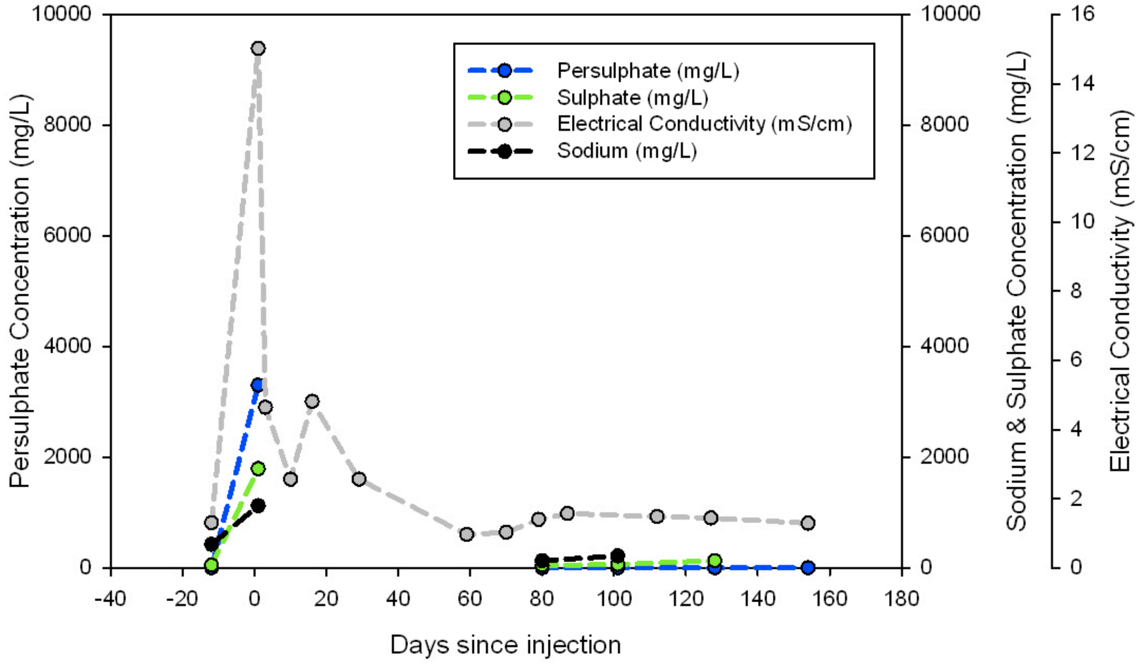

MW-301-6
Persulphate Concentration (mg/L)
Sodium & Sulphate Concentration (mg/L)
Electrical Conductivity (mS/cm)
Days since injection
Persulphate (mg/L)
Sulphate (mg/L)
Electrical Conductivity (mS/cm)
Sodium (mg/L)
10000
8000
6000
4000
2000
0
16
14
12
10
8
6
4
2
0
-40
-20
0
20
40
60
80
100
120
140
160
180

MW-302-9



MW-302-7





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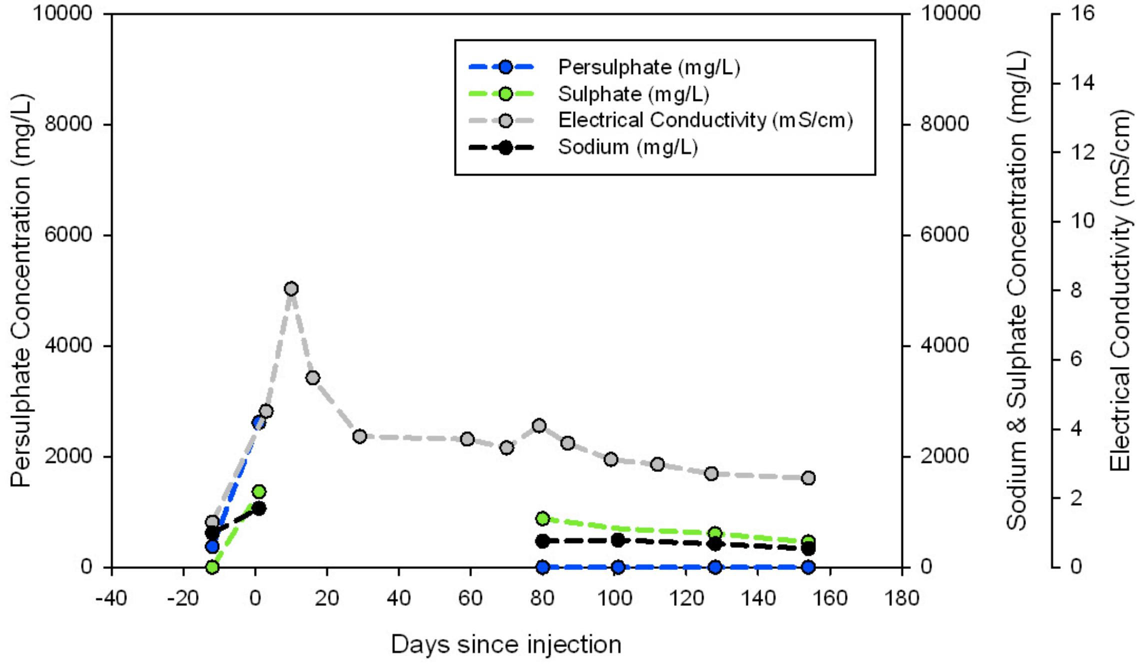
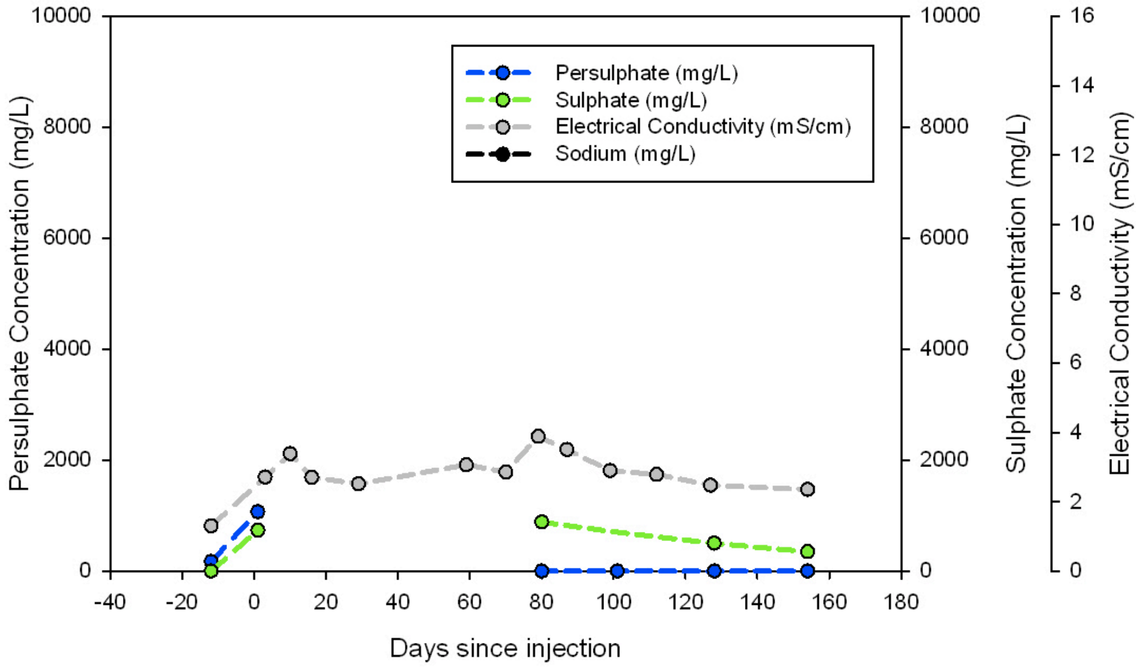


MW-401-9

MW-401-7



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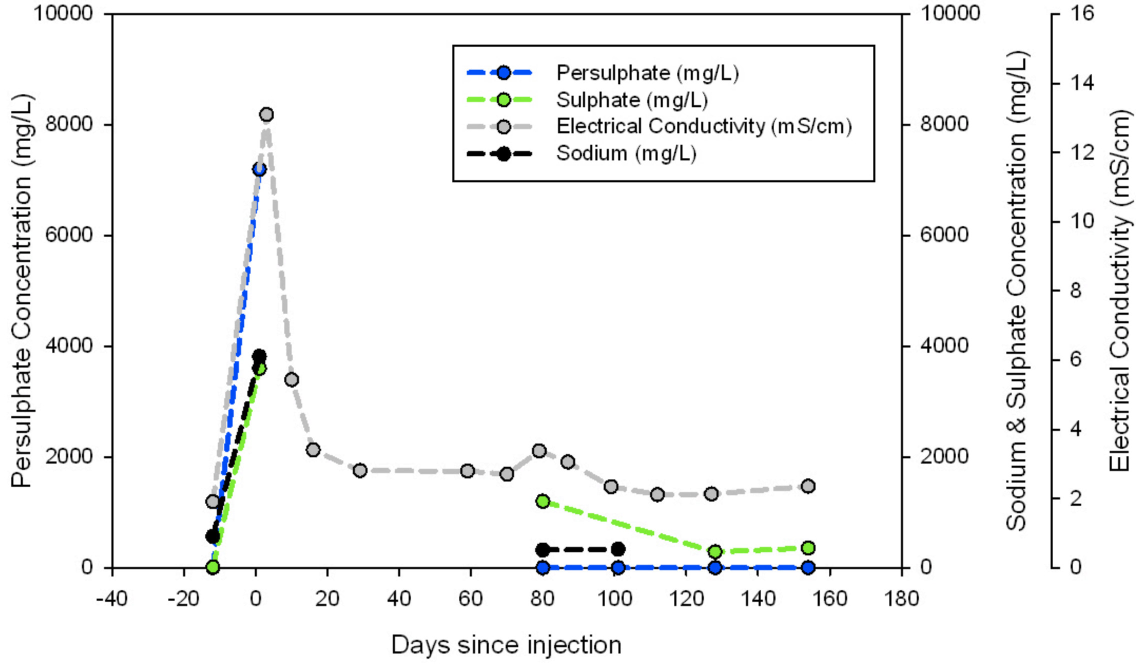

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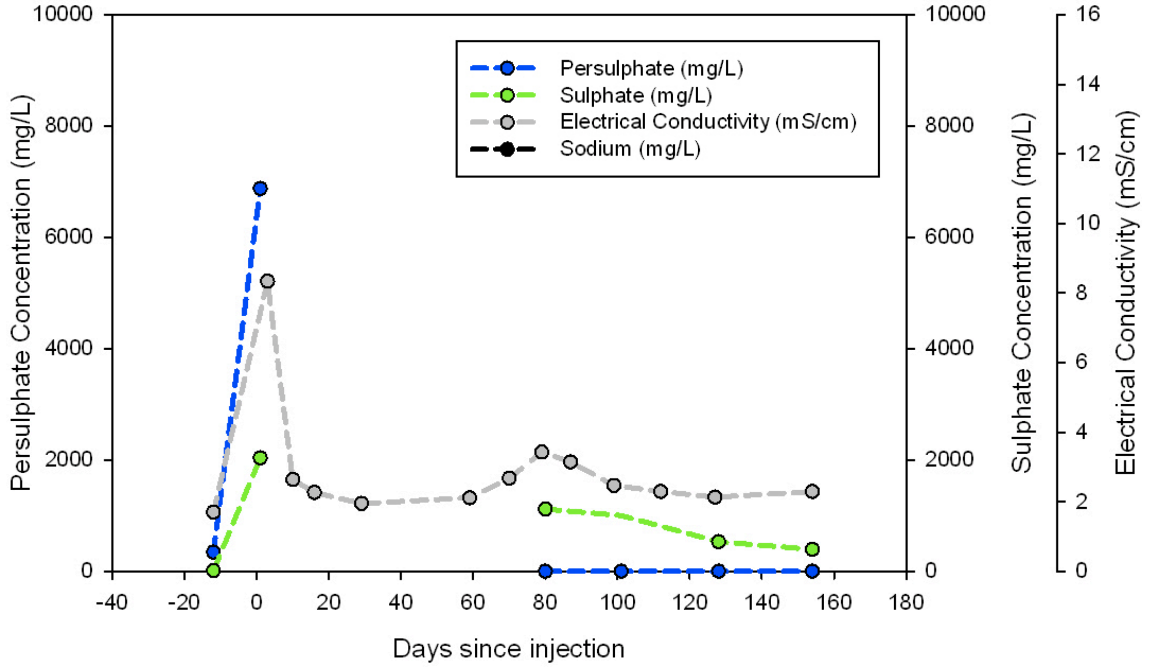

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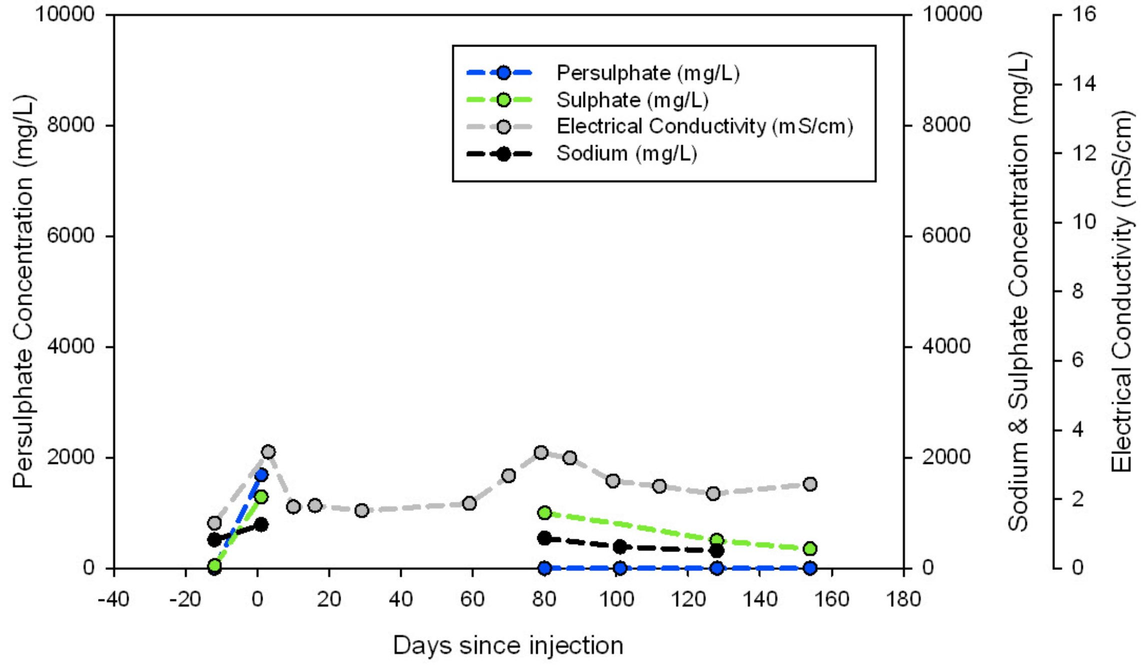

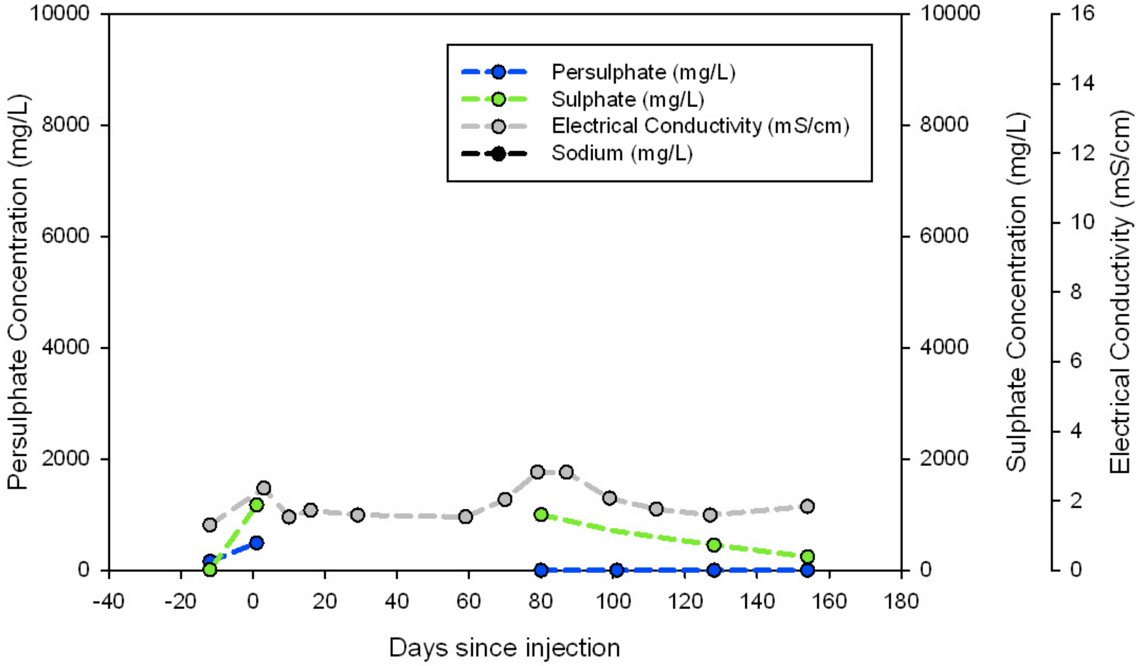
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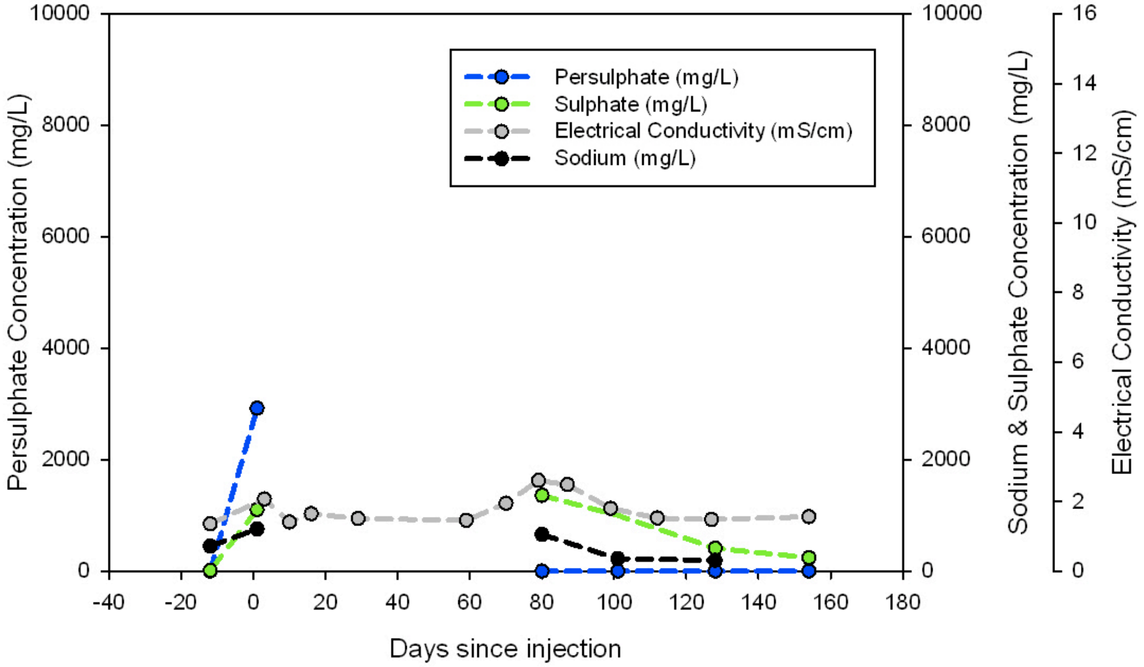
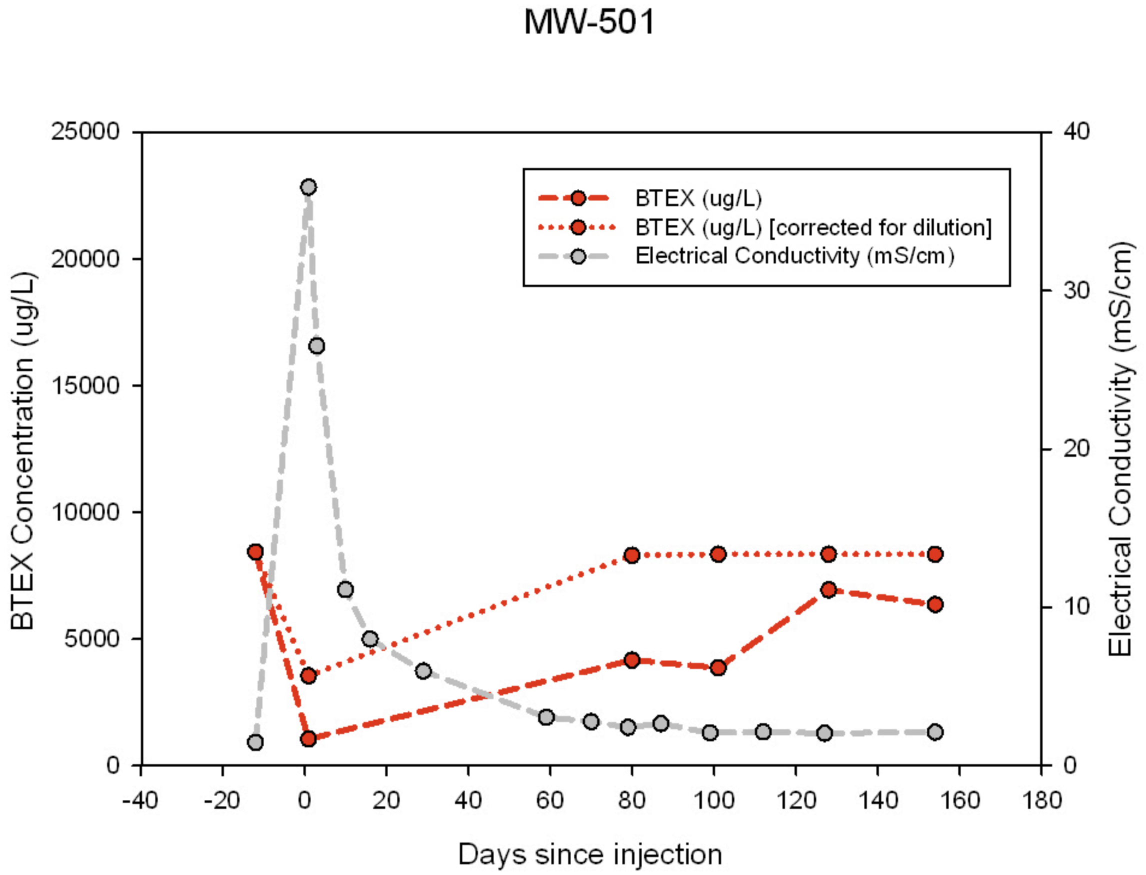
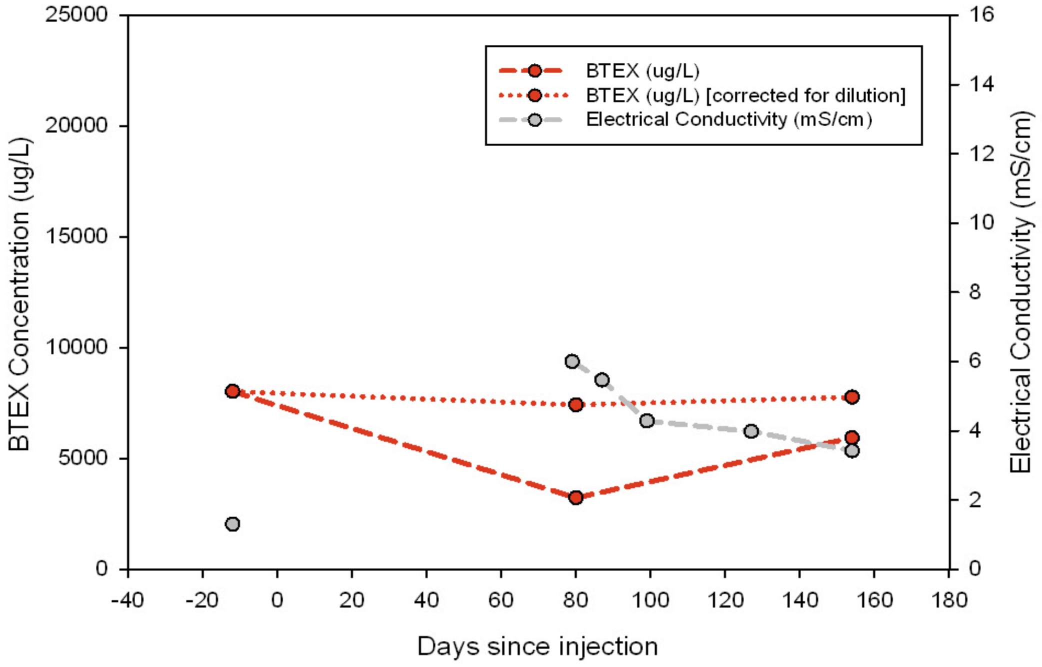

MW-402-5

Figure 22. BTEX concentrations and electrical conductivity levels over time



MW-301-11



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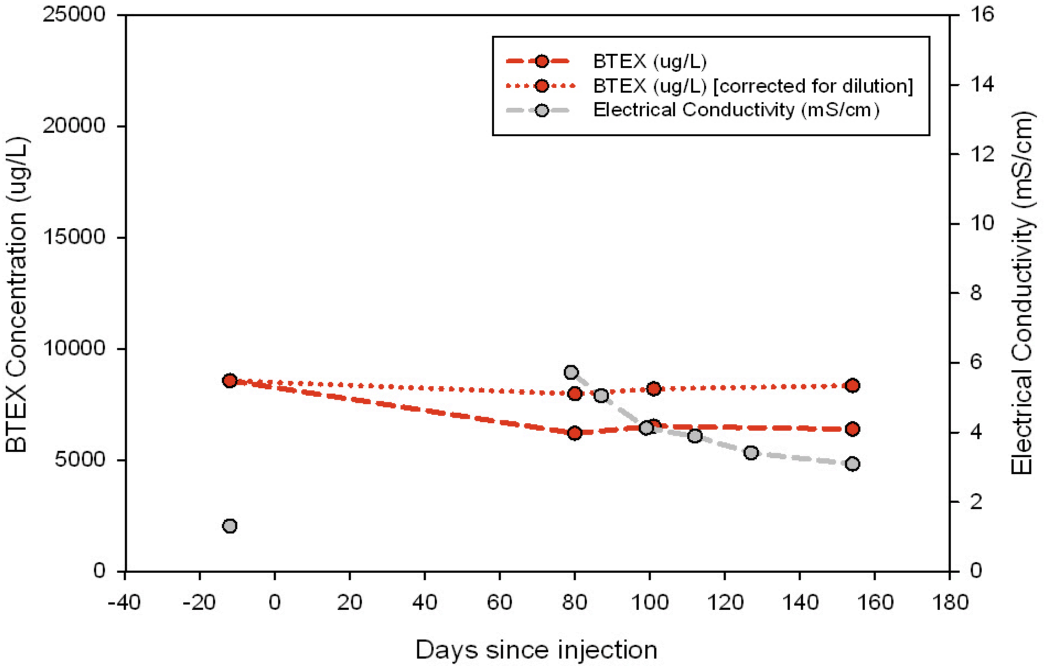

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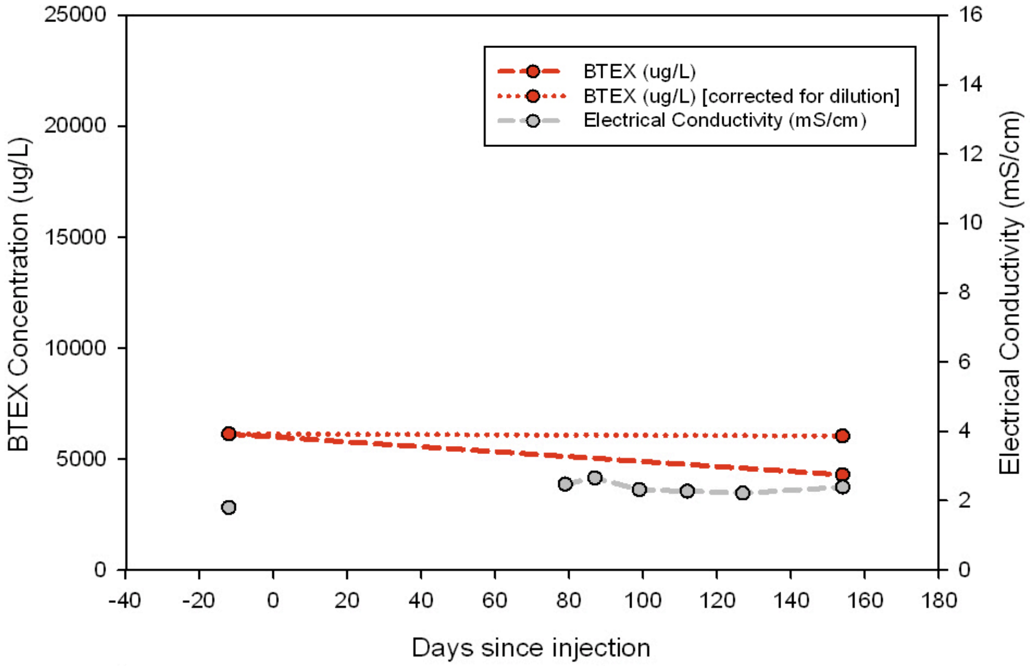

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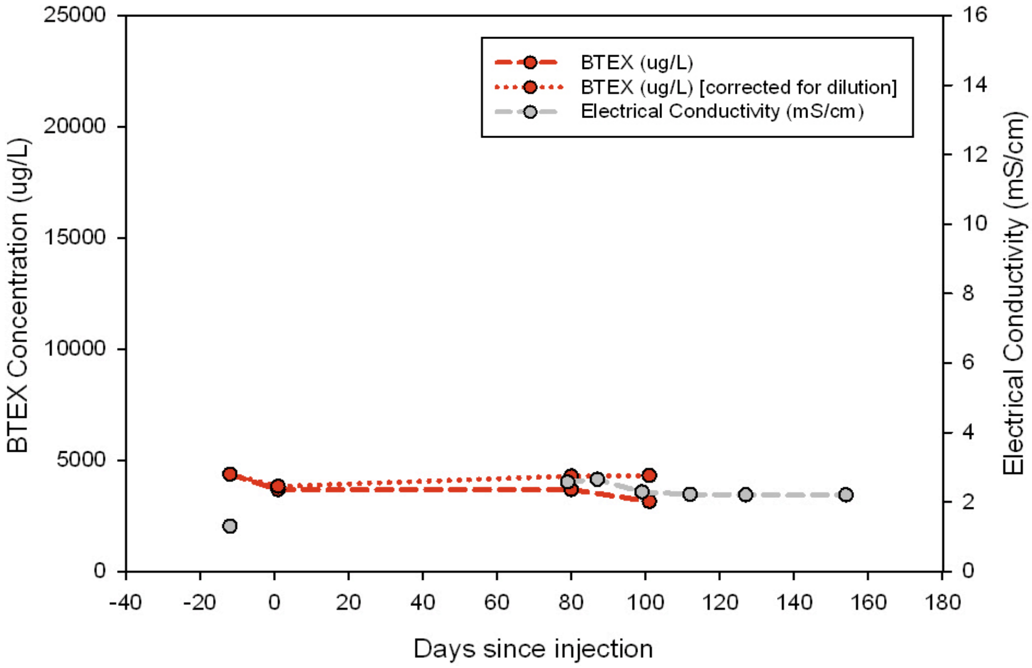

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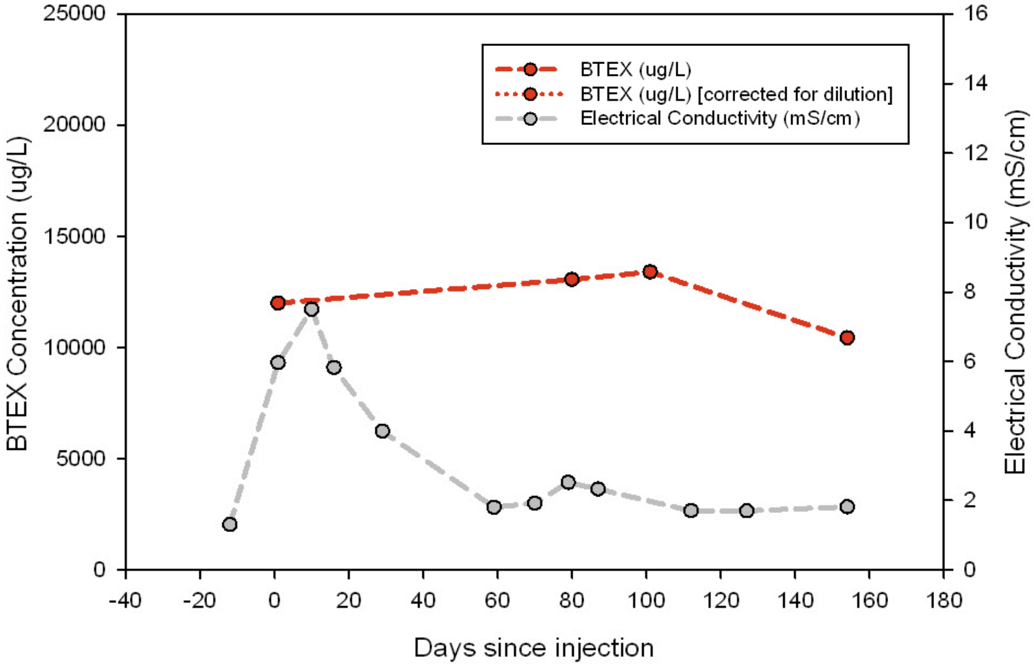
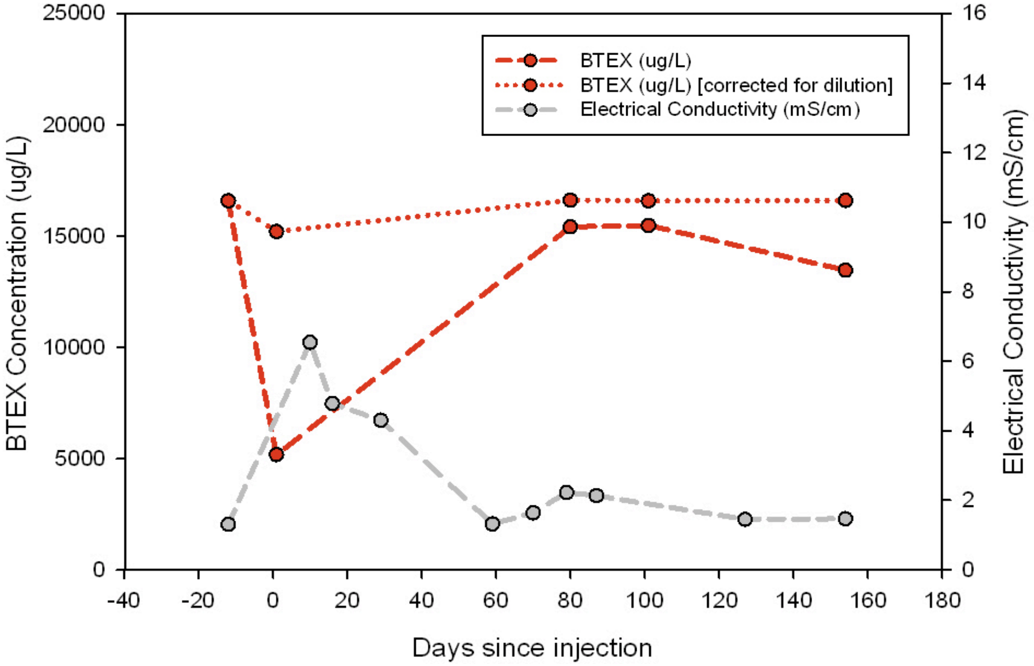


MW-302-7



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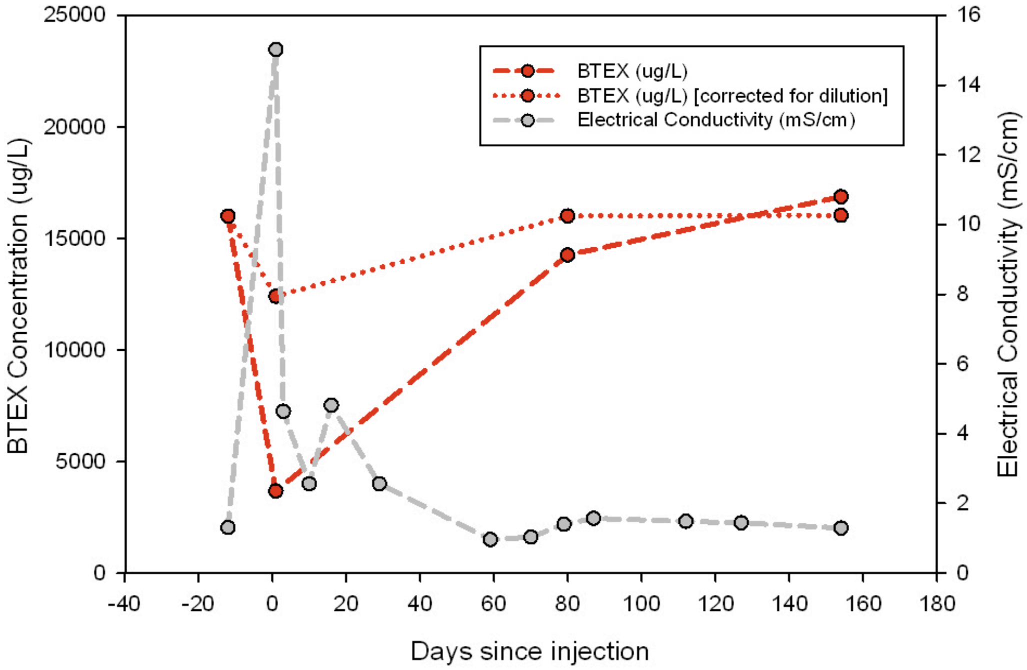

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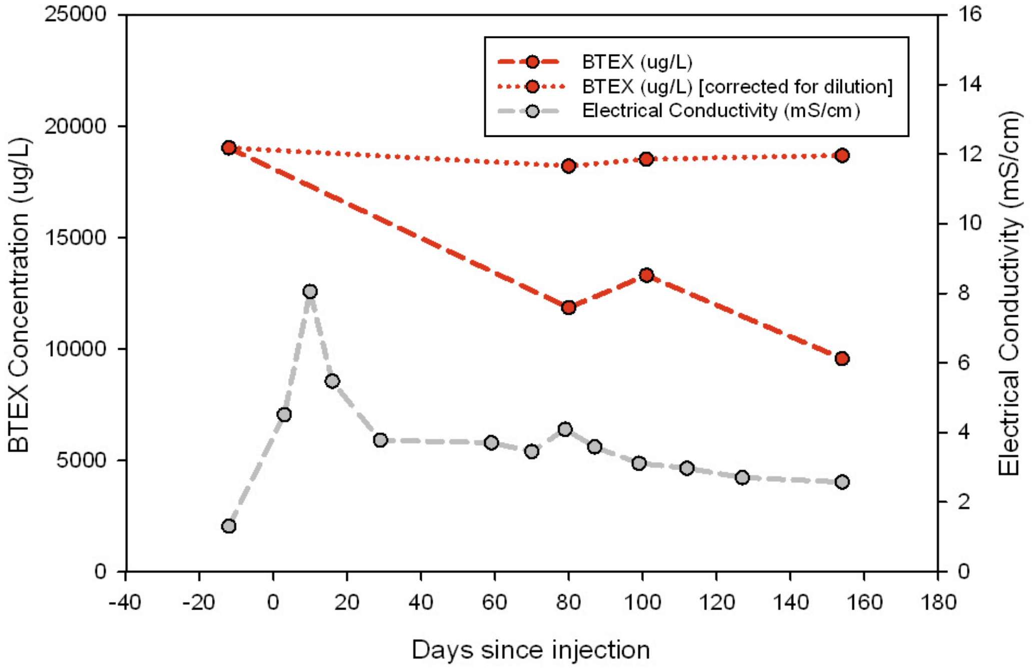

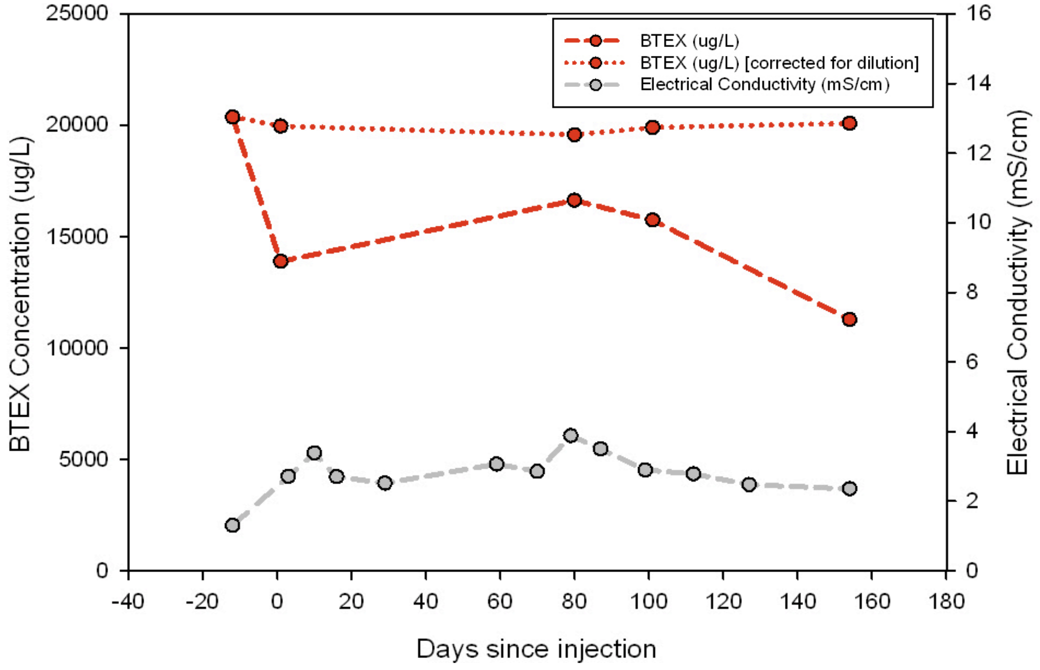
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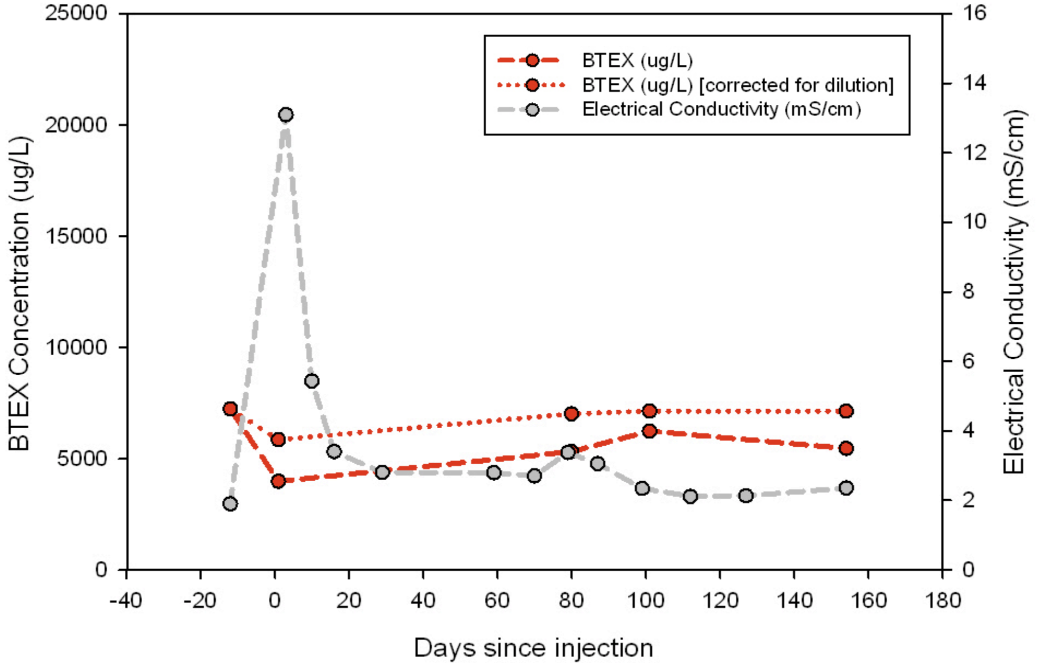
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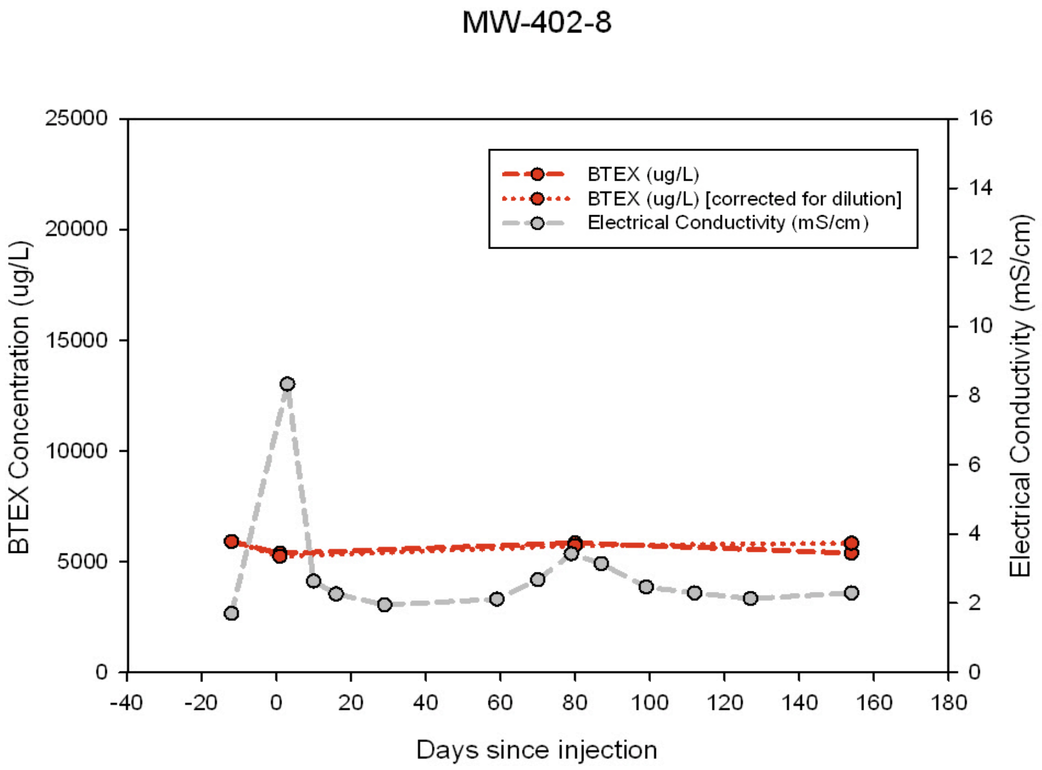

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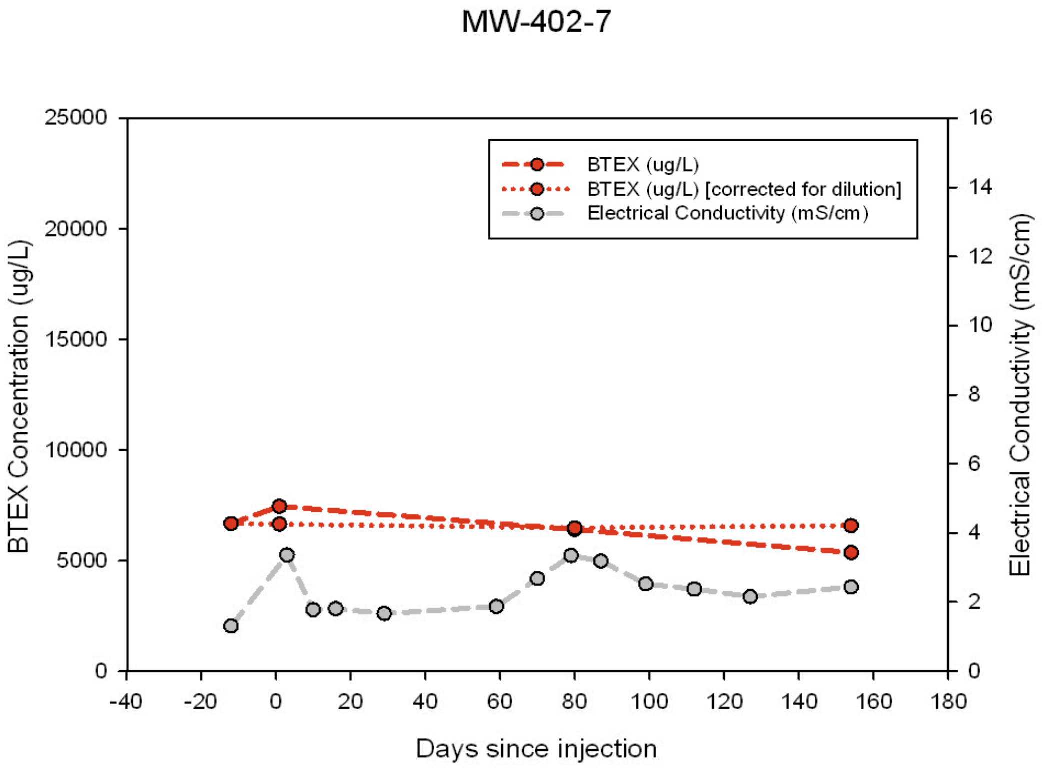

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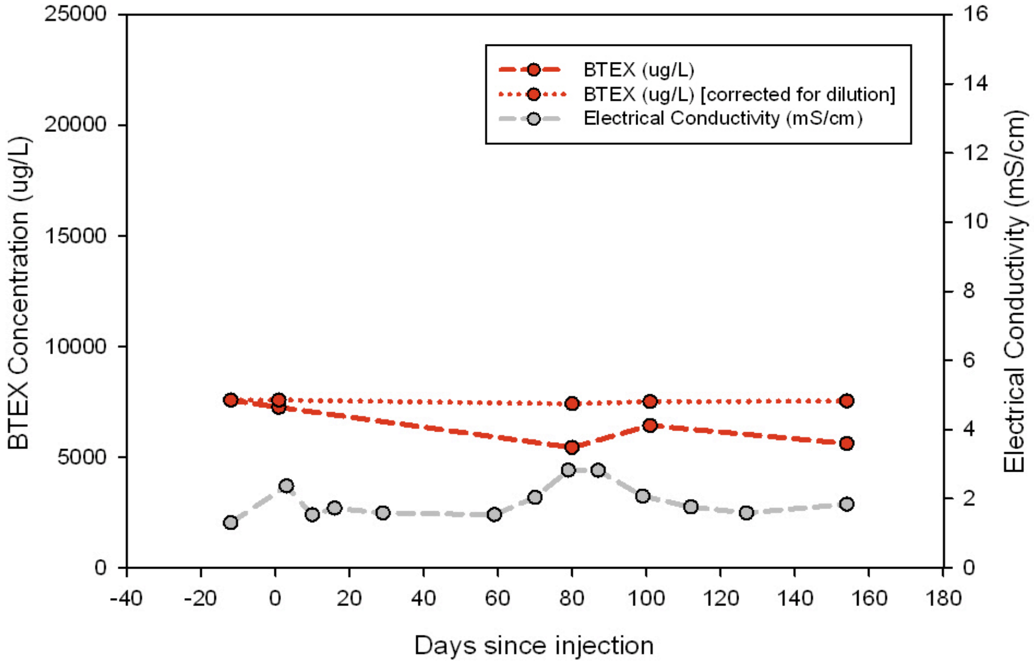

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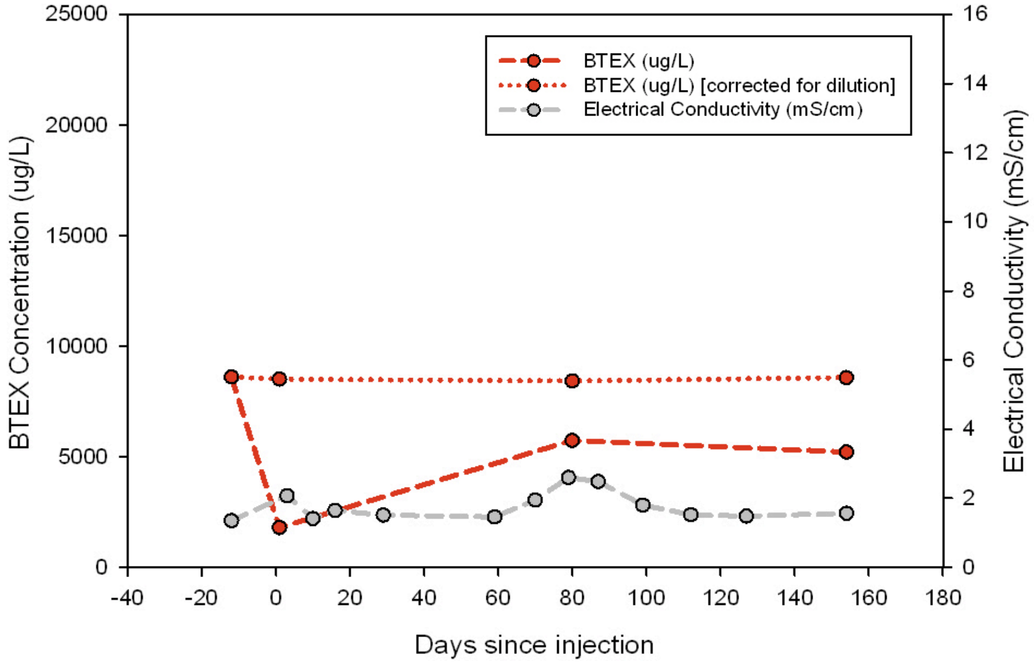
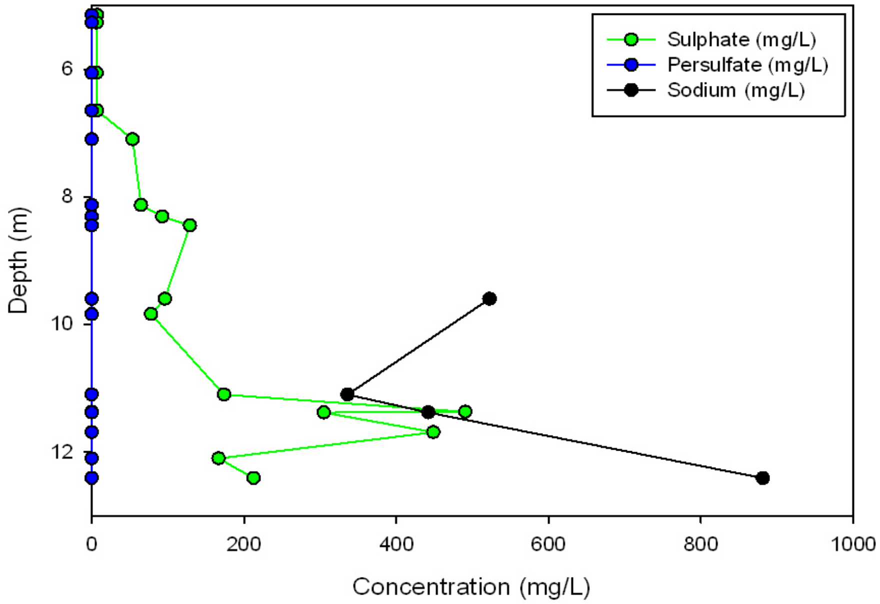
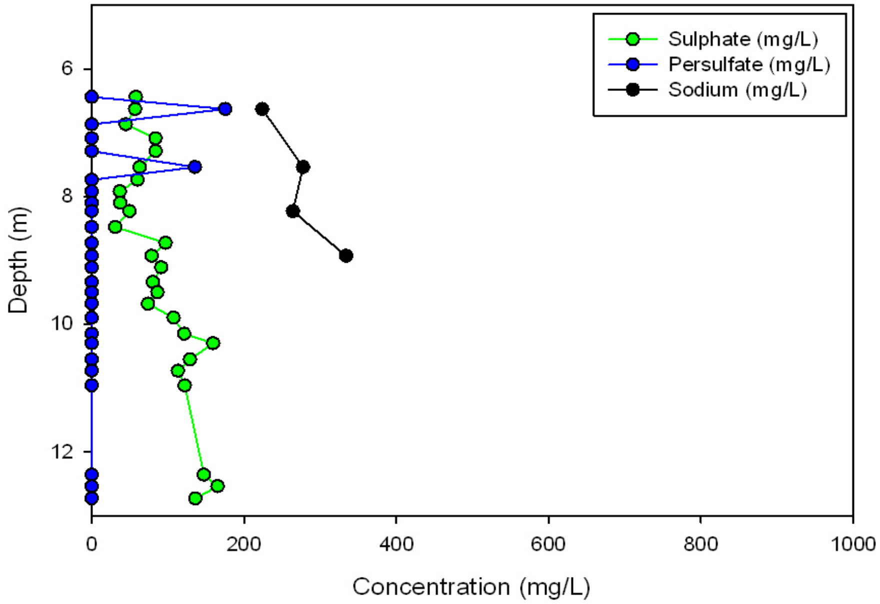


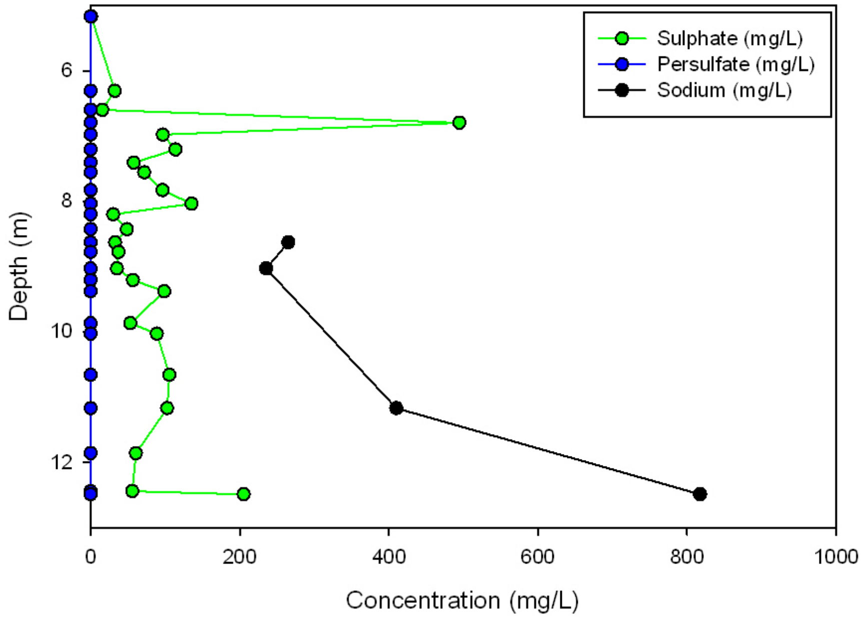
Figure 23. Sulphate, persulphate, and sodium concentrations from post-injection soil samples

BH 701



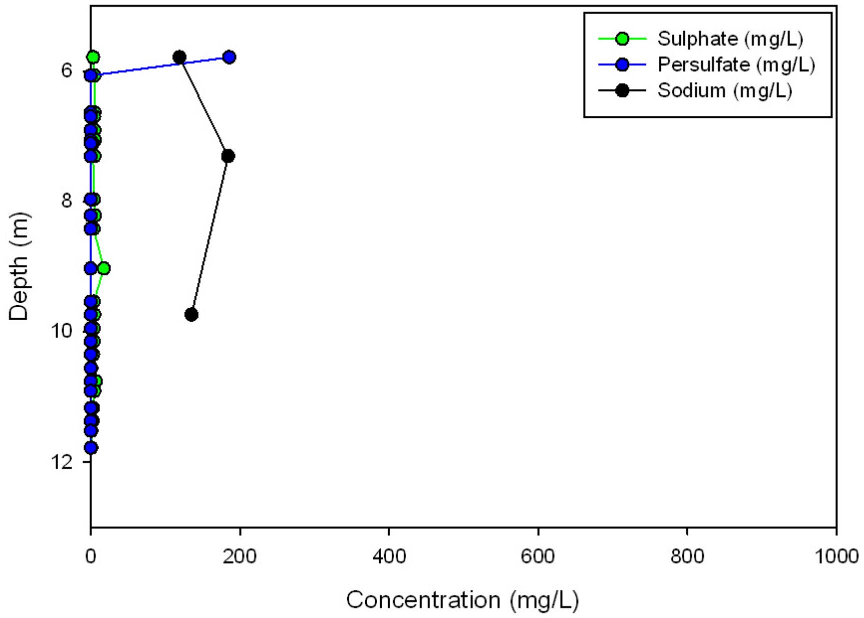
BH 702





BH 703

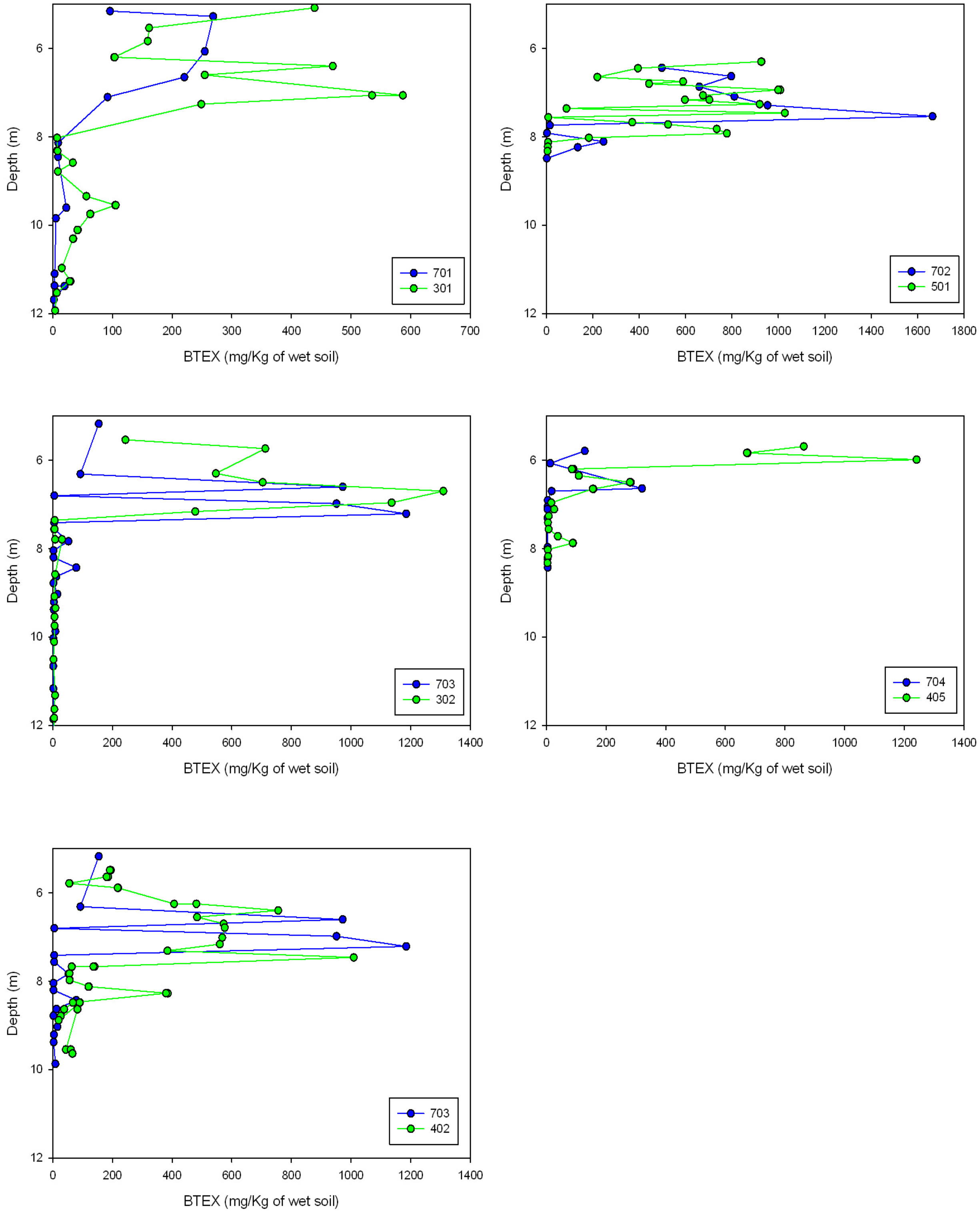
Sulphate (mg/L)
Persulfate (mg/L)
Sodium (mg/L)
Depth (m)
6
8
10
12
0
200
400
600
800
1000
Concentration (mg/L)



BH 704

Sulphate (mg/L)
Persulfate (mg/L)
Sodium (mg/L)
Depth (m)
6
8
10
12
0
200
400
600
800
1000
Concentration (mg/L)

Figure 24. Pre and post-injection residual BTEX distribution



Tables

Table 1. ***Natural Oxidant Interaction (NOI) test frequency of sampling***

	Number of samples		
Days	Active - Soil, Groundwater, Persulphate	Control - Groundwater and Persulphate	Control - Persulphate and DI
0	1	1	
1	1	1	
3	1	1	1
18	1	1	1
22	1	1	

Table 2. ***Degradation potential batch test frequency***

	Number of Samples					
	Active			Control		
Days	Soil, Groundwater, Persulphate	Soil, Persulphate	Groundwater, Persulphate	Soil, DI	Groundwater, DI	Soil, Groundwater, DI
0	3	3	3	1	3	3
1	3	3	3		3	3
7	3	3	3		3	3
14	3	3	3		3	3
21	3	3	3		3	3
35	3	3	3	1	3	3

Table 3. ***Normalized average sodium persulphate concentrations (g/L) from NOI study***

	Average Sodium Persulphate Concentrations (g/L)	C/C_0	**Average Sodium Persulphate Concentrations (g/L)**	C/C_0	**Average Sodium Persulphate Concentrations (g/L)**
Days	Active - Soil, Groundwater, Persulphate	Active - Soil, Groundwater, Persulphate	Control - Groundwater, Persulphate	Control - Groundwater, Persulphate	Control - Persulphate, DI
0	94.7	0.93	99.9	0.98	
1	97.1	0.96	99.9	0.97	
3	96.9	0.94	96.0	0.95	102
18	99.6	0.98	99.6	0.98	102
22	96.3	0.95	97.3	0.96	

Table 4. ***pH data from buffering capacity of soil test***

	pH			
	Sample 1	Sample 2	Sample 3	Control
Day	Groundwater, Sodium Persulphate, Soil	DI, Sodium Persulphate, Soil	Groundwater, Sodium Persulphate	Groundwater
0	6.8	6.8	7.2	6.6
1	6.3	6.2	3.3	6.6
4	6.2	6.1	2.7	6.6
8	6.0	5.6	2.2	6.7
14	5.7	5.5	2.0	6.6
26	5.4	5.3	1.7	6.5

Table 5. ***Summary of first order degradation coefficients from the degradation potential batch test***

Compounds	**Sample**	**R^2**	**K_{obs} (10^{-3} day^{-1})**
Benzene	Soil	0.83	31.1
	Groundwater	0.68	29.4
Toluene	Soil	0.99	150.7
	Groundwater	0.99	238.8
Ethylbenzene	Soil	0.98	165.8
	Groundwater	0.99	301.6
p,m-xylene	Soil	0.98	149.1
	Groundwater	0.99	235.2
o-xylene	Soil	0.97	133
	Groundwater	0.99	197.7
1,3,5-Trimethyl-benzene	Soil	0.99	272.9
	Groundwater	0.99	366.2
1,2,4-Trimethyl-benzene	Soil	0.94	127.2
	Groundwater	0.98	288.3
1,2,3-Trimethyl-benzene	Soil	0.99	169.7
	Groundwater	n/a	n/a
Naphthalene	Soil	0.96	135.9
	Groundwater	0.98	244.5
BTEX	Soil	0.98	146.1
	Groundwater	0.96	237.5
F1 Fraction	Soil	0.99	139.5
	Groundwater	0.88	228.3
F2 Fraction	Soil	0.98	71.3
	Groundwater	n/a	n/a
F3 Fraction	Soil	n/a	n/a
	Groundwater	n/a	n/a

Table 6. ***Dilution of injectate***

Well	Date	Days since injection	% influence of injected water	% influence of surronding background
501	5/19/2010	-12	0%	100%
	6/1/2010	1	58%	42%
	8/18/2010	80	2%	98%
	9/7/2010	101	1%	99%
	10/6/2010	128	1%	99%
	11/1/2010	154	1%	99%
301-6	5/19/2010	-12	0%	100%
	6/1/2010	1	12%	88%
	8/18/2010	80	2%	98%
	9/7/2010	101	1%	99%
	10/6/2010	128	1%	99%
	11/1/2010	154	n/a	n/a
301-8	5/19/2010	-12	0%	100%
	6/1/2010	1	n/a	n/a
	8/18/2010	80	2%	98%
	9/7/2010	101	1%	99%
	10/6/2010	128	1%	99%
	11/1/2010	154	1%	99%
301-9	5/19/2010	-12	0%	100%
	8/18/2010	80	7%	93%
	9/7/2010	101	4%	96%
	10/6/2010	128	3%	97%
	11/1/2010	154	3%	97%
301-11	5/19/2010	-12	0%	100%
	8/18/2010	80	7%	93%
	9/7/2010	101	5%	95%
	10/6/2010	128	4%	96%
	11/1/2010	154	3%	97%
302-6	5/19/2010	-12	0%	100%
	6/1/2010	1	22%	78%
	8/18/2010	80	0%	100%
	9/7/2010	101	0%	100%
	10/6/2010	128	0%	100%
	11/1/2010	154	0%	100%
302-7	5/19/2010	-12	0%	100%
	6/1/2010	1	8%	92%
	8/18/2010	80	0%	100%
	9/7/2010	101	0%	100%
	10/6/2010	128	0%	100%
	11/1/2010	154	0%	100%

302-9	5/19/2010	-12	0%	100%
	6/1/2010	1	10%	90%
	8/18/2010	80	2%	98%
	9/7/2010	101	1%	99%
	10/6/2010	128	0%	100%
	11/1/2010	154	1%	99%
401-7	5/19/2010	-12	0%	100%
	6/1/2010	1	2%	98%
	8/18/2010	80	4%	96%
	9/7/2010	101	2%	98%
	10/6/2010	128	2%	98%
	11/1/2010	154	1%	99%
401-9	5/19/2010	-12	0%	100%
	6/1/2010	1	7%	93%
	8/18/2010	80	4%	96%
	9/7/2010	101	3%	97%
	10/6/2010	128	2%	98%
	11/1/2010	154	2%	98%
402-5	5/19/2010	-12	0%	100%
	6/1/2010	1	1%	99%
	8/18/2010	80	2%	98%
	9/7/2010	101	1%	99%
	10/6/2010	128	0%	100%
	11/1/2010	154	0%	100%
402-6	5/19/2010	-12	0%	100%
	6/1/2010	1	0%	100%
	8/18/2010	80	2%	98%
	9/7/2010	101	1%	99%
	10/6/2010	128	0%	100%
	11/1/2010	154	1%	99%
402-7	5/19/2010	-12	0%	100%
	6/1/2010	1	0%	100%
	8/18/2010	80	3%	97%
	9/7/2010	101	2%	98%
	10/6/2010	128	1%	99%
	11/1/2010	154	1%	99%
402-8	5/19/2010	-12	0%	100%
	6/1/2010	1	11%	89%
	8/18/2010	80	3%	97%
	9/7/2010	101	2%	98%
	10/6/2010	128	1%	99%
	11/1/2010	154	1%	99%
402-9	5/19/2010	-12	0%	100%
	6/1/2010	1	19%	81%
	8/18/2010	80	3%	97%
	9/7/2010	101	1%	99%
	10/6/2010	128	1%	99%
	11/1/2010	154	1%	99%

Appendix A: Data tables

Electrical conductivity and pH data

Well	Date	Conductivity (mS/cm)	Temp (°C)	pH
501	22-Jul-09	1.445	10.0	7.20
501	20-Aug-09	1.502	12.6	7.00
501	24-Sep-09	1.467	12.5	7.10
501	27-Oct-09	1.053	11.6	7.10
501	20-Nov-09	1.002	11.0	6.50
501	15-Dec-09	0.957	10.7	7.00
501	23-May-10	1.450	12.0	6.50
301-10	23-May-10	n/a	n/a	n/a
301-11	23-May-10	1.300	11.5	n/a
301-5	23-May-10	n/a	n/a	n/a
301-6	23-May-10	1.710	11.7	5.91
301-7	23-May-10	1.960	11.7	5.65
301-8	23-May-10	1.800	11.6	6.32
301-9	23-May-10	1.305	11.5	n/a
302-10	23-May-10	n/a	n/a	n/a
302-13	23-May-10	n/a	n/a	n/a
302-5	23-May-10	n/a	n/a	n/a
302-6	23-May-10	n/a	n/a	n/a
302-7	23-May-10	1.295	11.5	n/a
302-8	23-May-10	n/a	n/a	n/a
302-9	23-May-10	1.400	11.7	n/a
303-11	23-May-10	1.300	11.3	n/a
303-6	23-May-10	n/a	n/a	n/a
303-7	23-May-10	n/a	n/a	n/a
401-1	23-May-10	n/a	n/a	n/a
401-2	23-May-10	n/a	n/a	n/a
401-3	23-May-10	1.270	12.3	n/a
401-4	23-May-10	n/a	n/a	n/a
401-5	23-May-10	1.360	11.3	6.44
401-6	23-May-10	n/a	n/a	n/a
401-7	23-May-10	1.450	11.4	6.55
401-8	23-May-10	n/a	n/a	n/a
401-9	23-May-10	n/a	n/a	n/a
402-1	23-May-10	n/a	n/a	n/a
402-2	23-May-10	n/a	n/a	n/a
402-3	23-May-10	n/a	n/a	n/a
402-4	23-May-10	n/a	n/a	n/a

402-5	23-May-10	1.350	12.0	6.07
402-6	23-May-10	1.527	11.7	n/a
402-7	23-May-10	1.300	11.5	6.16
402-8	23-May-10	1.700	n/a	n/a
402-9	23-May-10	1.900	11.4	n/a
501	01-Jun-10	36.530	11.3	n/a
501	03-Jun-10	26.500	12.0	n/a
602	03-Jun-10	1.401	11.0	n/a
302-6	03-Jun-10	4.640	11.6	n/a
303-7	03-Jun-10	1.403	16.1	n/a
304-7	03-Jun-10	0.782	11.0	n/a
401-5	03-Jun-10	1.765	12.1	n/a
401-7	03-Jun-10	2.710	10.5	n/a
402-5	03-Jun-10	2.070	11.0	n/a
403-5	03-Jun-10	1.460	11.2	n/a
403-6	03-Jun-10	1.213	10.6	n/a
403-8	03-Jun-10	1.442	11.1	n/a
405-5	03-Jun-10	0.841	10.0	n/a
405-6	03-Jun-10	1.195	11.3	n/a
405-7	03-Jun-10	1.166	10.1	n/a
405-8	03-Jun-10	1.179	10.7	n/a
405-9	03-Jun-10	1.076	10.3	n/a
406-5	03-Jun-10	0.800	10.1	n/a
406-6	03-Jun-10	0.812	11.1	n/a
406-7	03-Jun-10	0.865	11.1	n/a
406-8	03-Jun-10	0.895	10.9	n/a
406-9	03-Jun-10	0.904	10.7	n/a
501	10-Jun-10	11.100	10.6	n/a
602	10-Jun-10	1.430	11.6	n/a
302-13	10-Jun-10	6.100	18.0	n/a
302-6	10-Jun-10	2.560	11.3	n/a
302-7	10-Jun-10	6.540	11.9	n/a
302-8	10-Jun-10	5.500	12.5	n/a
302-9	10-Jun-10	7.500	12.7	n/a
303-11	10-Jun-10	3.750	12.0	n/a
401-5	10-Jun-10	2.560	13.1	n/a
401-6	10-Jun-10	2.690	11.7	n/a
401-7	10-Jun-10	3.380	11.2	n/a
401-8	10-Jun-10	5.360	11.3	n/a
402-4	10-Jun-10	1.393	12.3	n/a

402-5	10-Jun-10	1.406	11.4	n/a
402-6	10-Jun-10	1.527	11.9	n/a
402-7	10-Jun-10	1.772	12.4	n/a
402-8	10-Jun-10	2.630	11.6	n/a
402-9	10-Jun-10	5.430	11.5	n/a
403-6	10-Jun-10	1.446	12.7	n/a
403-9	10-Jun-10	1.590	12.1	n/a
404-6	10-Jun-10	1.400	12.0	n/a
404-9	10-Jun-10	1.372	11.6	n/a
405-4	10-Jun-10	0.847	11.9	n/a
405-6	10-Jun-10	1.281	11.3	n/a
405-9	10-Jun-10	1.150	11.6	n/a
406-4	10-Jun-10	0.803	11.9	n/a
406-5	10-Jun-10	0.847	12.4	n/a
406-6	10-Jun-10	0.861	12.2	n/a
406-8	10-Jun-10	0.894	11.6	n/a
406-9	10-Jun-10	0.895	11.6	n/a

501	16-Jun-10	7.970	11.5	n/a
602	16-Jun-10	1.435	10.7	n/a
604	16-Jun-10	1.706	11.1	n/a
301-6	16-Jun-10	9.000	n/a	n/a
302-13	16-Jun-10	6.180	14.6	n/a
302-6	16-Jun-10	4.810	11.4	n/a
302-7	16-Jun-10	4.780	11.2	n/a
302-8	16-Jun-10	5.900	12.3	n/a
302-9	16-Jun-10	5.820	12.5	n/a
303-11	16-Jun-10	2.430	11.4	n/a
401-4	16-Jun-10	2.780	12.6	n/a
401-5	16-Jun-10	2.180	11.8	n/a
401-6	16-Jun-10	2.300	12.2	n/a
401-7	16-Jun-10	2.700	11.5	n/a
401-8	16-Jun-10	3.690	11.9	n/a
401-9	16-Jun-10	5.470	12.0	n/a
402-4	16-Jun-10	1.661	11.0	n/a
402-5	16-Jun-10	1.643	11.4	n/a
402-6	16-Jun-10	1.721	11.7	n/a
402-7	16-Jun-10	1.804	11.2	n/a
402-8	16-Jun-10	2.260	11.1	n/a
402-9	16-Jun-10	3.400	11.6	n/a
404-5	16-Jun-10	1.359	10.9	n/a
404-9	16-Jun-10	1.323	10.6	n/a
406-4	16-Jun-10	0.908	11.4	n/a

406-8	16-Jun-10	0.880	11.6	n/a
406-9	16-Jun-10	0.905	11.2	n/a
501	29-Jun-10	5.960	10.6	n/a
602	29-Jun-10	1.368	10.1	n/a
302-13	29-Jun-10	4.890	12.5	n/a
302-5	29-Jun-10	n/a	n/a	n/a
302-6	29-Jun-10	2.560	10.5	n/a
302-7	29-Jun-10	4.300	10.6	n/a
302-8	29-Jun-10	4.610	11.3	n/a
302-9	29-Jun-10	3.990	11.7	n/a
401-5	29-Jun-10	2.530	10.8	n/a
401-6	29-Jun-10	2.240	10.8	n/a
401-7	29-Jun-10	2.510	10.6	n/a
401-8	29-Jun-10	2.470	10.7	n/a
401-9	29-Jun-10	3.780	10.6	n/a
402-5	29-Jun-10	1.507	10.0	n/a
402-6	29-Jun-10	1.586	10.2	n/a
402-7	29-Jun-10	1.662	10.2	n/a
402-8	29-Jun-10	1.945	10.4	n/a
402-9	29-Jun-10	2.800	10.3	n/a
403-6	29-Jun-10	1.395	10.0	n/a
403-9	29-Jun-10	1.461	9.8	n/a
405-6	29-Jun-10	1.192	9.8	n/a
405-9	29-Jun-10	1.016	10.0	n/a
501	29-Jul-10	3.030	13.3	6.06
602	29-Jul-10	1.180	11.6	6.99
604	29-Jul-10	1.837	14.3	7.40
302-13	29-Jul-10	3.340	15.5	6.18
302-5	29-Jul-10	2.100	13.6	6.70
302-6	29-Jul-10	0.960	12.8	6.80
302-7	29-Jul-10	1.314	12.5	6.73
302-8	29-Jul-10	1.439	12.6	6.72
302-9	29-Jul-10	1.800	12.3	6.69
303-11	29-Jul-10	1.403	11.9	6.96
303-6	29-Jul-10	1.076	19.3	6.87
303-7	29-Jul-10	1.305	20.3	7.08
401-1	29-Jul-10	3.150	13.1	6.60
401-2	29-Jul-10	2.900	12.9	6.59
401-3	29-Jul-10	3.590	13.9	6.65
401-4	29-Jul-10	3.650	12.8	6.44
401-5	29-Jul-10	3.440	12.4	6.45

401-6	29-Jul-10	3.240	12.4	6.38
401-7	29-Jul-10	3.060	11.7	6.39
401-8	29-Jul-10	3.120	11.7	6.35
401-9	29-Jul-10	3.700	11.7	6.22
402-4	29-Jul-10	1.509	12.1	6.90
402-5	29-Jul-10	1.455	12.0	6.92
402-6	29-Jul-10	1.536	12.0	6.82
402-7	29-Jul-10	1.869	11.4	6.78
402-8	29-Jul-10	2.110	11.5	6.72
402-9	29-Jul-10	2.790	11.8	6.64
405-7	29-Jul-10	1.239	12.7	7.02
405-9	29-Jul-10	1.038	13.7	7.09
501	09-Aug-10	2.760	14.8	5.64
302-13	09-Aug-10	2.840	19.3	n/a
302-5	09-Aug-10	1.540	14.7	5.99
302-6	09-Aug-10	1.025	14.4	5.84
302-7	09-Aug-10	1.635	13.7	5.00
302-8	09-Aug-10	1.720	14.9	6.30
302-9	09-Aug-10	1.911	13.8	6.15
401-1	09-Aug-10	2.960	16.4	5.94
401-2	09-Aug-10	2.320	15.0	n/a
401-3	09-Aug-10	3.620	17.1	5.06
401-4	09-Aug-10	3.180	13.8	4.80
401-5	09-Aug-10	3.270	14.1	5.12
401-6	09-Aug-10	2.950	14.2	5.45
401-7	09-Aug-10	2.850	13.0	5.55
401-8	09-Aug-10	3.130	13.3	5.64
401-9	09-Aug-10	3.450	13.0	5.66
402-4	09-Aug-10	1.953	13.3	5.40
402-5	09-Aug-10	1.947	13.9	5.60
402-6	09-Aug-10	2.030	13.5	5.72
402-7	09-Aug-10	2.670	12.8	5.73
402-8	09-Aug-10	2.670	12.9	5.84
402-9	09-Aug-10	2.700	12.7	5.90
501	18-Aug-10	2.400	15.3	6.20
602	18-Aug-10	1.502	13.4	5.29
301-10	18-Aug-10	4.180	16.8	6.04
301-11	18-Aug-10	6.000	11.9	6.02
301-5	18-Aug-10	2.010	15.6	6.05
301-6	18-Aug-10	2.570	13.6	6.28
301-7	18-Aug-10	2.570	12.7	6.12

301-8	18-Aug-10	2.470	12.9	6.24
301-9	18-Aug-10	5.720	12.9	5.89
302-?A	18-Aug-10	3.070	21.0	5.18
302-10	18-Aug-10	3.140	26.4	6.16
302-13	18-Aug-10	3.110	16.5	6.22
302-6	18-Aug-10	1.395	15.0	6.29
302-7	18-Aug-10	2.220	14.3	6.14
302-8	18-Aug-10	2.310	14.4	6.15
302-9	18-Aug-10	2.510	14.1	6.20
303-6	18-Aug-10	1.193	21.1	6.32
303-7	18-Aug-10	1.535	22.1	6.43
401-1	18-Aug-10	5.000	18.4	6.45
401-2	18-Aug-10	4.840	15.4	6.21
401-3	18-Aug-10	4.840	15.4	6.14
401-4	18-Aug-10	4.400	14.5	5.84
401-5	18-Aug-10	4.280	14.6	5.83
401-6	18-Aug-10	3.820	13.5	5.82
401-7	18-Aug-10	3.880	13.7	5.80
401-8	18-Aug-10	3.820	12.6	5.70
401-9	18-Aug-10	4.090	14.3	5.70
402-1	18-Aug-10	3.030	14.5	6.07
402-2	18-Aug-10	2.600	14.4	6.17
402-3	18-Aug-10	2.620	14.2	6.16
402-4	18-Aug-10	2.620	14.1	6.19
402-5	18-Aug-10	2.600	13.9	6.17
402-6	18-Aug-10	2.820	13.8	6.14
402-7	18-Aug-10	3.340	13.7	6.11
402-8	18-Aug-10	3.420	13.3	6.06
402-9	18-Aug-10	3.370	13.7	6.09
405-9	18-Aug-10	1.375	12.9	5.16
501	26-Aug-10	2.630	13.6	6.53
602	26-Aug-10	1.439	12.3	7.00
301-?	26-Aug-10	2.660	14.1	6.88
301-10	26-Aug-10	3.490	16.7	6.78
301-11	26-Aug-10	5.460	12.2	6.51
301-6	26-Aug-10	2.650	13.7	6.92
301-7	26-Aug-10	2.680	13.1	6.86
301-8	26-Aug-10	2.650	13.2	6.94
301-9	26-Aug-10	5.050	13.3	6.65
302-?A	26-Aug-10	2.810	17.8	n/a
302-10	26-Aug-10	2.810	21.4	6.76
302-13	26-Aug-10	2.820	16.1	7.06

302-5	26-Aug-10	1.647	14.9	6.69
302-6	26-Aug-10	1.567	13.8	6.51
302-7	26-Aug-10	2.130	14.3	6.07
302-8	26-Aug-10	2.190	13.2	5.75
302-9	26-Aug-10	2.320	15.8	6.75
303-11	26-Aug-10	1.634	11.6	6.86
303-6	26-Aug-10	1.232	17.4	6.98
401-1	26-Aug-10	5.100	16.1	7.13
401-2	26-Aug-10	4.980	14.3	6.84
401-3	26-Aug-10	4.700	15.1	6.90
401-4	26-Aug-10	4.300	14.1	6.62
401-5	26-Aug-10	4.200	13.4	6.70
401-6	26-Aug-10	3.770	13.1	6.74
401-7	26-Aug-10	3.500	12.1	6.57
401-8	26-Aug-10	3.560	11.8	6.51
401-9	26-Aug-10	3.580	13.4	6.93
402-1	26-Aug-10	2.280	14.8	6.81
402-2	26-Aug-10	1.932	13.7	6.89
402-3	26-Aug-10	2.340	13.4	6.83
402-4	26-Aug-10	2.400	13.9	6.80
402-5	26-Aug-10	2.480	13.2	6.86
402-6	26-Aug-10	2.820	13.1	6.89
402-7	26-Aug-10	3.180	12.2	6.78
402-8	26-Aug-10	3.140	13.1	6.79
402-9	26-Aug-10	3.050	12.0	6.87
405-2	26-Aug-10	1.257	13.9	n/a
405-6	26-Aug-10	1.605	12.6	7.24
405-9	26-Aug-10	1.322	13.6	7.28
501	07-Sep-10	2.050	13.4	5.50
602	07-Sep-10	1.248	11.1	6.90
301-?	07-Sep-10	2.320	n/a	n/a
301-10	07-Sep-10	2.970	14.7	7.10
301-11	07-Sep-10	4.280	12.5	6.90
301-6	07-Sep-10	2.290	13.9	6.80
301-7	07-Sep-10	2.320	13.3	6.70
301-8	07-Sep-10	2.310	12.9	6.80
301-9	07-Sep-10	4.120	13.1	6.60
302-10	07-Sep-10	2.200	16.3	6.60
303-11	07-Sep-10	1.346	12.5	5.50
303-7	07-Sep-10	1.287	14.5	6.40
401-1	07-Sep-10	4.120	13.8	6.30
401-2	07-Sep-10	4.050	13.6	6.60

401-3	07-Sep-10	3.930	13.8	6.80
401-4	07-Sep-10	3.390	12.9	6.70
401-5	07-Sep-10	3.220	12.8	6.70
401-6	07-Sep-10	3.030	12.7	6.70
401-7	07-Sep-10	2.890	12.1	6.80
401-8	07-Sep-10	2.980	12.2	6.80
401-9	07-Sep-10	3.110	11.8	6.60
402-2	07-Sep-10	1.577	13.3	6.30
402-3	07-Sep-10	1.814	12.9	6.20
402-4	07-Sep-10	1.831	12.8	6.00
402-5	07-Sep-10	1.798	12.7	5.90
402-6	07-Sep-10	2.070	12.2	5.80
402-7	07-Sep-10	2.520	11.5	5.60
402-8	07-Sep-10	2.460	12.4	5.20
402-9	07-Sep-10	2.340	11.4	n/a
501	20-Sep-10	2.110	13.7	5.60
602	20-Sep-10	1.256	12.0	7.00
301-?	20-Sep-10	2.290	13.0	7.30
301-10	20-Sep-10	2.930	15.4	7.50
301-6	20-Sep-10	2.220	14.2	6.90
301-7	20-Sep-10	2.250	13.5	7.20
301-8	20-Sep-10	2.270	12.6	7.30
301-9	20-Sep-10	3.890	12.8	7.20
302-13	20-Sep-10	2.130	16.0	7.50
302-6	20-Sep-10	1.478	13.6	7.10
302-8	20-Sep-10	1.659	13.7	7.10
302-9	20-Sep-10	1.697	13.9	7.20
401-2	20-Sep-10	3.620	16.7	7.50
401-3	20-Sep-10	3.510	16.6	7.40
401-4	20-Sep-10	3.090	15.8	7.70
401-5	20-Sep-10	2.910	14.3	7.50
401-6	20-Sep-10	2.820	14.1	7.60
401-7	20-Sep-10	2.780	13.6	7.50
401-8	20-Sep-10	2.790	14.0	7.50
401-9	20-Sep-10	2.970	13.3	7.30
402-3	20-Sep-10	1.549	14.4	7.20
402-4	20-Sep-10	1.546	13.7	7.20
402-5	20-Sep-10	1.521	13.5	7.00
402-6	20-Sep-10	1.758	13.3	6.90
402-7	20-Sep-10	2.370	13.1	6.70
402-8	20-Sep-10	2.290	12.6	6.60
402-9	20-Sep-10	2.110	12.6	6.50

501	05-Oct-10	2.030	14.0	7.17
602	05-Oct-10	1.246	11.4	7.80
301-10	05-Oct-10	2.780	14.8	7.43
301-11	05-Oct-10	3.980	11.9	7.10
301-6	05-Oct-10	2.200	13.5	7.65
301-7	05-Oct-10	2.200	12.9	7.60
301-8	05-Oct-10	2.210	13.1	7.60
301-9	05-Oct-10	3.410	12.8	7.56
302-10	05-Oct-10	2.090	18.0	7.90
302-13	05-Oct-10	1.925	13.7	6.28
302-6	05-Oct-10	1.437	13.6	6.93
302-7	05-Oct-10	1.448	13.1	6.85
302-8	05-Oct-10	1.476	13.3	6.81
302-9	05-Oct-10	1.696	13.1	6.76
303-7	05-Oct-10	1.215	19.8	n/a
401-3	05-Oct-10	2.960	14.8	7.57
401-4	05-Oct-10	2.690	13.8	7.57
401-5	05-Oct-10	2.580	12.9	7.26
401-6	05-Oct-10	2.420	12.8	7.28
401-7	05-Oct-10	2.470	12.5	7.22
401-8	05-Oct-10	2.540	12.2	7.23
401-9	05-Oct-10	2.700	11.4	7.31
402-3	05-Oct-10	1.557	13.7	7.60
402-4	05-Oct-10	1.563	13.5	7.70
402-5	05-Oct-10	1.481	13.4	7.40
402-6	05-Oct-10	1.585	12.9	6.86
402-7	05-Oct-10	2.150	12.5	7.75
402-8	05-Oct-10	2.130	12.2	7.58
402-9	05-Oct-10	2.130	12.2	7.14
405-9	05-Oct-10	1.160	12.2	7.66
501	01-Nov-10	2.100	10.4	n/a
602	01-Nov-10	1.245	11.1	n/a
301-?	01-Nov-10	2.400	10.5	n/a
301-10	01-Nov-10	2.510	11.3	n/a
301-11	01-Nov-10	3.420	10.5	n/a
301-7	01-Nov-10	2.360	11.8	n/a
301-8	01-Nov-10	2.390	11.4	n/a
301-9	01-Nov-10	3.090	11.1	n/a
302-10	01-Nov-10	2.240	11.1	n/a
302-13	01-Nov-10	2.050	10.3	n/a
302-6	01-Nov-10	1.287	11.7	n/a

302-7	01-Nov-10	1.467	11.9	n/a
302-8	01-Nov-10	1.496	11.6	n/a
302-9	01-Nov-10	1.814	11.2	n/a
303-11	01-Nov-10	1.483	10.8	n/a
303-7	01-Nov-10	1.204	10.7	n/a
401-2	01-Nov-10	2.650	11.2	n/a
401-3	01-Nov-10	2.700	11.2	n/a
401-4	01-Nov-10	2.350	11.6	n/a
401-5	01-Nov-10	2.300	11.4	n/a
401-6	01-Nov-10	2.270	11.4	n/a
401-7	01-Nov-10	2.350	11.1	n/a
401-8	01-Nov-10	2.430	10.9	n/a
401-9	01-Nov-10	2.570	10.8	n/a
402-3	01-Nov-10	1.653	11.7	n/a
402-4	01-Nov-10	1.733	12.0	n/a
402-5	01-Nov-10	1.559	12.0	n/a
402-6	01-Nov-10	1.835	12.0	n/a
402-7	01-Nov-10	2.430	11.4	n/a
402-8	01-Nov-10	2.290	11.0	n/a
402-9	01-Nov-10	2.350	10.8	n/a
403-5	01-Nov-10	1.483	11.6	n/a
403-9	01-Nov-10	1.777	10.6	n/a
405-5	01-Nov-10	1.134	10.8	n/a
405-6	01-Nov-10	1.352	11.2	n/a
405-7	01-Nov-10	1.392	10.9	n/a
405-8	01-Nov-10	1.408	11.0	n/a
405-9	01-Nov-10	1.286	10.9	n/a

Persulphate, sulphate and sodium (groundwater) data:

Sample	Time	Date	Sulphate Concentration (mg/L)	Persulphate Concentration (mg/L)	Sodium Concentration (mg/L)	Corrected Sodium Concentration
501		03-Nov-09	ND	n/a	n/a	n/a
501		27-Apr-10	15.0	n/a	n/a	n/a
501		19-May-10	ND	n/a	n/a	n/a
301-3		23-May-10	n/a	ND	n/a	n/a
301-6		23-May-10	ND	ND	675.5	678.8
301-8		23-May-10	ND	ND	n/a	n/a
301-9		23-May-10	ND	ND	n/a	n/a
301-11		23-May-10	ND	ND	571.4	573.6
302-6		23-May-10	45.2	ND	422.0	422.7
302-7		23-May-10	42.2	ND	392.7	393.1
302-8		23-May-10	43.9	ND	n/a	n/a
302-9		23-May-10	27.7	ND	n/a	n/a
303-11		23-May-10	ND	n/a	n/a	n/a
303-7		23-May-10	ND	ND	481.6	482.9
401-4		23-May-10	ND	ND	572.6	574.8
401-6		23-May-10	ND	284.0	616.6	619.3
401-7		23-May-10	ND	171.4	615.1	617.7
401-8		23-May-10	ND	ND	n/a	n/a
401-9		23-May-10	ND	372.1	613.6	616.2
402-5		23-May-10	9.4	ND	443.7	444.6
402-6		23-May-10	7.6	156.7	n/a	n/a
402-7		23-May-10	9.5	ND	511.1	512.7
402-8		23-May-10	9.8	342.7	n/a	n/a
402-9		23-May-10	10.5	ND	563.1	565.2
405-9		23-May-10	0.0	ND	n/a	n/a
602		23-May-10	9.2	ND	n/a	n/a
501		01-Jun-10	9200.5	7194.0	9163.0	9252.0
301-6	11:32 AM	01-Jun-10	17.6	ND	367.9	368.0
301-6	1:50 PM	01-Jun-10	83.8	558.1	418.9	419.6
301-6	3:46 PM	01-Jun-10	857.1	6290.0	1487.0	1498.4
302-6	9:25 PM	01-Jun-10	1790.5	3298.0	1115.0	1122.7
302-7	2:45 PM	01-Jun-10	5023.6	7072.0	3961.0	3997.4
303-7		01-Jun-10	2.1	ND	163.3	161.4
401-5	11:23 AM	01-Jun-10	8.6	<MDL	n/a	n/a
401-5	1:47 PM	01-Jun-10	12.2	<MDL	n/a	n/a
401-5	3:45 PM	01-Jun-10	40.5	<MDL	242.1	241.0
401-5	9:17 PM	01-Jun-10	318.8	274.1	340.0	339.9
401-7		01-Jun-10	733.2	1067.0	617.9	620.6
401-9		01-Jun-10	1362.1	2614.0	1058.0	1065.1
402-5	11:19 AM	01-Jun-10	6.9	ND	173.2	171.4
402-5	1:43 PM	01-Jun-10	864.2	2650.0	711.6	715.2
402-5	3:42 PM	01-Jun-10	1100.2	2919.0	752.8	756.8
402-5	8:46 PM	01-Jun-10	1144.4	ND	399.0	399.5
402-6		01-Jun-10	1170.7	489.6	n/a	n/a
402-7		01-Jun-10	1284.4	1684.0	778.7	783.0
402-8		01-Jun-10	2035.7	6876.0	n/a	n/a
402-9	9:14 PM	01-Jun-10	3597.7	7194.0	3779.0	3813.6
403-5	8:29 PM	01-Jun-10	56.1	ND	n/a	n/a
501		18-Aug-10	568.9	ND	405.3	405.3
301-6		18-Aug-10	ND	ND	331.7	331.7
301-8		18-Aug-10	ND	ND	n/a	n/a
301-9		18-Aug-10	1621.6	686.0	n/a	n/a
301-10		18-Aug-10	1066.2	265.0	n/a	n/a
301-11		18-Aug-10	16.1	760.6	1034.0	1034.0
302-6		18-Aug-10	41.4	ND	128.3	128.3
302-7		18-Aug-10	46.1	ND	244.9	244.9
302-8		18-Aug-10	46.6	ND	n/a	n/a
302-9		18-Aug-10	57.0	ND	318.5	318.5
302-13		18-Aug-10	74.8	<MDL	n/a	n/a
303-6		18-Aug-10	1.0	ND	n/a	n/a
303-7		18-Aug-10	12.2	ND	150.2	150.2
401-4		18-Aug-10	665.1	<MDL	n/a	n/a
401-5		18-Aug-10	644.6	ND	306.8	306.8
401-6		18-Aug-10	672.3	ND	n/a	n/a
401-7		18-Aug-10	881.4	ND	470.0	470.0
401-8		18-Aug-10	882.0	ND	n/a	n/a
401-9		18-Aug-10	877.1	ND	470.5	470.5

LEGEND
MDL - Method Detection Limit
ND - Non Detect
n/a - Not Available

402-5	18-Aug-10	1355.2	ND	657.0	657.0
402-6	18-Aug-10	994.5	ND	n/a	n/a
402-7	18-Aug-10	996.9	ND	542.1	542.1
402-8	18-Aug-10	1116.7	ND	n/a	n/a
402-9	18-Aug-10	1198.4	ND	601.2	601.2
405-9	18-Aug-10	1.8	n/a	n/a	n/a
602	18-Aug-10	2.0	ND	n/a	n/a
501	07-Sep-10	939.3	ND	296.2	296.2
301-6	07-Sep-10	n/a	ND	366.3	366.3
301-8	07-Sep-10	n/a	ND	n/a	n/a
301-11	07-Sep-10	1483.4	208.3	664.5	664.5
302-6	07-Sep-10	n/a	ND	213.9	213.9
302-7	07-Sep-10	n/a	ND	209.4	209.4
302-8	07-Sep-10	n/a	ND	n/a	n/a
302-9	07-Sep-10	n/a	ND	n/a	n/a
302-13	07-Sep-10	432.8	ND	n/a	n/a
303-7	07-Sep-10	n/a	n/a	135.9	135.9
303-11	07-Sep-10	n/a	ND	n/a	n/a
401-4	07-Sep-10	1286.5	ND	n/a	n/a
401-5	07-Sep-10	1125.4	ND	529.9	529.9
401-6	07-Sep-10	903.7	ND	n/a	n/a
401-7	07-Sep-10	788.8	ND	441.0	441.0
401-8	07-Sep-10	811.9	ND	n/a	n/a
401-9	07-Sep-10	979.3	ND	491.3	491.3
402-5	07-Sep-10	n/a	ND	220.3	220.3
402-6	07-Sep-10	n/a	ND	n/a	n/a
402-7	07-Sep-10	1825.5	ND	385.1	385.1
402-8	07-Sep-10	1701.1	ND	n/a	n/a
402-9	07-Sep-10	1515.0	ND	331.0	331.0
602	07-Sep-10	25.4	ND	n/a	n/a
501	05-Oct-10	163.7	ND	293.0	293.0
301-6	05-Oct-10	24.5	ND	n/a	n/a
301-8	05-Oct-10	22.8	ND	n/a	n/a
301-9	05-Oct-10	1073.6	ND	n/a	n/a
301-10	05-Oct-10	522.6	ND	n/a	n/a
301-11	05-Oct-10	1651.4	ND	554.0	554.0
302-6	05-Oct-10	127.6	ND	n/a	n/a
302-7	05-Oct-10	149.9	ND	n/a	n/a
302-8	05-Oct-10	159.9	ND	n/a	n/a
302-9	05-Oct-10	187.6	ND	n/a	n/a
302-13	05-Oct-10	263.3	ND	n/a	n/a
303-6	05-Oct-10	ND	<MDL	n/a	n/a
303-7	05-Oct-10	ND	<MDL	n/a	n/a
401-4	05-Oct-10	602.3	ND	n/a	n/a
401-5	05-Oct-10	502.5	ND	n/a	n/a
401-6	05-Oct-10	604.5	ND	n/a	n/a
401-7	05-Oct-10	642.9	ND	n/a	n/a
401-8	05-Oct-10	682.3	ND	n/a	n/a
401-9	05-Oct-10	792.9	ND	421.9	421.9
402-5	05-Oct-10	76.8	ND	191.1	191.1
402-6	05-Oct-10	115.4	ND	n/a	n/a
402-7	05-Oct-10	302.4	ND	314.6	314.6
402-8	05-Oct-10	251.6	ND	n/a	n/a
402-9	05-Oct-10	285.1	ND	315.7	315.7
405-9	05-Oct-10	18.6	ND	n/a	n/a
602	05-Oct-10	6.0	ND	n/a	n/a
501	01-Nov-10	232.9	ND	n/a	n/a
301-8	01-Nov-10	9.3	ND	n/a	n/a
301-9	01-Nov-10	901.7	ND	323.4	323.4
301-11	01-Nov-10	1153.9	ND	393.6	393.6
302-6	01-Nov-10	37.1	<MDL	n/a	n/a
302-7	01-Nov-10	85.6	ND	146.2	146.2
302-8	01-Nov-10	87.1	ND	n/a	n/a
302-9	01-Nov-10	160.3	ND	n/a	n/a
302-13	01-Nov-10	276.3	190.2	n/a	n/a
303-7	01-Nov-10	ND	ND	n/a	n/a
303-11	01-Nov-10	n/a	ND	n/a	n/a
401-4	01-Nov-10	263.1	209.2	n/a	n/a
401-5	01-Nov-10	238.9	ND	299.0	299.0
401-6	01-Nov-10	242.4	ND	n/a	n/a
401-7	01-Nov-10	432.4	ND	n/a	n/a

401-8	01-Nov-10	517.0	ND	n/a	n/a
401-9	01-Nov-10	603.4	ND	334.5	334.5
402-5	01-Nov-10	144.0	ND	n/a	n/a
402-6	01-Nov-10	178.1	ND	n/a	n/a
402-7	01-Nov-10	322.9	ND	n/a	n/a
402-8	01-Nov-10	292.8	ND	n/a	n/a
402-9	01-Nov-10	437.8	ND	n/a	n/a
403-5	01-Nov-10	1.0	ND	n/a	n/a
403-9	01-Nov-10	6.2	ND	n/a	n/a
405-5	01-Nov-10	14.8	ND	n/a	n/a
405-7	01-Nov-10	52.5	ND	n/a	n/a
405-9	01-Nov-10	68.2	ND	n/a	n/a
602	01-Nov-10	15.4	ND	n/a	n/a

Persulphate, sulphate and sodium (soil) data:

Borehole	**Elevation (m)**	**Sulphate concentration (mg/L)**	**Persuphate concentration (mg/L)**	**Sodium concentration (mg/L)**
BH-701	5.15	7.38	0.00	n/a
BH-701	5.27	6.70	0.00	n/a
BH-701	6.06	6.79	0.00	n/a
BH-701	6.65	7.32	0.00	n/a
BH-701	7.10	53.85	0.00	n/a
BH-701	8.13	64.97	0.00	n/a
BH-701	8.31	92.97	0.00	n/a
BH-701	8.45	129.14	0.00	n/a
BH-701	9.60	96.02	0.00	522.56
BH-701	9.84	78.00	0.00	n/a
BH-701	11.10	173.87	0.00	336.00
BH-701	11.37	490.68	0.00	n/a
BH-701	11.38	304.83	0.00	442.14
BH-701	11.69	448.61	0.00	n/a
BH-701	12.10	166.69	0.00	n/a
BH-701	12.41	212.69	0.00	881.27
BH-702	6.44	58.04	0.00	n/a
BH-702	6.63	57.13	142.60	224.14
BH-702	6.87	44.95	0.00	n/a
BH-702	7.09	83.95	0.00	n/a
BH-702	7.29	84.11	0.00	n/a
BH-702	7.54	63.27	95.10	277.65
BH-702	7.74	60.27	0.00	n/a
BH-702	7.92	37.03	0.00	n/a
BH-702	8.10	37.79	0.00	n/a
BH-702	8.23	49.95	0.00	264.30
BH-702	8.48	31.03	0.00	n/a
BH-702	8.73	97.05	0.00	n/a
BH-702	8.93	78.98	0.00	334.06
BH-702	9.11	91.53	0.00	n/a
BH-702	9.34	80.77	0.00	n/a
BH-702	9.50	86.50	0.00	n/a
BH-702	9.68	74.01	0.00	n/a
BH-702	9.90	107.64	0.00	n/a
BH-702	10.15	121.45	0.00	n/a
BH-702	10.30	159.77	0.00	n/a
BH-702	10.55	129.16	0.00	n/a
BH-702	10.73	113.31	0.00	n/a
BH-702	10.96	122.21	0.00	n/a
BH-702	12.36	147.59	0.00	n/a
BH-702	12.54	165.50	0.00	n/a
BH-702	12.73	136.27	0.00	n/a
BH-703	5.17	0.88	0.00	n/a
BH-703	6.31	32.47	0.00	n/a

BH-703	6.60	15.68	0.00	n/a
BH-703	6.80	494.62	0.00	n/a
BH-703	6.98	96.82	0.00	n/a
BH-703	7.21	114.06	0.00	n/a
BH-703	7.41	57.87	0.00	n/a
BH-703	7.56	71.86	0.00	n/a
BH-703	7.83	96.74	0.00	n/a
BH-703	8.04	135.45	0.00	n/a
BH-703	8.20	30.23	0.00	n/a
BH-703	8.43	48.66	0.00	n/a
BH-703	8.63	32.94	0.00	265.27
BH-703	8.78	37.35	0.00	n/a
BH-703	9.03	35.59	0.00	235.44
BH-703	9.21	56.94	0.00	n/a
BH-703	9.38	98.82	0.00	n/a
BH-703	9.87	53.25	0.00	n/a
BH-703	10.03	88.85	0.00	n/a
BH-703	10.66	105.71	0.00	n/a
BH-703	11.17	102.66	0.00	410.06
BH-703	11.86	60.81	0.00	n/a
BH-703	12.44	55.80	0.00	n/a
BH-703	12.49	205.24	0.00	817.54
BH-704	5.79	3.51	152.10	119.18
BH-704	6.07	5.11	0.00	n/a
BH-704	6.64	5.00	0.00	n/a
BH-704	6.70	4.62	0.00	n/a
BH-704	6.91	5.00	0.00	n/a
BH-704	7.06	5.74	0.00	n/a
BH-704	7.31	5.00	0.00	184.20
BH-704	7.11	2.96	0.00	n/a
BH-704	7.97	4.22	0.00	n/a
BH-704	8.22	5.68	0.00	n/a
BH-704	8.42	3.94	0.00	n/a
BH-704	9.03	17.72	0.00	n/a
BH-704	9.54	4.11	0.00	n/a
BH-704	9.74	4.91	0.00	135.32
BH-704	9.95	3.80	0.00	n/a
BH-704	10.15	3.80	0.00	n/a
BH-704	10.35	3.30	0.00	n/a
BH-704	10.56	0.80	0.00	n/a
BH-704	10.76	6.98	0.00	n/a
BH-704	10.91	5.11	0.00	n/a
BH-704	11.17	3.11	0.00	n/a
BH-704	11.37	2.99	0.00	n/a
BH-704	11.52	0.97	0.00	n/a
BH-704	11.78	0.86	0.00	n/a

BTEX, TMB and naphthalene concentrations (groundwater) data:

Sample	Benzene	Toluene	Ethylbenzene	P,M-xylene	O-xylene	1,3,5-Trimethyl-Benzene	1,2,4-Trimethyl-Benzene	1,2,3-Trimethyl-Benzene	Naphthalene	Total BTEX	Total BTEX, TMB, Naphthalene
Samples from Nov 20, 2008											
301-6	249.2	491.3	838.7	3202.7	599.9	352.3	1346.1	456.9	320.8	5382.0	7858.1
301-7	273.6	512.2	836.9	3256.1	442.3	338.1	1320.8	443.1	279.5	5321.1	7702.5
301-8	249.7	501.2	1108.3	4292.1	811.5	462.6	1819.1	566.7	344.5	6962.7	10155.6
301-9	1029.9	2247.0	1856.7	6971.4	2374.8	432.1	1810.5	584.5	367.4	14479.9	17674.3
301-10	854.7	2347.4	1548.7	5724.0	1860.8	360.0	1510.7	497.2	334.4	12335.7	15037.8
301-11	180.9	753.0	1081.3	4149.8	986.6	371.5	1511.1	483.7	293.3	7151.6	9811.1
301-12	1182.4	2568.2	1947.6	7115.7	2453.1	388.5	1675.7	544.1	360.3	15267.0	18235.6
301-13	1137.5	2478.5	1849.8	6761.6	2338.1	363.7	1572.2	513.9	342.5	14565.4	17357.7
302-5	87.8	1154.0	628.8	2942.1	1122.2	247.8	978.7	368.2	225.2	5934.8	7754.7
302-6	322.5	5369.2	2344.4	8964.3	3442.7	551.9	2212.9	712.0	481.1	20443.1	24400.9
302-7	383.1	4442.2	2004.8	7607.4	2836.8	593.0	2289.5	708.2	436.6	17274.4	21301.7
302-8	1078.6	6653.4	1934.3	7490.1	2793.4	484.3	1991.4	624.4	397.0	19949.8	23447.0
302-8	1210.7	7085.5	1945.3	7499.9	2795.1	478.9	1926.4	613.3	402.7	20536.5	23957.8
302-9	3200.2	8200.8	2244.8	8400.4	3350.6	516.5	2131.7	665.5	450.4	25396.9	29161.0
302-10											
302-11	2126.0	5917.2	2089.9	8149.8	3055.1	548.9	2235.1	707.5	432.8	21338.0	25262.2
302-12	2249.6	5493.9	2012.6	7822.1	2918.3	538.8	2230.4	698.3	424.8	20496.4	24388.7
302-13	1845.8	3388.0	1193.5	4628.1	1806.9	326.0	1373.2	429.2	251.0	12862.3	15241.8
303-6	1464.0	3024.7	1819.2	7597.8	2530.7	611.4	2476.0	767.7	468.5	16436.3	20759.9
303-6	1521.1	3075.5	1949.2	8034.8	2662.5	670.1	2713.9	828.8	459.6	17243.1	21915.6
303-7	1795.8	5431.5	1903.4	7888.0	2861.7	640.1	2578.7	791.2	493.8	19880.4	24384.2
303-10	486.2	1666.1	1439.4	6245.0	1863.6	574.3	2345.9	730.6	391.0	11700.3	15742.2
303-11	276.6	803.0	1446.2	6203.3	1782.5	630.7	2596.0	791.8	421.2	10511.7	14951.4
304-5	494.7	5794.0	1481.8	7745.4	3147.9	660.5	2346.9	805.8	354.3	18663.8	22831.2
304-6	602.0	7050.8	1384.0	7106.9	2906.0	619.1	2302.7	762.9	352.9	19049.7	23087.3
304-7	817.2	2730.9	2065.2	8799.5	3316.2	664.8	2768.3	882.2	475.6	17728.9	22519.8
304-8	330.2	2267.5	756.7	3502.6	1205.4	443.0	1718.7	545.1	286.3	8062.4	11055.5
304-8	343.8	2238.9	757.3	3542.2	1222.9	465.6	1808.9	565.4	265.9	8105.1	11210.9
304-9	449.0	1319.9	1430.2	6465.7	2200.5	643.0	2583.0	811.7	388.8	11865.3	16291.9
304-10	389.8	1694.3	1435.7	6498.4	2163.5	610.4	2440.0	777.2	385.2	12181.6	16394.3
302-12	530.8	807.0	949.6	3976.7	1382.1	345.0	1451.4	454.9	234.3	7646.2	10131.8
MDL	**1.32**	**1.12**	**1.50**	**2.63**	**1.79**	**1.05**	**0.96**	**1.19**	**2.21**		
LOQ	**3.95**	**3.36**	**4.49**	**7.89**	**5.38**	**3.14**	**2.88**	**3.58**	**6.63**		
Samples from May 29, 2008											
301-3	77.1	274.9	237.3	913.5	498.1	230.5	520.8	329.6	102.8	2000.8	3184.5
301-4	48.8	69.7	46.0	217.0	84.0	64.8	180.1	127.4	54.7	465.5	892.5
301-4	45.3	69.6	47.6	224.1	84.4	65.1	181.2	128.0	55.8	471.0	901.2
301-5	124.0	338.4	297.7	1149.5	337.3	182.7	616.9	240.8	124.6	2246.8	3411.8
301-7	281.6	884.8	933.0	3700.5	812.5	407.4	1601.9	512.5	267.9	6612.5	9402.2
301-8	347.0	1083.0	1194.1	4727.5	1107.5	554.3	2215.8	667.9	419.3	8459.0	12316.2
301-9	662.4	1802.3	825.7	3352.6	1247.7	257.2	1087.9	394.9	258.3	7890.7	9889.0
301-9	889.2	2308.6	948.3	3806.9	1455.7	271.3	1168.7	419.8	281.3	9408.7	11549.8
301-10	379.9	2945.7	1365.3	5117.3	1967.1	344.2	1452.2	481.5	300.2	11775.2	14353.3
301-11	288.4	871.9	848.7	3268.9	1068.3	329.0	1369.8	462.1	365.5	6346.3	8872.6
301-11	270.2	872.2	869.6	3273.5	1074.3	330.0	1330.0	446.6	297.8	6359.8	8764.2
301-12	2020.7	6576.3	2169.3	8116.4	2949.0	460.7	1970.3	619.4	401.9	21831.7	25284.0
301-12	1875.4	6522.3	2163.5	8032.8	2929.1	460.9	1958.6	617.5	399.1	21523.0	24959.0
302-3	218.3	56.8	711.7	3310.9	302.1	352.2	1305.6	479.8	262.3	4599.9	6999.8
302-4	154.6	45.0	630.6	3101.4	419.7	416.1	1622.6	546.2	255.3	4351.3	7191.5
302-5	131.6	85.1	571.5	2816.0	476.5	380.3	1462.7	498.8	263.0	4080.6	6685.5
302-6	136.6	138.4	643.1	3115.9	644.1	423.3	1626.4	550.9	249.3	4678.2	7528.2
302-7	173.4	907.1	898.5	4123.7	1120.9	469.3	1823.8	597.3	273.2	7223.6	10387.2
302-8	1225.5	6012.8	1316.3	5263.2	1919.3	355.9	1468.7	492.7	311.6	15737.1	18365.9
302-9	3287.7	6718.9	1799.0	7158.0	2894.8	416.6	1829.6	608.7	417.0	21858.4	25130.3
302-10	2166.9	4813.2	1496.4	6028.3	2344.4	392.2	1699.8	563.6	374.9	16849.2	19879.7
302-11	1275.1	2945.5	1196.3	5107.6	1893.3	409.4	1782.1	594.2	364.5	12417.8	15568.0
302-12	1343.9	3033.6	1285.1	5504.3	2017.0	441.2	1919.0	638.7	390.1	13183.9	16572.8
302-13	1251.4	2377.1	974.8	4069.7	1608.5	296.1	1305.1	437.2	271.2	10281.6	12591.1
302-13	1496.8	2958.6	1322.9	5544.0	2100.9	411.9	1795.8	584.1	349.9	13423.2	16565.0
303-3	920.3	453.0	503.2	3599.8	1240.9	514.4	1750.7	670.4	188.6	6717.3	9841.4
303-3	937.7	464.8	530.2	3622.4	1259.5	520.2	1719.7	661.5	171.4	6814.6	9887.4
303-4	771.3	473.5	463.8	3634.9	1200.8	358.2	1387.0	503.6	166.0	6544.2	8959.0
303-4	776.7	481.7	491.5	3739.5	1241.0	364.5	1433.6	517.6	194.1	6730.4	9240.1
303-6	2049.2	4573.9	1842.9	6929.5	2469.3	757.8	3024.6	912.5	656.3	17864.8	23216.0
303-6	2116.6	4650.7	1927.0	7095.8	2572.2	774.4	3033.4	909.6	514.0	18362.3	23593.7
303-7	2765.8	6836.6	1538.9	6319.8	2369.6	435.5	1746.4	563.8	328.6	19830.7	22905.0

303-10	271.7	1005.3	984.8	4585.8	1484.5	512.9	2172.6	692.7	86.3	8332.1	11796.7
303-11	163.3	324.1	1082.9	5024.2	1526.6	626.5	2564.3	778.9	334.0	8121.2	12424.9
304-3	215.3	732.9	321.6	4648.2	1793.2	707.7	2661.4	847.6	367.3	7711.2	12295.1
304-4	256.3	1451.5	595.7	5870.7	2287.9	800.9	2996.9	938.4	391.1	10462.1	15589.4
304-4	255.5	1423.0	597.1	5880.4	2289.5	801.3	3000.1	939.6	395.5	10445.4	15581.9
304-5	421.6	3803.3	1398.5	6867.6	2743.5	688.3	2811.2	902.9	502.0	15234.5	20139.0
304-6	906.6	6432.9	1772.8	8309.3	3386.9	811.6	3155.7	976.7	399.9	20808.5	26152.4
304-6	760.3	6225.8	1777.7	8140.4	3336.5	798.0	3107.6	951.0	537.1	20240.6	25634.4
304-7	457.6	1941.6	1301.2	5962.6	2234.1	525.8	2170.9	695.4	369.8	11897.1	15659.1
304-8	320.9	3073.5	1154.5	5506.9	2185.3	495.9	2065.0	680.7	380.9	12241.1	15863.6
304-9	241.4	1173.3	1112.8	5387.8	1945.9	478.7	1989.8	655.5	333.5	9861.3	13318.8
304-9	307.9	933.4	1422.6	6633.8	2208.0	610.0	2516.7	787.9	386.6	11505.6	15806.8
304-10	488.1	1921.5	1407.6	6561.5	2291.9	606.9	2450.1	773.1	378.0	12670.6	16878.6
304-11	333.7	1600.8	1125.0	5309.6	1919.6	496.9	2021.0	663.6	324.0	10288.7	13794.2
304-12	466.0	1296.1	1228.3	5404.8	1925.7	429.7	1822.5	583.5	296.6	10321.0	13453.3
Laboratory Blank-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Laboratory Blank-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Laboratory Blank-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Sample	Date	Benzene	Toluene	Ethylbenzene	P,M-xylene	O-xylene	1,3,5-Trimethyl-Benzene	1,2,4-Trimethyl-Benzene	1,2,3-Trimethyl-Benzene	Naphthalene	Total BTEX	Total BTEX, TMB, Naphthalene	*F1 Fraction*	*F2 Fraction*	*F3 Fraction*	*Total (F1, F2, F3)*
Samples from May 19, 2010																
MW-301-6	19-May-10	140.5	223.7	598.7	3024.7	382.7	391.0	1539.1	491.1	211.4	4370.2	7002.8	8215.0	6028.2	38.5	14281.7
MW-301-7	19-May-10	159.8	425.1	923.6	3903.0	540.1	358.3	1467.2	470.2	267.1	5951.6	8514.4	9873.3	5867.8	17.5	15758.6
MW-301-8	19-May-10	211.2	643.9	981.3	3833.4	453.1	444.7	1799.8	549.5	240.4	6122.9	9157.3	11343.4	17637.5	3111.1	32092.0
MW-301-9	19-May-10	200.0	664.5	1340.4	5280.1	1084.8	426.0	1813.6	554.1	341.3	8569.9	11704.8	13249.8	8069.4	377.3	21696.4
MW-301-10	19-May-10	230.2	723.5	1274.5	4987.0	961.6	412.4	1726.1	532.5	279.9	8176.8	11127.7	12933.8	8879.6	513.7	22327.1
MW-301-11	19-May-10	228.6	641.1	1311.8	4822.5	1013.1	307.1	1377.2	417.7	264.3	8017.1	10383.4	11695.1	4375.8	18.5	16089.5
MW-302-6	19-May-10	243.0	1964.5	2049.7	8513.3	3224.0	630.2	2468.0	740.6	320.0	15994.5	20153.3	23307.9	11599.7	1148.3	36055.9
MW-302-7	19-May-10	222.5	1817.7	2151.4	8943.8	3448.1	613.7	2521.6	759.7	419.1	16583.6	20897.8	23726.2	8682.4	60.1	32468.7
MW-302-8	19-May-10	221.2	1631.8	1962.6	8160.6	3160.9	585.1	2431.8	728.8	433.2	15137.1	19316.0	21977.0	8741.7	59.8	30778.5
MW-302-9	19-May-10	212.3	1167.8	1610.7	6197.4	2372.7	449.9	1903.8	616.5	374.8	11560.8	14905.8	17124.6	7078.5	40.6	24243.6
MW-302-9	19-May-10	232.6	1151.6	1671.6	6459.1	2483.8	474.9	2012.7	649.6	403.7	11998.7	15539.7	17491.0	7012.0	43.9	24546.9
MW-302-10	19-May-10	142.6	462.5	551.1	1891.7	720.9	122.9	562.7	184.7	104.2	3768.9	4743.5	6042.7	1324.4	66.0	7433.0
MW-303-6	19-May-10	316.1	168.1	281.6	2880.6	1019.4	436.6	1262.2	535.6	127.0	4665.8	7027.2	8420.9	6017.2	96.4	14534.5
MW-303-7	19-May-10	401.0	1227.0	2193.8	8845.5	3168.0	977.9	3898.2	1078.2	424.4	15835.3	22214.0	32889.5	26346.1	4911.2	64146.8
MW-303-10	19-May-10	226.3	358.5	1011.5	4836.8	1256.1	479.6	1872.1	603.2	253.3	7689.3	10897.6	12212.9	6130.8	18.3	18362.1
MW-303-10	19-May-10	254.5	316.3	916.5	4338.8	1157.8	418.6	1662.4	534.2	234.1	6984.0	9833.3	11004.8	5440.4	11.3	16456.4
MW-303-11	19-May-10	146.3	292.7	1153.2	5422.2	1276.6	565.6	2325.5	709.5	315.7	8291.0	12207.2	13573.2	7506.7	15.7	21095.6
MW-304-7	19-May-10	234.8	833.4	1598.0	6749.1	2559.1	506.6	2108.6	661.8	311.6	11974.3	15562.9	17470.3	7172.7	88.2	24731.2
MW-304-8	19-May-10	108.5	575.5	448.6	2273.6	717.4	370.5	1405.2	451.4	194.9	4123.5	6545.5	7453.9	5722.3	15.9	13192.2
MW-304-9	19-May-10	198.0	560.6	1410.1	6277.4	1906.1	647.6	2612.8	779.9	332.8	10352.2	14725.3	16433.8	8173.2	15.5	24622.5
MW-304-10	19-May-10	344.7	1575.8	1467.8	6516.2	2071.5	582.8	2367.6	735.9	337.2	11975.9	15999.5	17876.1	7488.5	20.4	25385.0
MW-304-10	19-May-10	325.0	1560.4	1505.6	6702.7	2135.1	604.3	2455.4	761.6	351.7	12228.8	16401.9	18172.1	7547.7	22.4	25742.2
MW-304-11	19-May-10	259.9	653.5	1147.8	4626.1	1499.0	327.3	1466.8	446.9	229.3	8186.3	10656.6	11933.8	4447.1	14.6	16395.5
MW-401-2	19-May-10	489.2	4865.9	2008.2	13372.4	5988.1	1294.6	5493.1	1450.2	568.5	26723.7	35530.2	46505.6	43791.4	6705.5	97002.5
MW-401-3	19-May-10	559.3	7224.6	1964.9	10217.7	4361.0	739.9	3154.7	873.8	398.9	24327.4	29494.7	36838.3	18185.5	1944.0	56967.7
MW-401-4	19-May-10	442.4	8550.7	1977.8	8196.9	3492.5	414.1	1824.7	550.3	306.7	22660.3	25756.2	29198.8	6973.0	176.7	36348.5
MW-401-5	19-May-10	132.7	2393.3	550.5	2855.7	1487.2	173.4	861.4	296.4	190.4	7419.5	8941.1	9763.4	5970.1	601.0	16334.5
MW-401-5	19-May-10	131.0	1756.3	377.6	2047.4	1118.7	141.4	711.8	238.5	153.0	5431.0	6675.6	7439.7	7180.1	1293.9	15913.7
MW-401-5	19-May-10	115.9	1744.4	387.6	2097.7	1148.1	146.1	733.3	248.1	162.0	5493.6	6783.2	7639.0	7199.1	1374.3	16212.5
MW-401-6	19-May-10	326.1	5608.8	2034.7	8146.1	3428.9	409.4	1799.4	538.0	304.7	19544.6	22596.1	25748.6	7576.1	382.4	33707.1
MW-401-7	19-May-10	350.2	4965.0	2321.4	9007.2	3723.2	465.2	2031.5	605.0	354.3	20367.0	23823.0	27233.4	9939.6	1004.0	38177.1
MW-401-8	19-May-10	284.8	4545.4	2184.2	8145.9	3430.9	354.6	1553.1	491.8	328.7	18591.1	21319.3	24125.3	5374.7	129.8	29629.8
MW-401-9	19-May-10	314.7	4399.5	2369.6	8490.8	3447.2	381.0	1717.4	523.4	385.0	19021.8	22028.7	24879.4	5835.4	25.3	30740.1
MW-402-4	19-May-10	195.5	774.0	932.7	4438.9	1663.8	351.7	1238.6	465.9	201.1	8004.9	10262.1	11849.6	5035.4	20.4	16905.3
MW-402-5	19-May-10	266.6	915.3	1086.2	4686.4	1650.1	360.9	1406.1	491.4	220.9	8604.6	11083.8	12774.1	6596.9	675.9	20047.0
MW-402-6	19-May-10	291.1	920.9	951.9	4046.7	1367.2	278.7	1129.9	393.1	197.7	7577.7	9577.1	11026.8	4478.4	59.5	15564.6
MW-402-7	19-May-10	319.4	795.4	896.1	3468.7	1190.9	287.8	1171.4	418.8	223.3	6670.5	8771.8	10117.6	4660.5	29.7	14807.8
MW-402-8	19-May-10	248.9	845.5	817.1	3077.9	914.4	239.2	1001.7	351.1	187.3	5903.8	7683.1	8745.6	3541.8	15.4	12302.7
MW-402-9	19-May-10	210.4	1014.8	1002.0	3749.8	1258.3	240.3	1086.9	395.4	231.7	7235.4	9189.6	10704.0	3983.2	22.4	14709.5
MW-403-1	19-May-10	224.1	909.6	227.6	2030.7	919.8	195.0	611.6	234.3	0.7	4311.8	5353.3	6574.9	3911.9	23.0	10509.8
MW-403-2	19-May-10	31.1	68.2	3.0	267.6	122.5	30.4	93.1	54.8	9.7	492.4	680.4	1133.2	3163.5	941.4	5238.1
MW-403-4	19-May-10	577.5	2290.6	932.5	4015.5	1537.1	244.6	1005.7	317.2	175.6	9353.3	11096.4	12546.0	3520.3	184.1	16250.4
MW-403-5	19-May-10	339.3	1060.4	314.5	1454.1	687.5	84.9	415.1	162.8	118.8	3855.8	4637.5	5366.1	1138.5	25.8	6530.4
MW-403-6	19-May-10	1294.7	4152.8	1212.4	4765.3	1851.2	300.7	1240.4	384.0	204.6	13276.4	15406.1	17328.4	3898.4	17.1	21243.8
MW-403-7	19-May-10	1313.9	3226.5	1625.0	6101.4	2360.9	341.1	1486.0	452.5	257.1	14627.7	17164.3	19346.4	4822.2	14.0	24182.6
MW-403-8	19-May-10	1285.7	2813.8	1534.8	5721.7	2241.2	299.6	1310.7	411.1	240.6	13597.2	15859.2	17863.6	4333.1	3.5	22200.3
MW-403-9	19-May-10	538.7	1223.3	442.8	1714.5	792.2	78.0	399.3	142.1	100.1	4711.5	5431.0	6306.0	935.5	34.6	7276.1
MW-404-2	19-May-10	389.3	5639.7	1107.7	5676.5	2679.1	346.3	1306.4	458.6	180.7	15492.3	17784.4	20323.0	5313.2	219.0	25855.1
											0.0					
MW-404-4	19-May-10	482.1	6184.2	1485.6	6226.9	2695.4	291.5	1222.6	397.6	216.7	17074.2	19202.6	21754.8	4206.7	54.4	26016.0
MW-404-5	19-May-10	427.7	5270.1	1458.9	6131.2	2619.4	283.7	1215.8	390.4	216.5	15907.3	18013.7	20293.7	3978.3	85.0	24357.0
MW-404-6	19-May-10	62.5	633.8	70.0	692.7	402.7	30.9	165.9	80.1	80.4	1861.7	2219.1	2344.4	984.5	9.4	3338.3
MW-404-7	19-May-10	404.6	6155.7	1500.3	6184.3	2661.8	233.1	1059.3	347.2	207.3	16906.7	18753.6	21187.3	3259.7	50.6	24497.7
MW-404-8	19-May-10	418.4	6230.1	1600.0	6659.9	2847.4	265.6	1207.5	388.8	230.7	17755.8	19848.4	22409.3	3619.1	26.6	26055.0
MW-404-9	19-May-10	400.7	6172.1	1562.0	6470.1	2779.1	261.3	1199.9	381.7	231.8	17384.0	19458.6	21932.7	3715.4	61.2	25709.2
MW-405-2	19-May-10	273.4	2806.7	471.1	4583.3	2291.3	236.8	916.9	374.2	112.5	10425.9	12066.3	13924.4	3947.5	52.7	17924.6
MW-405-3	19-May-10	178.8	2307.3	479.4	3507.7	1631.3	154.4	649.9	256.3	99.3	8104.4	9264.2	11206.1	1882.1	43	13131.6
MW-405-4	19-May-10	498.2	4181.2	861.6	3931.9	1728.6	153.1	677.9	254.3	139.7	11201.4	12426.3	13955.1	2744.4	278	16977.8
MW-405-5	19-May-10	781.8	4218.8	845.0	3647.0	1609.5	140.0	616.3	230.2	111.3	11102.2	12200.0	14399.9	1510.8	53	15963.5
MW-405-5	19-May-10	657.2	3826.4	817.7	3984.0	1701.0	169.2	723.6	271.2	127.2	10986.2	12277.4	13869.2	2729.0	51	16649.2
MW-405-6	19-May-10	1448.3	5151.4	1351.0	5906.5	2389.0	289.3	1236.5	398.7	200.0	16246.4	18370.8	20578.5	3753.4	18	24349.5
MW-405-7	19-May-10	1469.2	4342.6	1536.0	6472.2	2447.4	331.1	1444.5	458.7	235.9	16267.4	18737.7	20957.4	4402.9	13	25373.1
MW-405-8	19-May-10	1571.5	4890.4	1776.9	6978.6	2622.4	345.3	1559.8	494.3	275.8	17839.7	20514.9	22905.6	4731.2	18	27654.9
MW-405-9	19-May-10	1480.3	6958.2	1883.2	7243.2	2866.6	353.0	1618.8	497.5	292.9	20431.5	23193.7	26008.8	5079.1	30	31118.4
MW-406-2	19-May-10	722.6	11508.4	1573.6	7349.6	3539.6	447.4	1795.7	605.4	273.4	24693.7	27815.8	31284.1	6623.7	115	38022.8
MW-406-3	19-May-10	1387.4	11688.0	1702.6	7314.5	3302.0	414.3	1786.9	573.7	274.7	25394.5	28444.1	31810.6	6662.8	387	38860.1
MW-406-4	19-May-10	1060.6	9612.0	1340.3	5933.8	2799.7	319.3	1392.9	455.2	211.7	20746.4	23125.5	27344.6	5002.9	813	33160.1
MW-406-5	19-May-10	1277.6	11485.0	2004.9	8263.5	3566.7	458.6	2026.4	622.9	324.8	26597.7	30030.4	33675.0	7101.9	134	40910.9
MW-406-6	19-May-10	1131.5	9681.1	2023.9	8326.0	3438.1	460.6	2044.2	630.6	355.7	24600.7	28091.7	31437.1	6478.8	42	37957.7
MW-406-7	19-May-10	1227.9	9181.2	2137.5	8735.2	3503.7	485.7	2164.4	664.5	371.8	24785.5	28471.9	32725.8	5929.9	31	38687.1
MW-406-7	19-May-10	1215.7	7883.4	2067.2	8441.1	3304.4	469.3	2090.7	648.5	354.5	22911.8	26474.7	30142.5	5871.2	16	36029.8
MW-406-8	19-May-10	1155.2	10232.8	1922.7	7853.3	3339.0	408.3	1818.8	571.6	313.5	24503.0	27615.3	30896.3	5521.7	19	36437.4
MW-406-9	19-May-10	1113.4	10733.0	1874.2	7603.3	3258.9	395.0	1798.0	543.9	296.2	24582.9	27616.0	33089.8	3988.2	135	37213.1
MW-501	19-May-10	184.0	1128.5	1208.9	4551.8	1350.1	422.2	1787.2	523.8	275.1	8423.3	11431.6	13313.3	7385.8	104	20802.6
MW-601	19-May-10	868.6	4391.5	2723.1	10369.8	2911.1	528.7	2447.3	739.7	443.0	21264.1	25422.8	28475.9	7552.3	17	36045.2
MW-602	19-May-10	2462.0	6913.6	2861.7	10723.9	3612.2	538.3	2506.0	752.5	449.5	26573.5	30819.7	34365.1	7910.1	7	42282.1
MW-603	19-May-10	1213.0	697.8	2463.4	9013.3	150.6	487.3	2184.3	647.5	407.4	13538.1	17264.7	19474.6	6977.8	13	26465.5
MW-604	19-May-10	1084.8	7295.7	1289.8	4693.6	1282.1	253.0	1147.0	358.2	231.5	15646.1	17635.7	19771.5	4216.0	40	24027.7
Laboratory Blank 1	19-May-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	15.6	18.7	48.8
Laboratory Blank 2	19-May-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	1.1	7.1	12.2
Laboratory Blank 3	19-May-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.0	9.6	15.2
Laboratory Blank 4	19-May-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	1.2	15.0	19.9
Laboratory Blank 5	19-May-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	2.5	11.1	18.0

Sample	Time	Date	Benzene	Toluene	Ethylbenzene	P,M-xylene	O-xylene	1,3,5-Trimethyl-Benzene	1,2,4-Trimethyl-Benzene	1,2,3-Trimethyl-Benzene	Naphthalene	Total BTEX	Total BTEX, TMB, Naphthalene	*F1 Fraction*	*F2 Fraction*	*F3 Fraction*	*Total (F1, F2, F3)*
Samples from June 3, 2010																	
Lab Blank 1		03-Jun-10	1.9	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	3.2	3.2	6.4	20.3	8.7	35.4
402-5		03-Jun-10	43.9	63.4	0.0	1186.5	498.0	97.2	355.5	136.8	63.1	1791.9	2444.4	3453.7	2798.4	24.6	6276.8
402-6		03-Jun-10	300.1	896.9	707.6	3934.9	1406.4	276.1	1105.3	404.4	202.7	7245.9	9234.4	10986.7	4595.1	36.1	15617.9
402-7		03-Jun-10	353.5	991.0	1042.7	3810.3	1246.2	304.6	1275.4	456.5	236.0	7443.7	9716.1	11453.3	5141.0	32.1	16626.4
402-8		03-Jun-10	207.4	697.5	762.8	2759.1	941.0	196.9	784.5	314.8	167.0	5367.9	6831.1	8632.5	3911.0	34.7	12578.2
402-9		03-Jun-10	126.8	550.8	525.9	1997.7	776.3	110.3	441.4	186.4	109.6	3977.5	4825.1	6544.5	3426.4	49.2	10020.0
501		03-Jun-10	59.8	224.1	174.4	363.0	218.8	13.6	25.8	2.3	69.3	1040.1	1151.1	4331.3	4518.1	1282.8	10132.2
301-6	**3:46:00 PM**	03-Jun-10	112.1	298.3	504.9	2397.7	363.9	255.6	813.3	345.7	113.9	3676.8	5205.4	6902.1	3827.0	81.6	10810.7
302-7	**2:48:00 PM**	03-Jun-10	118.8	672.4	754.0	2379.7	1244.8	48.9	76.1	59.3	677.2	5169.7	6031.2	8459.0	5727.1	114.5	14300.6
401-5	**11:23:00 AM**	03-Jun-10	428.2	6583.9	189.5	6616.8	3112.6	351.7	1357.3	477.4	135.3	16931.1	19252.8	21787.9	4397.7	33.8	26219.4
401-5	**1:47:00 PM**	03-Jun-10	447.0	6757.9	266.9	6994.1	3239.7	378.5	1496.7	505.3	157.2	17705.7	20243.3	22967.4	4837.7	28.3	27833.4
401-5	**3:45:00 PM**	03-Jun-10	469.7	7209.3	287.1	6701.0	3145.9	356.0	1374.9	481.9	147.6	17813.0	20173.3	22895.0	4738.3	32.5	27665.8
401-7		03-Jun-10	212.5	2688.6	1801.6	6483.0	2695.4	283.7	1240.1	419.0	289.4	13881.0	16113.2	18850.2	4966.2	61.9	23878.2
402-5	**11:19:00 AM**	03-Jun-10	213.9	446.8	0.0	951.8	1271.7	281.4	78.5	383.3	40.0	2884.1	3667.3	4841.6	2238.2	20.8	7100.5
402-5	**1:43:00 PM**	03-Jun-10	50.5	263.9	261.4	1227.8	501.1	103.2	355.5	148.4	87.8	2304.7	2999.7	3982.8	2068.1	23.2	6074.0
402-5	**3:42:00 PM**	03-Jun-10	83.5	465.9	423.8	2083.9	885.7	163.8	613.9	261.0	142.0	3942.6	5123.4	6484.9	3417.2	41.6	9943.7
401-5		03-Jun-10	419.0	7583.5	1069.0	7193.4	3172.9	344.6	1510.6	498.0	303.7	19437.8	41113.6	25820.4	6153.0	60.2	32033.6
301-6	**11:32:00 AM**	03-Jun-10	126.3	244.9	519.8	2462.4	337.7	283.3	1042.8	383.2	137.4	3691.1	9102.7	8298.8	3678.4	47.1	12024.2
301-6	**1:50:00 PM**	03-Jun-10	122.1	250.6	78.8	2288.9	356.1	335.3	1052.6	430.2	125.2	3096.5	8014.3	6650.5	4519.3	18.8	11188.5
Samples from Sept 8, 2010																	
301-6		08-Sep-10	98.5	143.3	457.0	2172.8	278.7	309.6	1153.5	388.7	166.6	3150.4	5168.8	6125.2	4388.8	43.4	10557.4
301-9		08-Sep-10	251.4	1544.0	819.7	3012.8	897.3	239.9	952.7	332.0	184.7	6525.2	8234.4	10186.1	4095.5	35.7	14317.4
302-9		08-Sep-10	298.4	1091.5	2051.4	7058.5	2895.4	511.0	2195.4	658.3	349.2	13395.1	17109.0	19909.1	8209.0	269.5	28387.6
302-9		08-Sep-10	340.9	1206.8	2308.6	7958.0	3233.9	578.4	2495.2	733.2	390.4	15048.3	19245.5	22488.6	9405.7	312.7	32207.0
302-13		08-Sep-10	139.3	536.4	746.0	2404.5	962.2	171.7	768.2	240.3	133.6	4788.4	6102.3	7148.3	2847.4	67.4	10063.1
302-7		08-Sep-10	411.9	1347.4	2305.6	8191.5	3215.3	618.0	2652.6	765.6	369.5	15471.8	19877.5	23802.7	11541.1	644.9	35988.7
401-5		08-Sep-10	652.5	7134.2	2217.5	9296.7	3941.5	628.3	2915.8	765.6	331.3	23242.3	27883.3	34049.5	14866.2	1395.0	50310.7
401-7		08-Sep-10	260.7	2566.9	2088.7	7927.9	2897.2	414.1	1831.9	550.5	340.5	15741.4	18878.4	21972.3	6603.0	172.0	28747.4
401-9		08-Sep-10	236.0	2598.2	1772.7	6359.2	2339.6	311.9	1407.7	434.3	301.0	13305.7	15760.6	18436.1	5130.1	85.6	23651.8
402-6		08-Sep-10	227.3	479.9	971.8	3842.8	901.5	316.0	1233.5	433.7	202.5	6423.3	8609.1	11625.0	2945.1	88.1	14658.2
402-9		08-Sep-10	171.5	554.5	965.8	3522.5	1016.4	290.1	1233.9	411.3	218.6	6230.7	8384.7	9790.5	4318.7	57.8	14167.0
501		08-Sep-10	167.1	421.8	617.4	2045.1	593.2	217.5	1031.1	278.7	115.1	3844.7	5487.1	8257.0	4759.9	543.3	13560.3
Laboratory Blank-1		08-Sep-10	0.0	1.3	0.0	4.4	1.7	0.0	1.0	0.0	0.0	7.4	8.4	15.9	15.7	5.8	37.4
Laboratory Blank-2		08-Sep-10	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.2	1.2	6.4	16.2	15.7	38.3
Laboratory Blank-4		08-Sep-10	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	1.4	1.4	7.5	15.0	13.0	35.5
Laboratory Blank-1		08-Sep-10	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	3.8	19.3	25.1	48.2
Laboratory Blank-2		08-Sep-10	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	3.7	15.2	11.6	30.5
Samples from Oct 5, 2010																	
501		05-Oct-10	215.1	865.2	1068.3	3650.9	1122.0	412.1	1827.5	498.6	238.8	6921.5	9898.6	12028.7	8144.0	369.0	20541.8
501		05-Oct-10	149.7	870.4	943.1	3304.2	994.9	364.9	1550.6	441.8	231.2	6262.3	8850.8	10382.8	5905.9	109.6	16398.3
Laboratory Blank-1		05-Oct-10	0.0	1.4	0.0	1.0	0.9	0.0	0.0	0.0	0.0	3.3	3.3	7.9	26.2	10.1	44.3
Sample Identification	***MDL (Oct 2009)***		**1.11**	**0.83**	**0.77**	**1.46**	**0.37**	**0.74**	**0.82**	**0.76**	**2.20**						
	LOQ		**3.95**	**3.36**	**4.49**	**7.89**	**5.38**	**3.14**	**2.88**	**3.58**	**6.63**						

BTEX, TMB and naphthalene concentrations (soil) data:

Units are μg/g or mg/Kg (Wet Soil)

Borehole	Sample	Top of Barrel (m)	Bottom of Barrel (m)	Recovery (m)	Depth of Sample (m)	Elevation (m)	Depth Error	Benzene	Toluene	Ethylbenzene	P,M-xylene	O-xylene	1,3,5-Trimethyl-Benzene	1,2,4-Trimethyl-Benzene	1,2,3-Trimethyl-Benzene	Naphthalene	Total BTEX	Total BTEX, TMB's and Naphthalene
BH-301	**BH-301-3**	2.286	3.048		0.3	2.59		8.1	18.4	28.4	47.9	15.5	35.4	108.9	37.6	18.6	118.2	318.8
BH-301	**BH-301-1**	2.286	3.048		0.5	2.79		8.6	16.9	20.3	31.2	12.2	21.7	67.6	24.9	14.0	89.2	217.3
BH-301	**BH-301-4**	3.810	4.579	0.53	0.2	4.01	0.24	5.0	8.3	6.1	5.9	3.3	1.6	5.5	1.7	3.4	28.5	40.8
BH-301	**BH-301-5**	3.810	4.579	0.53	0.4	4.21	0.24	17.5	19.8	12.9	15.2	5.8	4.2	13.2	4.6	8.1	71.1	101.2
BH-301	**BH-301-6**	4.579	5.334	0.69	0.1	4.68	0.06	21.4	21.4	7.7	39.8	16.7	12.0	37.2	9.4	4.8	107.0	170.4
BH-301	**BH-301-7**	4.579	5.334	0.69	0.3	4.88	0.06	29.3	33.0	13.3	66.2	27.9	19.1	61.9	15.9	8.1	169.7	274.7
BH-301	**BH-301-8**	4.579	5.334	0.69	0.5	5.08	0.06	89.0	93.4	32.1	157.4	66.9	41.4	145.2	37.1	18.3	438.8	680.9
BH-301	**BH-301-9**	5.334	6.096	0.72	0.2	5.53	0.04	25.9	23.6	15.6	72.3	24.1	20.7	71.7	19.8	14.0	161.4	287.6
BH-301	**BH-301-10**	5.334	6.096	0.72	0.5	5.83	0.04	24.4	20.8	17.2	78.7	18.3	22.0	76.2	20.7	11.6	159.3	289.7
BH-301	**BH-301-11**	6.096	6.858	0.62	0.1	6.20	0.14	15.5	12.6	11.0	47.4	16.4	12.6	45.0	12.2	6.7	103.0	179.7
BH-301	**BH-301-11**	6.096	6.858	0.62	0.1	6.20	0.14	15.2	12.8	11.0	47.9	16.8	12.1	42.7	11.7	6.5	103.7	176.8
BH-301	**BH-301-12**	6.096	6.858	0.62	0.3	6.40	0.14	77.6	59.6	47.2	213.7	71.3	52.8	203.3	54.5	31.7	469.4	811.6
BH-301	**BH-301-13**	6.096	6.858	0.62	0.5	6.60	0.14	28.4	52.3	25.9	106.1	42.1	23.2	92.7	22.9	11.4	254.7	405.0
BH-301	**BH-301-14**	6.858	7.620	0.75	0.2	7.06	0.01	49.3	196.4	66.3	191.1	83.8	32.1	131.3	31.7	16.4	586.9	798.4
BH-301	**BH-301-14-DUP**	6.858	7.620	0.75	0.2	7.06	0.01	44.6	177.7	60.7	175.4	77.0	29.3	120.8	29.0	15.2	535.4	729.7
BH-301	**BH-301-15**	6.858	7.620	0.75	0.4	7.26	0.01	20.2	69.6	30.6	90.4	38.1	14.8	57.8	14.0	7.4	248.9	342.8
BH-301	**BH-301-16**	6.858	7.620	0.75	0.6	7.46	0.01	123.3	445.3	187.6	549.1	231.0	89.0	343.0	83.8	42.8	1536.5	2095.1
BH-301	**BH-301-16**	6.858	7.620	0.75	0.6	7.46	0.01	117.6	432.8	182.8	531.8	224.3	86.9	333.6	81.3	45.2	1489.3	2036.3
BH-301	**BH-301-18**	7.620	8.382	0.75	0.40	8.02	0.01	0.1	3.0	0.7	2.4	1.0	0.2	0.7	0.2	0.2	7.2	8.5
BH-301	**BH-301-19**	7.620	8.382	0.75	0.70	8.32	0.01	0.3	3.0	0.8	2.8	1.2	0.3	1.1	0.3	0.3	8.0	10.0
BH-301	**BH-301-20**	8.382	9.144	0.75	0.20	8.58	0.01	2.3	9.3	4.1	12.5	5.3	1.8	7.5	1.9	1.1	33.5	45.8
BH-301	**BH-301-21**	8.382	9.144	0.75	0.40	8.78	0.01	0.3	2.0	1.0	3.7	1.5	0.3	1.3	0.2	0.4	8.5	10.7
BH-301	**BH-301-22**	8.382	9.144	0.75	0.60	8.98	0.01	0.2	1.2	1.1	4.1	1.7	0.3	1.3	0.4	0.4	8.3	10.6
BH-301	**BH-301-22-DUP**	8.382	9.144	0.75	0.60	8.98	0.01	0.2	0.7	0.9	3.2	1.3	0.3	1.0	0.3	0.3	6.3	8.2
BH-301	**BH-301-23**	9.144	9.906	0.75	0.20	9.34	0.01	4.3	13.3	7.2	22.1	9.5	3.8	15.1	3.8	2.5	56.3	81.5
BH-301	**BH-301-23**	9.144	9.906	0.75	0.20	9.34	0.01	4.2	13.5	7.1	21.9	9.4	3.9	14.9	3.7	2.0	56.2	80.7
BH-301	**BH-301-24**	9.144	9.906	0.75	0.40	9.54	0.01	8.9	25.7	13.3	40.0	16.8	6.3	25.1	6.2	3.4	104.8	145.8
BH-301	**BH-301-24**	9.144	9.906	0.75	0.40	9.54	0.01	8.7	26.2	13.4	40.2	17.0	6.4	24.7	6.0	3.2	105.5	145.8
BH-301	**BH-301-25**	9.144	9.906	0.75	0.60	9.74	0.01	5.1	15.2	8.1	24.5	10.4	4.0	15.9	3.9	2.3	63.2	89.4
BH-301	**BH-301-25**	9.144	9.906	0.75	0.60	9.74	0.01	4.9	15.4	7.9	24.1	10.4	4.0	15.7	3.8	2.2	62.7	88.3
BH-301	**BH-301-26**	9.906	10.668	0.75	0.20	10.11	0.01	3.8	10.2	5.3	16.1	6.7	2.4	9.6	2.4	1.4	42.1	57.8
BH-301	**BH-301-26**	9.906	10.668	0.75	0.20	10.11	0.01	3.8	10.3	5.0	15.7	6.6	2.4	9.4	2.3	1.2	41.4	56.7
BH-301	**BH-301-27**	9.906	10.668	0.75	0.40	10.31	0.01	3.0	8.6	4.3	13.1	5.5	2.0	7.7	1.9	1.2	34.4	47.2
BH-301	**BH-301-27**	9.906	10.668	0.75	0.40	10.31	0.01	2.9	8.7	4.1	12.7	5.4	2.0	7.6	1.9	1.0	33.8	46.2
BH-301	**BH-301-28**	9.906	10.668	0.75	0.60	10.51	0.01	3.1	8.2	4.5	13.7	5.7	2.1	8.1	2.0	1.2	35.1	48.5
BH-301	**BH-301-28**	9.906	10.668	0.75	0.60	10.51	0.01	3.3	8.3	4.4	13.5	5.6	2.1	8.0	2.0	1.0	35.2	48.2
BH-301	**BH-301-29**	10.668	11.430	0.75	0.30	10.97	0.01	1.2	3.3	2.0	6.2	2.6	0.9	3.6	0.9	0.7	15.2	21.4
BH-301	**BH-301-29**	10.668	11.430	0.75	0.30	10.97	0.01	1.2	3.3	1.9	6.0	2.5	1.0	3.5	1.0	0.5	14.9	20.9
BH-301	**BH-301-30**	10.668	11.430	0.75	0.60	11.27	0.01	2.6	7.0	3.8	11.6	4.8	1.7	6.8	1.7	1.0	29.8	41.0
BH-301	**BH-301-30**	10.668	11.430	0.75	0.60	11.27	0.01	2.1	7.1	2.6	11.6	4.8	1.8	6.8	1.7	0.9	28.2	39.4
BH-301	**BH-301-31**	11.430	12.192	0.75	0.10	11.53	0.01	0.5	1.3	0.8	2.8	1.2	0.3	1.2	0.3	0.3	6.7	8.8
BH-301	**BH-301-32**	11.430	12.192	0.75	0.50	11.93	0.01	0.4	0.6	0.5	1.8	0.7	0.2	0.7	0.2	0.2	3.9	5.3
BH-301	**BH-301-33**	11.430	12.192	0.75	0.70	12.13	0.01	0.4	0.1	0.3	1.2	0.3	0.1	0.5	0.2	0.1	2.4	3.3
BH-302	**BH-302-1**	0.000	1.524	0.57	0.50	0.50	0.95	5.8	7.2	8.8	50.2	5.9	14.5	50.7	14.8	11.0	77.8	168.9
BH-302	**BH-302-2**	1.524	2.286	0.54	0.20	1.72	0.22	1.6	0.9	0.5	0.5	0.2	0.9	2.8	1.4	2.4	3.6	11.2
BH-302	**BH-302-3**	1.524	2.286	0.54	0.40	1.92	0.22	3.7	1.5	2.2	7.5	1.0	6.7	23.7	10.2	14.5	15.9	71.1
BH-302	**BH-302-4**	3.049	3.810	0.32	0.20	3.25	0.44	13.4	9.5	10.8	59.6	3.7	16.8	56.4	16.3	10.1	97.0	196.6
BH-302	**BH-302-5**	3.810	4.579	0.41	0.13	3.94	0.36	57.4	50.2	25.6	158.6	52.6	46.4	162.2	44.0	23.1	344.4	620.2
BH-302	**BH-302-6**	3.810	4.579	0.41	0.33	4.14	0.36	27.9	32.7	23.2	132.5	50.4	35.8	126.1	34.5	17.0	266.7	480.2
BH-302	**BH-302-7**	4.579	5.334	0.41	0.13	4.71	0.35	67.4	63.4	76.6	231.6	80.2	47.4	164.2	43.9	23.5	519.1	798.1
BH-302	**BH-302-8**	4.579	5.334	0.41	0.33	4.91	0.35	17.4	30.7	41.2	118.6	49.3	23.9	89.8	23.3	16.1	257.2	410.4
BH-302	**BH-302-9**	5.334	6.096	0.65	0.20	5.53	0.11	21.5	39.7	37.5	102.6	42.2	21.2	78.5	19.8	10.7	243.4	373.6
BH-302	**BH-302-10**	5.334	6.096	0.65	0.40	5.73	0.11	92.9	145.9	69.9	286.7	117.2	63.4	234.9	57.2	26.4	712.5	1094.3
BH-302	**BH-302-10-DUP**	5.334	6.096	0.65	0.40	5.73	0.11	76.0	117.8	57.5	237.4	97.0	55.2	195.6	47.6	21.6	585.7	905.7
BH-302	**BH-302-11**	6.096	6.858	0.75	0.20	6.30	0.01	58.7	113.2	72.7	215.1	87.1	43.4	497.5	41.7	19.3	546.8	1148.7
BH-302	**BH-302-12**	6.096	6.858	0.75	0.40	6.50	0.01	86.0	157.6	67.1	279.4	113.4	53.9	201.6	49.7	23.1	703.5	1031.9
BH-302	**BH-302-13**	6.096	6.858	0.75	0.60	6.70	0.01	159.3	285.1	169.2	495.5	200.3	96.5	356.8	88.2	43.1	1309.4	1894.0
BH-302	**BH-302-14**	6.858	7.620	0.75	0.10	6.96	0.01	132.1	256.7	147.1	424.3	175.8	80.9	316.9	78.9	42.0	1136.0	1654.6
BH-302	**BH-302-15**	6.858	7.620	0.75	0.30	7.16	0.01	58.7	104.7	61.3	178.8	73.9	32.5	129.7	31.5	17.2	477.4	688.4
BH-302	**BH-302-16**	6.858	7.620	0.75	0.50	7.36	0.01	0.4	2.6	0.5	2.0	0.8	0.2	0.9	0.3	0.3	6.3	8.0
BH-302	**BH-302-17**	6.858	7.620	0.75	0.70	7.56	0.01	0.3	2.4	0.5	1.9	0.8	0.2	0.9	0.3	0.2	5.9	7.5
BH-302	**BH-302-18**	7.620	8.382	0.34	0.17	7.79	0.42	0.8	2.9	0.7	2.5	1.0	0.3	1.1	0.3	0.3	7.9	10.0
BH-302	**BH-302-18-DUP**	7.620	8.382	0.34	0.17	7.79	0.42	3.5	7.7	3.7	11.3	4.6	2.1	7.8	2.0	1.1	30.9	43.8
BH-302	**BH-302-19**	8.382	9.144	0.75	0.20	8.58	0.01	0.4	1.8	1.0	3.5	1.4	0.4	1.4	0.4	0.4	8.1	10.7
BH-302	**BH-302-20**	8.382	9.144	0.75	0.70	9.08	0.01	0.4	0.9	0.6	2.3	0.9	0.2	0.9	0.3	0.3	5.1	6.7
BH-302	**BH-302-21**	9.144	9.906	0.75	0.20	9.34	0.01	0.6	1.8	1.1	3.8	1.5	0.4	1.7	0.5	0.5	8.8	12.0
BH-302	**BH-302-22**	9.144	9.906	0.75	0.40	9.54	0.01	0.5	1.3	0.6	2.3	1.0	0.3	1.2	0.3	0.3	5.7	7.9
BH-302	**BH-302-23**	9.144	9.906	0.75	0.60	9.74	0.01	0.5	1.6	0.6	2.3	1.0	0.3	1.2	0.3	0.3	6.1	8.2
BH-302	**BH-302-24**	9.906	10.668	0.75	0.20	10.11	0.01	0.6	0.8	0.5	1.9	0.7	0.4	1.5	0.4	0.3	4.5	7.0
BH-302	**BH-302-25**	9.906	10.668	0.75	0.60	10.51	0.01	0.2	0.1	0.3	1.3	0.4	0.3	1.2	0.3	0.3	2.3	4.5
BH-302	**BH-302-26**	10.668	11.430	0.75	0.65	11.32	0.01	0.8	1.6	0.9	3.1	1.2	0.5	2.1	0.6	0.3	7.7	11.2
BH-302	**BH-302-26-DUP**	10.668	11.430	0.75	0.65	11.32	0.01	0.8	1.5	0.9	3.1	1.3	0.6	2.2	0.6	0.4	7.6	11.3
BH-302	**BH-302-27**	11.430	12.192	0.75	0.20	11.63	0.01	0.6	0.6	0.6	2.4	0.9	0.4	1.7	0.5	0.3	5.1	8.1
BH-302	**BH-302-28**	11.430	12.192	0.75	0.40	11.83	0.01	0.6	0.5	0.5	2.1	0.8	0.3	1.4	0.4	0.3	4.6	6.9
BH-302	**BH-302-29**	11.430	12.192	0.75	0.60	12.03	0.01	0.6	0.6	0.5	2.2	0.8	0.3	1.2	0.3	0.3	4.8	6.8
BH-302	**BH-302-30**	12.192	12.954	0.75	0.20	12.39	0.01	0.6	0.7	0.6	2.3	0.8	0.3	1.4	0.4	0.3	5.0	7.4
BH-302	**BH-302-31**	12.192	12.954	0.75	0.40	12.59	0.01	0.5	0.6	0.4	1.8	0.6	0.2	1.0	0.3	0.2	3.9	5.6
BH-302	**BH-302-32**	12.192	12.954	0.75	0.60	12.79	0.01	0.5	0.8	0.6	2.3	0.8	0.3	1.3	0.4	0.3	5.1	7.4
BH-303	**BH-303-1**	1.524	3.048	0.25	0.15	1.67	1.27	5.8	13.4	19.0	8.6	60.3	23.8	82.6	23.6	12.1	107.1	249.2
BH-303	**BH-303-1-DUP**	1.524	3.048	0.25	0.15	1.67	1.27	1.6	19.8	20.6	8.8	62.7	25.6	89.0	25.4	13.2	113.4	266.6
BH-303	**BH-303-2**	3.810	4.472	0.20	0.10	3.91	0.46	3.7	20.1	15.8	16.7	86.6	25.4	87.2	26.4	17.0	142.9	298.9
BH-303	**BH-303-3**	4.572	5.334	0.05	0.03	4.60	0.71	13.4	52.8	37.6	27.5	146.3	40.1	143.6	39.2	20.3	277.7	520.9
BH-303	**BH-303-4**	5.334	6.096	0.60	0.20	5.53	0.16	57.4	6.2	10.7	7.2	35.4	11.3	40.1	10.2	5.8	116.8	184.2
BH-303	**BH-303-5**	5.334	6.096	0.60	0.40	5.73	0.16	27.9	18.6	32.2	19.8	94.5	27.3	96.1	24.1	12.6	193.0	353.2
BH-303	**BH-303-6**	6.096	6.858	0.75	0.30	6.40	0.01	67.4	53.9	89.9	76.4	225.6	54.3	207.0	51.7	22.9	513.1	849.1
BH-303	**BH-303-7**	6.096	6.858	0.75	0.50	6.60	0.01	17.4	79.5	143.1	99.1	295.4	64.3	242.5	64.6	29.0	634.5	1034.9
BH-303	**BH-303-8**	6.096	6.858	0.75	0.70	6.80	0.01	21.5	98.4	157.6	111.1	332.0	67.2	254.1	66.9	29.9	720.5	1138.6

BH-303	**BH-303-9**	6.858	7.620	0.75	0.20	7.06	0.01	130.8	229.3	175.9	527.7	212.3	107.6	400.6	100.0	46.8	1276.0	1931.1
BH-303	**BH-303-9-DUP**	6.858	7.620	0.75	0.20	7.06	0.01	3.4	5.5	2.8	9.4	3.8	1.7	6.7	1.8	1.2	24.9	36.4
BH-303	**BH-303-10**	6.858	7.620	0.75	0.40	7.26	0.01	69.9	105.5	52.1	222.7	89.5	42.7	160.0	39.4	18.1	539.7	800.0
BH-303	**BH-303-11**	6.858	7.620	0.75	0.60	7.46	0.01	2.1	2.7	0.7	2.8	1.1	0.3	1.2	0.4	0.3	9.5	11.7
BH-303	**BH-303-12**	7.620	8.382	0.60	0.10	7.72	0.16	2.4	3.4	1.9	6.6	2.5	1.0	3.9	1.1	0.7	16.8	23.5
BH-303	**BH-303-13**	7.620	8.382	0.60	0.30	7.92	0.16	0.8	1.3	0.8	3.0	1.2	0.4	1.6	0.5	0.4	7.1	9.9
BH-303	**BH-303-14**	7.620	8.382	0.60	0.50	8.12	0.16	0.4	0.6	0.8	3.9	1.3	0.5	2.1	0.6	0.5	7.2	10.9
BH-303	**BH-303-15**	8.382	9.144	0.75	0.20	8.58	0.01	0.7	0.9	1.0	3.9	1.4	0.5	2.1	0.6	0.6	8.0	11.9
BH-303	**BH-303-16**	8.382	9.144	0.75	0.40	8.78	0.01	0.7	0.8	1.0	3.8	1.4	0.5	2.0	0.6	0.5	7.6	11.2
BH-303	**BH-303-17**	8.382	9.144	0.75	0.60	8.98	0.01	0.9	0.8	0.9	3.7	1.4	0.4	1.7	0.5	0.4	7.7	10.8
BH-303	**BH-303-18**	9.144	9.906	0.35	0.20	9.34	0.41	0.4	0.5	0.7	2.7	0.8	0.5	2.0	0.6	0.5	5.2	8.7
BH-304	**BH-304-1**	1.524	3.048	0.75	0.20	1.72	0.77	0.45	4.93	14.01	29.08	12.12	16.34	54.84	13.61	6.35	60.6	151.7
BH-304	**BH-304-2**	1.524	3.048	0.75	0.40	1.92	0.77	2.57	16.54	27.30	59.86	28.62	51.13	171.97	45.33	22.90	134.9	426.2
BH-304	**BH-304-3**	1.524	3.048	0.75	0.60	2.12	0.77	6.37	17.07	7.14	52.44	23.72	22.10	76.02	19.50	10.09	106.7	234.4
BH-304	**BH-304-4**	3.048	3.810	0.52	0.40	3.45	0.24	17.98	36.90	20.47	115.34	49.39	36.08	128.15	32.45	16.12	240.1	452.9
BH-304	**BH-304-5**	3.810	4.572	0.75	0.25	4.06	0.01	54.26	107.67	56.77	295.28	121.13	85.01	299.37	74.36	32.37	635.1	1126.2
BH-304	**BH-304-6**	3.810	4.572	0.75	0.45	4.26	0.01	32.42	66.16	65.37	183.83	76.62	53.60	192.44	48.40	22.64	424.4	741.5
BH-304	**BH-304-7**	3.810	4.572	0.75	0.65	4.46	0.01	29.16	63.56	55.81	167.34	68.99	41.49	152.89	43.36	18.95	384.9	641.5
BH-304	**BH-304-8**	4.572	5.334	0.75	0.20	4.77	0.01	38.52	93.84	69.21	204.71	84.51	47.20	173.66	44.06	21.41	490.8	777.1
BH-304	**BH-304-9**	4.572	5.334	0.75	0.40	4.97	0.01	36.67	95.51	66.19	194.21	81.24	44.95	165.83	42.05	20.84	473.8	747.5
BH-304	**BH-304-10**	4.572	5.334	0.75	0.60	5.17	0.01	9.81	31.99	15.12	68.95	29.35	16.99	62.34	15.49	8.15	155.2	258.2
BH-304	**BH-304-11**	5.334	6.096	0.75	0.25	5.58	0.01	4.11	15.37	7.55	35.06	15.51	9.76	36.54	9.33	5.14	77.6	138.4
BH-304	**BH-304-12**	5.334	6.096	0.75	0.50	5.83	0.01	84.62	210.96	65.42	295.36	117.99	63.60	241.19	59.42	25.90	774.4	1164.5
BH-304	**BH-304-12-DUP**	5.334	6.096	0.75	0.50	5.83	0.01	87.22	214.60	105.79	319.68	124.50	67.35	255.72	63.50	28.30	851.8	1266.7
BH-304	**BH-304-13**	5.334	6.096	0.75	0.70	6.03	0.01	23.32	50.24	29.62	92.87	36.26	20.18	80.09	19.85	9.02	232.3	361.5
BH-304	**BH-304-14**	6.096	6.858	0.75	0.20	6.30	0.01	65.84	90.23	70.98	220.03	86.89	41.86	168.79	41.77	18.10	534.0	804.5
BH-304	**BH-304-16**	6.858	7.620	0.54	0.35	7.21	0.22	0.30	0.26	0.40	1.59	0.63	0.27	1.09	0.31	0.25	3.2	5.1
BH-304	**BH-304-17**	7.620	8.382	0.75	0.30	7.92	0.01	0.46	0.39	0.61	2.33	0.99	0.42	1.74	0.46	0.32	4.8	7.7
BH-304	**BH-304-18**	7.620	8.382	0.75	0.50	8.12	0.01	0.20	0.14	0.35	1.53	0.53	0.32	1.25	0.35	0.28	2.7	4.9
BH-304	**BH-304-19**	8.382	9.144	0.61	0.25	8.63	0.15	0.16	0.09	0.37	1.71	0.54	0.36	1.39	0.39	0.27	2.9	5.3
BH-304	**BH-304-20**	9.144	9.906	0.75	0.20	9.34	0.01	0.29	0.18	0.47	2.04	0.67	0.42	1.64	0.46	0.36	3.6	6.5
BH-304	**BH-304-21**	9.144	9.906	0.75	0.20	9.34	0.01	0.54	0.50	1.18	4.73	1.68	0.73	3.00	0.86	0.50	8.6	13.7
BH-304	**BH-304-21-DUP**	9.144	9.906	0.75	0.20	9.34	0.01	0.30	0.17	0.58	2.50	0.83	0.47	1.87	0.52	0.39	4.4	7.6
BH-304	**BH-304-22**	10.668	11.430	0.75	0.30	10.97	0.01	0.51	0.51	0.52	2.19	0.76	0.37	1.46	0.41	0.31	4.5	7.0
BH-304	**BH-304-23**	10.668	11.430	0.75	0.50	11.17	0.01	0.45	0.25	0.45	1.87	0.67	0.33	1.32	0.37	0.28	3.7	6.0
BH-304	**BH-304-24**	10.668	11.430	0.75	0.70	11.37	0.01	0.33	0.15	0.39	1.72	0.58	0.32	1.25	0.35	0.24	3.2	5.3
BH-304	**BH-304-25**	11.430	12.192	0.75	0.20	11.63	0.01	0.35	0.19	0.43	1.90	0.64	0.37	1.45	0.41	0.32	3.5	6.1
BH-304	**BH-304-26**	11.430	12.192	0.75	0.40	11.83	0.01	0.32	0.19	0.41	1.73	0.63	0.34	1.38	0.38	0.26	3.3	5.6
BH-304	**BH-304-27**	11.430	12.192	0.75	0.60	12.03	0.01	0.22	0.09	0.36	1.65	0.53	0.27	1.06	0.31	0.20	2.9	4.7
BH-401	**BH-401-1**	2.286	3.048	0.38	0.19	2.48	0.38	13.3	20.4	30.0	109.0	7.5	29.1	121.8	29.9	8.1	180.1	369.1
BH-401	**BH-401-2**	3.048	3.810	0.30	0.15	3.20	0.46	9.3	15.0	14.6	24.6	8.8	10.2	44.6	8.9	1.7	72.4	137.8
BH-401	**BH-401-3**	3.810	4.572	0.52	0.17	3.98	0.24	8.8	12.9	10.7	15.3	9.0	11.2	44.7	8.6	1.3	56.7	122.5
BH-401	**BH-401-3**	3.810	4.572	0.52	0.17	3.98	0.24	8.6	12.9	10.1	15.0	9.3	10.9	45.1	8.7	1.2	55.8	121.8
BH-401	**BH-401-4**	3.810	4.572	0.52	0.35	4.16	0.24	25.1	32.5	39.9	116.6	41.8	29.8	123.3	26.9	8.8	256.0	444.8
BH-401	**BH-401-4**	3.810	4.572	0.52	0.35	4.16	0.24	23.9	32.4	38.2	113.9	42.7	29.7	125.4	28.1	8.9	251.0	443.1
BH-401	**BH-401-5**	3.810	4.572	0.52	0.50	4.31	0.24	18.3	26.8	29.0	70.4	29.2	25.4	106.2	22.9	6.2	173.7	334.3
BH-401	**BH-401-6**	4.572	5.334	0.33	0.10	4.67	0.43	45.2	51.4	64.5	197.4	69.6	54.8	230.6	51.4	15.9	428.2	780.9
BH-401	**BH-401-7**	4.572	5.334	0.33	0.25	4.82	0.43	5.8	6.5	8.9	28.2	10.4	6.8	28.7	6.5	2.3	59.8	104.1
BH-401	**BH-401-9**	5.334	6.096	0.65	0.30	5.63	0.11	17.4	44.0	29.9	92.7	38.1	15.5	70.2	15.7	4.9	222.1	328.5
BH-401	**BH-401-9**	5.334	6.096	0.65	0.30	5.63	0.11	17.5	44.0	29.2	90.9	37.8	15.3	69.6	15.3	4.6	219.3	324.1
BH-401	**BH-401-10**	5.334	6.096	0.65	0.45	5.78	0.11	4.2	12.4	8.3	27.1	11.3	4.7	21.0	4.8	1.7	63.3	95.5
BH-401	**BH-401-11**	5.334	6.096	0.65	0.54	5.87	0.11	33.4	84.4	57.0	184.5	75.3	29.1	134.3	30.1	9.4	434.5	637.5
BH-401	**BH-401-11**	5.334	6.096	0.65	0.54	5.87	0.11	33.0	84.9	55.2	180.7	74.4	28.5	132.8	29.2	9.2	428.2	627.9
BH-401	**BH-401-12**	6.096	6.858	0.75	0.05	6.15	0.01	35.6	95.8	57.3	183.2	75.2	30.1	137.2	30.8	9.7	447.0	654.8
BH-401	**BH-401-12**	6.096	6.858	0.75	0.05	6.15	0.01	35.7	96.2	55.3	178.6	74.5	29.2	134.9	29.7	9.0	440.3	643.1
BH-401	**BH-401-12 Dup**	6.096	6.858	0.75	0.05	6.15	0.01	34.5	84.7	55.1	175.9	71.6	29.3	131.9	29.9	9.2	421.7	622.1
BH-401	**BH-401-12 Dup**	6.096	6.858	0.75	0.05	6.15	0.01	33.1	84.3	52.8	170.8	70.6	28.4	129.4	28.4	8.6	411.6	606.4
BH-401	**BH-401-13**	6.096	6.858	0.75	0.25	6.35	0.01	56.0	162.6	86.1	274.6	111.5	44.0	200.3	45.0	13.2	690.9	993.4
BH-401	**BH-401-13**	6.096	6.858	0.75	0.25	6.35	0.01	56.2	163.6	83.2	268.2	111.9	42.7	198.9	43.7	13.6	683.1	981.9
BH-401	**BH-401-14**	6.096	6.858	0.75	0.40	6.50	0.01	26.8	81.2	40.2	129.6	53.7	20.3	92.4	20.5	6.4	331.4	471.0
BH-401	**BH-401-14**	6.096	6.858	0.75	0.40	6.50	0.01	26.8	80.9	38.8	126.6	53.2	19.9	91.1	19.7	6.0	326.4	463.1
BH-401	**BH-401-15**	6.096	6.858	0.75	0.55	6.65	0.01	81.9	266.0	132.1	421.5	177.0	63.4	288.7	63.6	20.2	1078.5	1514.4
BH-401	**BH-401-16**	6.096	6.858	0.75	0.70	6.80	0.01	0.8	5.0	1.6	5.4	2.3	0.7	3.0	0.7	0.3	15.2	19.8
BH-401	**BH-401-17**	6.858	7.620	0.75	0.05	6.91	0.01	34.3	96.2	55.9	180.0	74.6	26.3	120.7	26.5	8.7	441.0	623.2
BH-401	**BH-401-18**	6.858	7.620	0.75	0.25	7.11	0.01	99.1	242.6	183.1	583.0	240.9	78.1	355.7	77.5	25.7	1348.7	1885.6
BH-401	**BH-401-19**	6.858	7.620	0.75	0.40	7.26	0.01	61.1	135.1	103.1	322.6	143.4	44.8	214.8	46.5	14.2	765.4	1085.7
BH-401	**BH-401-20**	6.858	7.620	0.75	0.55	7.41	0.01	19.8	31.3	36.4	118.1	48.9	14.9	70.7	15.6	5.0	254.5	360.7
BH-401	**BH-401-20**	6.858	7.620	0.75	0.55	7.41	0.01	19.3	31.1	35.4	115.7	48.6	14.5	69.7	14.9	4.7	250.0	353.9
BH-401	**BH-401-21**	6.858	7.620	0.75	0.70	7.56	0.01	0.2	1.3	1.1	3.7	1.6	0.3	1.2	0.3	0.3	7.8	9.9
BH-401	**BH-401-22**	7.620	8.382	0.75	0.05	7.67	0.01	8.7	22.6	16.4	52.3	21.6	7.1	32.9	7.3	2.4	121.6	171.2
BH-401	**BH-401-22**	7.620	8.382	0.75	0.05	7.67	0.01	8.4	23.2	16.1	51.6	22.0	7.1	33.1	7.3	2.4	121.2	171.2
BH-401	**BH-401-22 Dup**	7.620	8.382	0.75	0.05	7.67	0.01	7.8	19.1	13.8	43.9	18.3	6.0	27.6	6.2	1.9	102.9	144.6
BH-401	**BH-401-22 Dup**	7.620	8.382	0.75	0.05	7.67	0.01	7.5	19.3	13.3	42.9	18.3	5.9	27.6	6.0	2.0	101.4	143.0
BH-401	**BH-401-23**	7.620	8.382	0.75	0.25	7.87	0.01	10.8	24.1	20.0	63.7	26.3	8.4	39.3	8.6	2.7	145.0	204.1
BH-401	**BH-401-23**	7.620	8.382	0.75	0.25	7.87	0.01	10.2	24.3	19.2	62.1	26.5	8.3	39.4	8.5	2.7	142.4	201.2
BH-401	**BH-401-24**	7.620	8.382	0.75	0.40	8.02	0.01	9.9	23.3	17.7	56.0	23.2	7.6	35.4	7.7	2.6	130.1	183.4
BH-401	**BH-401-24**	7.620	8.382	0.75	0.40	8.02	0.01	9.4	23.7	17.0	54.5	23.4	7.4	35.3	7.6	2.5	127.9	180.7
BH-401	**BH-401-25**	7.620	8.382	0.75	0.55	8.17	0.01	10.4	23.9	19.7	62.5	26.0	8.4	39.0	8.5	2.7	142.4	201.0
BH-401	**BH-401-25**	7.620	8.382	0.75	0.55	8.17	0.01	10.2	24.2	18.8	60.6	26.1	8.1	38.8	8.4	2.7	139.9	198.0
BH-401	**BH-401-26**	7.620	8.382	0.75	0.70	8.32	0.01	13.9	31.6	25.5	80.5	33.3	10.8	50.1	10.8	3.5	184.9	260.1
BH-401	**BH-401-26**	7.620	8.382	0.75	0.70	8.32	0.01	13.4	32.1	24.2	77.6	33.4	10.4	49.6	10.6	3.4	180.7	254.9
BH-401	**BH-401-27**	8.382	9.144	0.75	0.05	8.43	0.01	2.7	7.8	5.4	17.5	7.2	2.3	10.2	2.3	0.9	40.6	56.3
BH-401	**BH-401-28**	8.382	9.144	0.75	0.25	8.63	0.01	1.6	5.3	3.5	11.6	4.8	1.4	6.3	1.5	0.6	26.8	36.6
BH-401	**BH-401-29**	8.382	9.144	0.75	0.40	8.78	0.01	1.5	4.5	3.4	11.4	4.7	1.4	6.3	1.4	0.6	25.7	35.4
BH-401	**BH-401-30**	8.382	9.144	0.75	0.55	8.93	0.01	0.2	0.4	0.8	3.1	1.2	0.3	1.2	0.3	0.4	5.7	7.9
BH-401	**BH-401-31**	8.382	9.144	0.75	0.68	9.06	0.01	0.1	0.1	1.0	3.8	1.5	0.3	1.1	0.3	0.3	6.6	8.6
BH-401	**BH-401-31 Dup**	8.382	9.144	0.75	0.68	9.06	0.01	0.2	0.2	1.1	3.9	1.5	0.3	1.3	0.3	0.4	6.9	9.2
BH-401	**BH-401-32**	9.144	9.906	0.75	0.05	9.19	0.01	3.3	8.8	6.3	20.5	8.5	2.8	12.8	2.9	1.1	47.4	67.0
BH-401	**BH-401-33**	9.144	9.906	0.75	0.25	9.39	0.01	5.0	12.5	9.6	30.8	12.6	4.3	19.7	4.4	1.6	70.5	100.4
BH-401	**BH-401-34**	9.144	9.906	0.75	0.40	9.54	0.01	5.0	12.6	9.6	30.9	12.7	4.4	19.9	4.5	1.6	70.8	101.1
BH-401	**BH-401-35**	9.144	9.906	0.75	0.55	9.69	0.01	3.2	8.1	6.0	19.5	8.1	2.8	12.7	2.9	1.1	44.9	64.4
BH-401	**BH-401-36**	9.144	9.906	0.75	0.65	9.79	0.01	0.5	1.2	1.2	4.1	1.8	0.5	2.2	0.5	0.3	8.8	12.2

BH-402	**BH-402-1**	2.286	3.048	0.38	0.18	2.47	0.38	16.2	19.8	29.9	98.3	8.4	25.6	109.8	27.6	8.2	172.6	343.8
BH-402	**BH-402-1**	2.286	3.048	0.38	0.18	2.47	0.38	16.3	19.6	29.0	96.4	8.3	25.1	108.0	26.9	7.7	169.6	337.4
BH-402	**BH-402-2**	3.048	3.810	0.33	0.17	3.21	0.43	18.0	24.3	32.8	104.5	10.5	29.5	127.0	31.2	9.0	190.0	386.7
BH-402	**BH-402-2**	3.048	3.810	0.33	0.17	3.21	0.43	18.0	24.3	31.8	102.8	10.5	28.9	125.4	30.7	8.4	187.5	380.8
BH-402	**BH-402-4**	3.810	4.572	0.33	0.11	3.92	0.43	8.8	6.7	13.0	49.0	2.7	7.7	37.5	10.0	3.6	80.2	138.9
BH-402	**BH-402-4**	3.810	4.572	0.33	0.11	3.92	0.43	8.6	6.7	12.7	48.7	2.9	7.9	37.6	10.3	3.6	79.6	139.0
BH-402	**BH-402-5**	4.572	5.334	0.18	0.05	4.62	0.58	23.4	22.8	24.5	78.0	12.8	22.5	97.1	23.5	5.9	161.4	310.5
BH-402	**BH-402-5**	4.572	5.334	0.18	0.05	4.62	0.58	23.2	22.4	23.0	75.1	12.4	22.1	95.5	23.0	3.8	156.2	300.6
BH-402	**BH-402-6**	5.334	6.096	0.59	0.15	5.48	0.17	20.6	27.0	30.0	85.0	32.2	17.5	79.7	17.7	5.0	194.8	314.6
BH-402	**BH-402-6**	5.334	6.096	0.59	0.15	5.48	0.17	20.3	27.0	29.0	83.0	32.2	16.9	79.0	17.3	4.8	191.4	309.5
BH-402	**BH-402-7**	5.334	6.096	0.59	0.30	5.63	0.17	21.6	31.9	27.1	75.3	29.9	17.0	75.3	16.3	4.4	185.8	298.8
BH-402	**BH-402-7**	5.334	6.096	0.59	0.30	5.63	0.17	20.9	31.2	25.9	72.8	29.5	16.5	73.8	15.6	4.2	180.3	290.4
BH-402	**BH-402-8**	5.334	6.096	0.59	0.45	5.78	0.17	5.5	6.3	8.6	26.3	9.5	5.5	23.6	5.1	1.5	56.2	91.9
BH-402	**BH-402-8**	5.334	6.096	0.59	0.45	5.78	0.17	5.4	6.4	8.3	25.6	9.5	5.4	23.7	5.2	1.5	55.2	90.9
BH-402	**BH-402-8**	5.334	6.096	0.59	0.45	5.78	0.17	5.3	6.3	8.3	25.6	9.5	5.4	23.7	5.2	1.5	55.0	90.8
BH-402	**BH-402-9**	5.334	6.096	0.59	0.55	5.88	0.17	18.3	47.9	28.7	88.8	35.2	18.2	80.5	17.8	4.9	218.9	340.3
BH-402	**BH-402-9**	5.334	6.096	0.59	0.55	5.88	0.17	18.5	48.1	28.1	87.6	35.1	18.1	80.2	17.4	4.7	217.3	337.7
BH-402	**BH-402-10**	6.096	6.858	0.75	0.15	6.25	0.01	37.9	85.5	51.6	166.0	65.7	33.0	147.8	32.6	9.2	406.8	629.3
BH-402	**BH-402-10 Dup**	6.096	6.858	0.75	0.15	6.25	0.01	42.9	99.3	61.2	199.3	79.0	40.0	178.5	39.9	11.4	481.6	751.4
BH-402	**BH-402-11**	6.096	6.858	0.75	0.30	6.40	0.01	64.5	166.2	94.3	308.9	122.0	58.5	264.3	59.3	17.6	755.9	1155.5
BH-402	**BH-402-12**	6.096	6.858	0.75	0.45	6.55	0.01	43.6	61.7	67.4	223.7	87.3	43.6	198.1	44.1	12.8	483.8	782.4
BH-402	**BH-402-13**	6.096	6.858	0.75	0.60	6.70	0.01	58.1	52.5	81.7	284.1	96.1	52.2	236.0	52.5	16.5	572.4	929.7
BH-402	**BH-402-14**	6.096	6.858	0.75	0.69	6.79	0.01	53.5	51.1	84.4	292.9	94.6	48.9	218.8	48.4	15.7	576.5	908.3
BH-402	**BH-402-15**	6.858	7.620	0.75	0.15	7.01	0.01	49.2	117.2	72.1	234.0	95.9	40.8	184.2	41.1	12.2	568.4	846.6
BH-402	**BH-402-16**	6.858	7.620	0.75	0.30	7.16	0.01	49.9	115.2	70.8	230.8	93.5	40.2	182.0	40.2	12.1	560.2	834.6
BH-402	**BH-402-17**	6.858	7.620	0.75	0.45	7.31	0.01	34.8	69.9	50.3	164.4	65.0	30.1	135.6	30.2	8.9	384.3	589.0
BH-402	**BH-402-18**	6.858	7.620	0.75	0.60	7.46	0.01	97.9	231.8	122.1	393.7	163.7	65.3	307.9	66.9	19.2	1009.1	1468.3
BH-402	**BH-402-19**	7.620	8.382	0.75	0.05	7.67	0.01	13.6	26.1	19.1	59.1	22.3	11.3	50.2	11.1	3.2	140.2	216.0
BH-402	**BH-402-19**	7.620	8.382	0.75	0.05	7.67	0.01	12.8	26.4	17.5	56.5	22.7	11.0	50.4	11.0	2.8	135.9	211.0
BH-402	**BH-402-19 Dup**	7.620	8.382	0.75	0.05	7.67	0.01	5.4	12.8	8.0	26.9	10.7	4.2	19.9	4.4	1.4	63.9	93.8
BH-402	**BH-402-19 Dup**	7.620	8.382	0.75	0.05	7.67	0.01	5.1	13.0	7.7	26.5	10.8	4.2	19.9	4.4	1.3	63.1	92.9
BH-402	**BH-402-20**	7.620	8.382	0.75	0.20	7.82	0.01	4.6	11.5	7.0	23.8	9.5	3.6	17.4	3.9	1.2	56.3	82.4
BH-402	**BH-402-20**	7.620	8.382	0.75	0.20	7.82	0.01	4.5	11.5	6.7	23.4	9.5	3.6	17.5	3.9	1.2	55.6	81.7
BH-402	**BH-402-21**	7.620	8.382	0.75	0.35	7.97	0.01	4.0	10.8	7.2	24.8	10.0	3.9	18.8	4.2	1.3	56.8	85.0
BH-402	**BH-402-21**	7.620	8.382	0.75	0.35	7.97	0.01	3.8	10.9	7.0	24.4	10.0	3.9	18.9	4.2	1.3	56.2	84.5
BH-402	**BH-402-22**	7.620	8.382	0.75	0.50	8.12	0.01	11.3	23.5	15.2	51.2	20.0	7.9	37.7	8.4	2.3	121.2	177.5
BH-402	**BH-402-22**	7.620	8.382	0.75	0.50	8.12	0.01	11.0	23.9	14.5	49.9	20.2	7.7	37.7	8.3	2.4	119.3	175.3
BH-402	**BH-402-23**	7.620	8.382	0.75	0.65	8.27	0.01	33.8	82.1	49.1	157.6	63.1	27.3	124.5	27.7	8.1	385.8	573.5
BH-402	**BH-402-23**	7.620	8.382	0.75	0.65	8.27	0.01	35.5	82.7	46.3	152.2	62.7	26.5	122.0	26.7	7.9	379.5	562.5
BH-402	**BH-402-24**	8.382	9.144	0.55	0.10	8.48	0.21	5.7	13.1	8.6	29.1	11.5	4.5	21.1	4.7	1.4	68.0	99.7
BH-402	**BH-402-24**	8.382	9.144	0.55	0.10	8.48	0.21	5.6	13.3	8.2	28.6	11.6	4.4	21.1	4.7	1.4	67.3	98.9
BH-402	**BH-402-25**	8.382	9.144	0.55	0.25	8.63	0.21	3.0	8.2	4.7	16.2	6.4	2.4	11.2	2.5	0.9	38.4	55.3
BH-402	**BH-402-25**	8.382	9.144	0.55	0.25	8.63	0.21	3.0	8.3	4.5	16.0	6.5	2.4	11.2	2.5	0.8	38.2	55.1
BH-402	**BH-402-26**	8.382	9.144	0.55	0.40	8.78	0.21	2.0	5.8	3.2	11.3	4.5	1.7	8.1	1.9	0.2	26.9	38.7
BH-402	**BH-402-27**	8.382	9.144	0.55	0.50	8.88	0.21	1.4	4.4	2.3	8.4	3.4	1.3	6.0	1.4	0.6	19.9	29.2
BH-402	**BH-402-28**	8.382	9.144	0.55	0.10	8.48	0.21	7.4	16.9	11.6	39.3	15.6	6.0	28.6	6.5	2.0	90.8	133.9
BH-402	**BH-402-28**	8.382	9.144	0.55	0.10	8.48	0.21	7.4	17.1	11.2	38.5	15.6	5.9	28.6	6.4	1.9	89.9	132.7
BH-402	**BH-402-29**	8.382	9.144	0.55	0.25	8.63	0.21	6.9	15.3	10.6	36.1	14.3	5.6	26.6	5.9	1.8	83.3	123.1
BH-402	**BH-402-29**	8.382	9.144	0.55	0.25	8.63	0.21	6.7	15.5	10.2	35.3	14.3	5.5	26.6	5.9	1.7	82.1	121.8
BH-402	**BH-402-30**	9.144	9.906	0.55	0.40	9.54	0.21	3.7	8.4	5.5	19.0	7.6	2.8	13.7	3.1	1.0	44.1	64.8
BH-402	**BH-402-30**	9.144	9.906	0.55	0.40	9.54	0.21	3.7	8.4	5.3	18.8	7.6	2.8	13.8	3.1	0.9	43.8	64.5
BH-402	**BH-402-30 Dup**	9.144	9.906	0.55	0.40	9.54	0.21	6.7	12.0	7.3	25.0	9.8	3.6	17.3	3.9	1.2	60.8	86.8
BH-402	**BH-402-30 Dup**	9.144	9.906	0.55	0.40	9.54	0.21	6.6	12.1	7.0	24.5	9.9	3.6	17.3	3.9	1.2	60.2	86.1
BH-402	**BH-402-31**	9.144	9.906	0.55	0.49	9.63	0.21	6.1	12.3	8.4	28.4	11.3	4.4	21.1	4.7	1.4	66.5	98.2
BH-402	**BH-402-31**	9.144	9.906	0.55	0.49	9.63	0.21	5.8	12.4	8.1	27.9	11.3	4.3	21.2	4.7	1.3	65.5	97.0
BH-403	**BH-403-1**	1.524	2.286	0.50	0.25	1.77	0.26	7.3	7.8	14.1	54.5	5.3	11.8	52.3	12.5	3.8	89.1	169.5
BH-403	**BH-403-2**	2.286	3.048	0.48	0.20	2.49	0.28	11.4	10.6	21.3	78.7	7.0	15.5	64.9	15.5	5.0	129.0	229.8
BH-403	**BH-403-3**	3.048	4.572	0.53	0.25	3.30	0.99	22.4	29.9	0.0	50.7	20.4	11.7	55.8	7.1	2.2	123.5	200.4
BH-403	**BH-403-5**	3.810	4.572	0.65	0.35	4.16	0.11	38.4	52.7	69.6	206.5	82.5	55.9	225.2	48.1	29.8	449.8	808.9
BH-403	**BH-403-5**	3.810	4.572	0.65	0.35	4.16	0.11	39.1	53.0	67.9	203.6	82.7	55.1	224.7	48.1	29.8	446.3	804.2
BH-403	**BH-403-6**	3.810	4.572	0.65	0.55	4.36	0.11	11.8	29.2	20.9	67.1	28.0	12.6	52.8	11.5	7.7	156.9	241.5
BH-403	**BH-403-7**	4.572	5.334	0.75	0.45	5.02	0.01	44.3	60.5	59.5	180.1	69.7	45.1	187.0	40.1	23.6	414.1	709.9
BH-403	**BH-403-7**	4.572	5.334	0.75	0.45	5.02	0.01	44.3	60.8	57.6	176.8	70.0	44.3	185.5	39.9	22.5	409.5	701.7
BH-403	**BH-403-8**	5.334	6.096	0.75	0.65	5.98	0.01	50.5	60.7	65.9	200.3	79.3	50.8	212.7	46.4	29.2	456.7	795.8
BH-403	**BH-403-8**	5.334	6.096	0.75	0.65	5.98	0.01	49.9	61.6	63.6	197.0	80.4	49.8	211.5	45.9	28.1	452.5	787.8
BH-403	**BH-403-9**	5.334	6.096	0.75	0.05	5.38	0.01	21.6	29.0	32.3	109.0	44.4	20.3	89.6	20.0	6.6	236.2	372.8
BH-403	**BH-403-10**	5.334	6.096	0.75	0.20	5.53	0.01	1.6	2.6	2.9	10.3	4.1	1.8	7.9	1.8	0.7	21.5	33.8
BH-403	**BH-403-10 Dup**	5.334	6.096	0.75	0.20	5.53	0.01	0.6	1.4	1.3	5.1	2.0	0.7	3.1	0.8	0.6	10.3	15.5
BH-403	**BH-403-11**	5.334	6.096	0.75	0.35	5.68	0.01	0.6	1.0	1.1	4.5	1.7	0.7	3.3	0.8	0.6	8.8	14.3
BH-403	**BH-403-12**	5.334	6.096	0.75	0.50	5.83	0.01	0.2	0.4	0.6	2.5	0.9	0.4	1.7	0.4	0.3	4.7	7.5
BH-403	**BH-403-13**	5.334	6.096	0.75	0.65	5.98	0.01	0.2	0.7	0.7	2.7	1.0	0.3	1.4	0.4	0.3	5.3	7.7
BH-403	**BH-403-16**	6.096	6.858	0.75	0.47	6.57	0.01	20.2	24.1	26.6	86.2	37.5	9.4	58.0	12.5	3.7	194.6	278.2
BH-403	**BH-403-17**	6.096	6.858	0.75	0.60	6.70	0.01	0.3	0.7	0.5	1.7	0.7	0.2	0.8	0.2	0.1	3.9	5.2
BH-403	**BH-403-18**	6.096	6.858	0.75	0.70	6.80	0.01	0.2	0.6	0.5	1.8	0.7	0.2	0.7	0.2	0.1	3.7	4.8
BH-403	**BH-403-19**	6.858	7.620	0.75	0.05	6.91	0.01	0.3	1.3	0.5	1.8	0.7	0.2	0.9	0.2	0.2	4.5	6.0
BH-403	**BH-403-20**	6.858	7.620	0.75	0.20	7.06	0.01	0.3	1.5	0.6	2.0	0.8	0.2	1.1	0.3	0.2	5.2	7.0
BH-403	**BH-403-20 Dup**	6.858	7.620	0.75	0.20	7.06	0.01	0.3	1.4	0.6	2.1	0.8	0.2	1.0	0.3	0.2	5.1	6.9
BH-403	**BH-403-21**	6.858	7.620	0.75	0.35	7.21	0.01	0.3	1.6	0.5	2.0	0.7	0.2	1.0	0.3	0.3	5.2	7.0
BH-403	**BH-403-22**	6.858	7.620	0.75	0.50	7.36	0.01	0.3	1.8	0.4	1.3	0.5	0.2	0.7	0.2	0.2	4.2	5.4
BH-403	**BH-403-23**	6.858	7.620	0.75	0.65	7.51	0.01	0.2	1.3	0.3	1.1	0.4	0.1	0.6	0.2	0.2	3.4	4.6
BH-403	**BH-403-24**	7.620	8.382	0.75	0.05	7.67	0.01	0.6	2.0	0.8	2.6	1.1	0.4	1.8	0.4	0.2	7.0	9.9
BH-403	**BH-403-25**	7.620	8.382	0.75	0.20	7.82	0.01	0.4	1.6	0.5	1.7	0.7	0.2	1.0	0.2	0.1	4.7	6.2
BH-403	**BH-403-26**	7.620	8.382	0.75	0.35	7.97	0.01	0.4	1.6	0.6	2.0	0.8	0.3	1.3	0.3	0.2	5.5	7.6
BH-403	**BH-403-27**	7.620	8.382	0.75	0.50	8.12	0.01	0.4	1.5	0.5	1.7	0.7	0.2	1.0	0.2	0.1	4.7	6.3
BH-403	**BH-403-28**	7.620	8.382	0.75	0.65	8.27	0.01	1.0	1.9	1.2	4.0	1.7	0.7	3.2	0.7	0.1	9.8	14.5
BH-403	**BH-403-29**	8.382	9.144	0.75	0.10	8.48	0.01	0.5	2.3	0.7	2.5	1.0	0.3	1.1	0.3	0.3	7.0	9.0
BH-405	**BH-405-1**	4.572	5.334	0.75	0.05	4.62	0.01	18.8	56.2	38.5	129.2	54.8	23.2	102.4	23.1	7.6	297.6	453.9
BH-405	**BH-405-2**	4.572	5.334	0.75	0.25	4.82	0.01	5.9	18.6	11.9	39.4	16.1	6.6	28.4	6.5	2.2	91.9	135.5
BH-405	**BH-405-2**	4.572	5.334	0.75	0.25	4.82	0.01	5.8	18.8	11.4	38.7	16.2	6.5	28.4	6.4	2.2	90.8	134.2
BH-405	**BH-405-3**	4.572	5.334	0.75	0.55	5.12	0.01	9.9	21.2	19.9	67.1	27.2	10.7	46.5	10.5	3.9	145.4	217.0
BH-405	**BH-405-4**	4.572	5.334	0.75	0.70	5.27	0.01	37.0	69.7	69.9	229.9	95.0	37.0	159.3	35.9	12.7	501.5	746.4
BH-405	**BH-405-5**	5.334	6.096	0.75	0.05	5.38	0.01	34.8	88.1	61.7	202.4	85.4	33.0	144.4	32.7	10.6	472.4	693.1
BH-405	**BH-405-6**	5.334	6.096	0.75	0.20	5.53	0.01	40.0	101.6	75.5	245.4	103.7	40.5	174.7	39.3	12.7	566.2	833.3

BH-405	**BH-405-6**	5.334	6.096	0.75	0.20	5.53	0.01	40.0	102.0	73.3	240.2	103.1	39.3	173.4	38.7	12.6	558.5	822.6
BH-405	**BH-405-7**	5.334	6.096	0.75	0.35	5.68	0.01	63.6	200.8	106.5	346.0	146.1	57.1	258.2	57.1	17.6	863.0	1253.0
BH-405	**BH-405-8**	5.334	6.096	0.75	0.50	5.83	0.01	48.7	167.9	82.5	264.2	111.2	45.5	193.1	43.0	14.3	674.5	970.4
BH-405	**BH-405-8**	5.334	6.096	0.75	0.50	5.83	0.01	49.5	169.4	80.3	260.5	112.5	44.4	193.5	42.8	13.8	672.1	966.6
BH-405	**BH-405-9**	5.334	6.096	0.75	0.65	5.98	0.01	91.7	323.3	146.3	476.0	203.8	82.3	353.3	78.1	25.8	1241.1	1780.4
BH-405	**BH-405-10**	6.096	6.858	0.62	0.10	6.20	0.14	6.9	23.8	10.6	34.9	14.7	5.9	25.3	5.7	2.0	90.9	129.8
BH-405	**BH-405-10**	6.096	6.858	0.62	0.10	6.20	0.14	6.8	24.2	10.1	34.1	14.7	5.7	25.2	5.6	1.9	89.9	128.3
BH-405	**BH-405-10 Dup**	6.096	6.858	0.62	0.10	6.20	0.14	6.4	22.6	9.9	33.1	14.0	5.6	24.3	5.4	1.9	86.0	123.3
BH-405	**BH-405-10 Dup**	6.096	6.858	0.62	0.10	6.20	0.14	6.4	22.5	9.8	33.1	14.0	5.6	24.4	5.5	1.9	85.8	123.2
BH-405	**BH-405-10 Dup**	6.096	6.858	0.62	0.10	6.20	0.14	6.2	22.9	9.6	32.6	14.1	5.5	24.3	5.4	1.8	85.3	122.3
BH-405	**BH-405-11**	6.096	6.858	0.62	0.25	6.35	0.14	8.3	28.7	12.3	42.1	18.0	7.2	32.9	7.2	2.1	109.4	158.9
BH-405	**BH-405-11**	6.096	6.858	0.62	0.25	6.35	0.14	8.1	28.6	12.4	42.3	17.9	7.3	33.1	7.3	2.2	109.3	159.2
BH-405	**BH-405-11**	6.096	6.858	0.62	0.25	6.35	0.14	8.1	29.0	11.9	41.3	18.0	7.2	32.9	7.1	2.1	108.3	157.6
BH-405	**BH-405-12**	6.096	6.858	0.62	0.40	6.50	0.14	21.8	69.4	32.3	111.2	48.6	20.2	95.8	20.5	5.7	283.3	425.5
BH-405	**BH-405-12**	6.096	6.858	0.62	0.40	6.50	0.14	22.3	69.2	31.4	109.0	48.2	19.8	94.3	20.1	5.4	280.2	419.8
BH-405	**BH-405-13**	6.096	6.858	0.62	0.55	6.65	0.14	13.3	32.2	19.3	65.9	27.1	11.7	55.4	11.9	3.0	157.7	239.8
BH-405	**BH-405-13**	6.096	6.858	0.62	0.55	6.65	0.14	12.5	32.5	18.5	64.3	27.3	11.4	55.3	12.0	3.2	155.2	237.0
BH-405	**BH-405-14**	6.858	7.620	0.75	0.10	6.96	0.01	1.7	4.9	1.6	5.8	2.4	0.8	3.9	0.9	0.3	16.4	22.3
BH-405	**BH-405-15**	6.858	7.620	0.75	0.25	7.11	0.01	2.6	6.7	2.9	9.7	4.2	1.6	8.1	1.7	0.5	26.1	38.0
BH-405	**BH-405-16**	6.858	7.620	0.75	0.40	7.26	0.01	0.6	2.9	0.7	2.8	1.1	0.3	1.4	0.4	0.3	8.1	10.5
BH-405	**BH-405-17**	6.858	7.620	0.75	0.55	7.41	0.01	0.3	2.0	0.4	1.7	0.7	0.2	0.8	0.2	0.2	5.1	6.5
BH-405	**BH-405-18**	6.858	7.620	0.75	0.70	7.56	0.01	0.5	3.1	0.6	2.3	0.9	0.3	1.2	0.3	0.3	7.3	9.4
BH-405	**BH-405-19**	7.620	8.382	0.75	0.10	7.72	0.01	3.6	8.9	4.5	15.1	6.4	2.6	12.5	2.7	0.8	38.6	57.2
BH-405	**BH-405-19**	7.620	8.382	0.75	0.10	7.72	0.01	3.6	9.1	4.3	14.9	6.5	2.6	12.6	2.7	0.7	38.3	56.9
BH-405	**BH-405-20**	7.620	8.382	0.75	0.25	7.87	0.01	8.2	19.6	10.9	35.5	15.1	6.3	30.7	6.6	1.7	89.4	134.6
BH-405	**BH-405-20**	7.620	8.382	0.75	0.25	7.87	0.01	8.2	19.9	10.5	34.8	15.2	6.1	30.7	6.5	1.6	88.6	133.5
BH-405	**BH-405-21**	7.620	8.382	0.75	0.40	8.02	0.01	0.4	1.6	0.4	1.6	0.6	0.2	0.7	0.2	0.2	4.5	5.8
BH-405	**BH-405-22**	7.620	8.382	0.75	0.40	8.02	0.01	0.4	1.8	0.4	1.6	0.6	0.2	0.7	0.2	0.2	4.8	6.0
BH-405	**BH-405-22 Dup**	7.620	8.382	0.75	0.55	8.17	0.01	0.5	1.6	0.6	2.2	0.9	0.3	1.2	0.3	0.3	5.8	7.8
BH-405	**BH-405-23**	7.620	8.382	0.75	0.70	8.32	0.01	0.3	1.0	0.4	1.4	0.6	0.2	0.8	0.2	0.2	3.6	5.1
BH-406	**BH-406-1**	1.524	2.286	0.41	0.20	1.72	0.35	0.1	0.3	0.4	1.5	0.0	0.8	3.1	0.7	0.6	2.4	7.6
BH-406	**BH-406-2**	2.286	3.048	0.39	0.20	2.49	0.37	4.7	14.4	15.2	33.9	10.3	17.1	67.8	12.6	1.5	78.6	177.6
BH-406	**BH-406-3**	3.048	4.572	0.26	0.13	3.18	1.26	5.3	17.2	20.6	55.8	20.6	18.8	78.6	16.4	3.2	119.5	236.5
BH-406	**BH-406-4**	3.810	4.572	0.66	0.20	4.01	0.10	62.9	163.7	134.9	445.4	179.4	80.6	350.4	78.7	22.6	986.3	1518.6
BH-406	**BH-406-4**	3.810	4.572	0.66	0.20	4.01	0.10	63.1	162.0	126.7	424.5	174.8	78.1	341.4	76.7	21.9	951.1	1469.2
BH-406	**BH-406-5**	3.810	4.572	0.66	0.40	4.21	0.10	16.5	45.1	36.4	119.8	48.9	21.1	93.4	20.8	6.5	266.6	408.4
BH-406	**BH-406-6**	3.810	4.572	0.66	0.60	4.41	0.10	19.9	58.9	44.2	145.2	59.5	25.0	111.6	24.8	7.7	327.7	496.9
BH-406	**BH-406-7**	4.572	5.334	0.67	0.20	4.77	0.09	22.0	68.6	44.1	147.1	60.8	25.8	114.2	25.6	7.6	342.6	515.7
BH-406	**BH-406-8**	4.572	5.334	0.67	0.50	5.07	0.09	12.1	48.8	28.3	95.6	40.2	17.2	76.4	17.1	5.4	225.0	341.0
BH-406	**BH-406-10**	5.334	6.096	0.48	0.26	5.59	0.28	55.8	186.0	92.6	304.1	125.8	53.0	237.6	52.3	16.3	764.4	1123.7
BH-406	**BH-406-11**	5.334	6.096	0.48	0.40	5.73	0.28	14.4	42.1	20.3	66.8	27.5	11.7	53.9	12.0	3.6	170.9	252.1
BH-406	**BH-406-12**	6.096	6.858	0.75	0.05	6.15	0.01	42.2	121.9	62.1	203.5	83.5	35.2	157.7	35.4	10.8	513.1	752.2
BH-406	**BH-406-12 dup**	6.096	6.858	0.75	0.05	6.15	0.01	146.4	416.6	224.2	724.3	286.0	124.7	559.0	119.2	52.6	1797.5	2652.9
BH-406	**BH-406-12 dup**	6.096	6.858	0.75	0.05	6.15	0.01	124.9	432.5	216.1	722.9	299.4	127.5	581.4	126.5	33.9	1795.8	2665.0
BH-406	**BH-406-13**	6.096	6.858	0.75	0.25	6.35	0.01	126.7	364.6	195.4	632.6	249.5	108.4	488.4	104.7	44.9	1568.9	2315.2
BH-406	**BH-406-13**	6.096	6.858	0.75	0.25	6.35	0.01	126.9	374.3	188.2	614.2	249.7	106.7	480.4	105.0	30.8	1553.4	2276.1
BH-406	**BH-406-14**	6.096	6.858	0.75	0.55	6.65	0.01	34.8	60.0	45.1	151.1	60.9	24.7	118.1	25.9	7.2	352.0	527.8
BH-406	**BH-406-14**	6.096	6.858	0.75	0.55	6.65	0.01	35.7	60.5	44.1	148.9	61.1	24.2	118.0	25.6	6.7	350.3	524.7
BH-406	**BH-406-15**	6.096	6.858	0.75	0.58	6.68	0.01	76.1	102.6	98.2	325.5	131.0	49.7	243.0	53.4	14.3	733.4	1093.8
BH-406	**BH-406-15**	6.096	6.858	0.75	0.58	6.68	0.01	75.3	103.3	95.2	318.2	130.5	49.1	241.5	53.3	13.9	722.5	1080.3
BH-406	**BH-406-16**	6.096	6.858	0.75	0.70	6.80	0.01	64.7	63.4	72.9	233.7	97.7	49.9	250.2	53.3	10.8	532.3	896.4
BH-406	**BH-406-16**	6.096	6.858	0.75	0.70	6.80	0.01	63.4	62.9	69.5	225.7	96.4	48.2	245.9	52.0	11.1	517.9	875.2
BH-406	**BH-406-18**	6.858	7.620	0.56	0.40	7.26	0.20	32.3	46.0	38.0	123.5	51.7	24.4	120.2	25.9	6.1	291.5	468.2
BH-406	**BH-406-18**	6.858	7.620	0.56	0.40	7.26	0.20	32.7	46.7	37.6	122.0	51.8	24.0	120.5	25.9	5.8	290.7	467.0
BH-406	**BH-406-19**	7.620	8.382	0.75	0.10	7.72	0.01	1.5	2.5	1.6	5.7	2.3	0.9	4.5	1.0	0.4	13.6	20.4
BH-406	**BH-406-20**	7.620	8.382	0.75	0.25	7.87	0.01	1.1	1.8	1.3	4.9	2.0	0.8	3.9	0.9	0.5	11.0	17.2
BH-406	**BH-406-21**	7.620	8.382	0.75	0.40	8.02	0.01	1.4	2.0	1.5	5.2	2.2	0.9	4.4	1.0	0.3	12.4	19.0
BH-406	**BH-406-21 Dup**	7.620	8.382	0.75	0.40	8.02	0.01	1.7	2.4	1.7	6.0	2.5	1.0	4.9	1.1	0.4	14.4	21.7
BH-406	**BH-406-22**	7.620	8.382	0.75	0.55	8.17	0.01	1.6	2.0	1.8	6.4	2.6	1.0	4.6	1.1	0.5	14.4	21.6
BH-406	**BH-406-23**	7.620	8.382	0.75	0.70	8.32	0.01	0.5	0.4	0.4	1.5	0.7	0.2	0.7	0.2	0.2	3.5	4.8
BH-501	**BH-501-1**	5.334	6.096	0.75	0.20	5.53	0.01	17.6	17.4	14.5	28.9	12.7	9.1	46.2	9.5	2.1	91.2	158.1
BH-501	**BH-501-2**	5.334	6.096	0.75	0.35	5.68	0.01	20.9	18.9	18.3	43.5	16.9	13.1	60.9	12.7	3.3	118.5	208.4
BH-501	**BH-501-3**	5.334	6.096	0.75	0.50	5.83	0.01	86.4	103.5	91.6	249.3	95.7	62.3	281.8	60.7	15.8	626.4	1047.0
BH-501	**BH-501-3**	5.334	6.096	0.75	0.50	5.83	0.01	90.6	104.4	89.7	247.0	95.7	62.0	281.3	61.0	15.4	627.5	1047.3
BH-501	**BH-501-4**	5.334	6.096	0.75	0.70	6.03	0.01	73.6	105.9	88.9	267.4	104.3	55.9	250.9	54.9	15.1	640.0	1016.7
BH-501	**BH-501-4**	5.334	6.096	0.75	0.70	6.03	0.01	72.5	106.8	87.2	263.4	105.4	54.7	251.3	54.9	14.7	635.3	1010.7
BH-501	**BH-501-5**	6.096	6.858	0.75	0.05	6.15	0.01	93.8	205.1	149.8	476.4	192.3	77.0	355.6	78.1	23.1	1117.4	1651.3
BH-501	**BH-501-5**	6.096	6.858	0.75	0.05	6.15	0.01	94.7	207.9	147.4	472.9	193.8	76.1	358.2	78.7	23.3	1116.7	1653.0
BH-501	**BH-501-6**	6.096	6.858	0.75	0.20	6.30	0.01	76.8	197.0	119.1	378.3	156.3	60.1	280.9	61.4	18.1	927.4	1347.9
BH-501	**BH-501-6**	6.096	6.858	0.75	0.20	6.30	0.01	77.0	199.3	117.4	375.2	157.0	59.4	281.2	61.6	17.6	925.9	1345.7
BH-501	**BH-501-7**	6.096	6.858	0.75	0.35	6.45	0.01	31.4	80.1	51.1	163.4	68.6	26.0	124.1	27.0	8.3	394.4	579.7
BH-501	**BH-501-8**	6.096	6.858	0.75	0.55	6.65	0.01	22.9	40.6	30.0	89.4	36.9	17.0	81.4	17.5	4.7	219.8	340.4
BH-501	**BH-501-9**	6.096	6.858	0.75	0.65	6.75	0.01	49.7	98.1	79.6	255.6	106.8	39.5	188.2	40.7	12.1	589.7	870.2
BH-501	**BH-501-10**	6.096	6.858	0.75	0.70	6.80	0.01	37.0	63.6	60.9	198.1	82.8	30.1	144.4	31.5	9.6	442.4	658.0
BH-501	**BH-501-11**	6.858	7.620	0.75	0.08	6.94	0.01	80.1	220.0	129.0	409.1	169.9	64.0	295.2	64.7	19.9	1008.1	1451.9
BH-501	**BH-501-11**	6.858	7.620	0.75	0.08	6.94	0.01	80.1	220.7	126.0	403.2	169.4	62.9	294.8	64.9	20.2	999.3	1442.1
BH-501	**BH-501-12**	6.858	7.620	0.75	0.20	7.06	0.01	54.8	130.0	88.1	283.7	118.5	43.4	204.2	44.4	13.5	675.1	980.7
BH-501	**BH-501-13**	6.858	7.620	0.75	0.30	7.16	0.01	53.9	166.8	86.7	278.7	116.5	43.9	204.0	44.8	13.3	702.6	1008.6
BH-501	**BH-501-13 Dup**	6.858	7.620	0.75	0.30	7.16	0.01	44.9	147.4	72.4	234.3	98.1	37.0	172.6	37.9	11.4	597.1	856.2
BH-501	**BH-501-15**	6.858	7.620	0.75	0.40	7.26	0.01	69.8	228.1	113.0	358.9	149.9	57.0	261.7	57.3	18.0	919.8	1313.7
BH-501	**BH-501-16**	6.858	7.620	0.75	0.50	7.36	0.01	6.2	19.1	11.0	35.6	14.7	5.6	25.8	5.8	1.8	86.5	125.5
BH-501	**BH-501-17**	6.858	7.620	0.75	0.60	7.46	0.01	81.8	227.0	130.9	418.9	169.9	66.5	305.4	67.5	20.7	1028.4	1488.6
BH-501	**BH-501-18**	6.858	7.620	0.75	0.70	7.56	0.01	0.3	3.3	0.8	2.8	1.2	0.3	1.2	0.3	0.3	8.2	10.3
BH-501	**BH-501-19**	7.620	8.382	0.75	0.05	7.67	0.01	29.6	81.1	46.6	149.7	62.9	23.2	109.1	23.9	7.2	369.9	533.3
BH-501	**BH-501-20**	7.620	8.382	0.75	0.10	7.72	0.01	42.1	115.9	66.2	211.6	88.5	32.8	153.7	33.7	10.4	524.3	754.9
BH-501	**BH-501-21**	7.620	8.382	0.75	0.20	7.82	0.01	60.5	154.2	94.4	300.3	124.8	47.5	221.6	48.6	14.6	734.2	1066.5
BH-501	**BH-501-22**	7.620	8.382	0.75	0.30	7.92	0.01	64.0	158.0	101.1	321.5	133.4	50.8	237.1	52.3	15.0	778.1	1133.3
BH-501	**BH-501-23**	7.620	8.382	0.75	0.40	8.02	0.01	13.7	40.3	23.4	74.6	30.5	11.7	53.3	12.1	3.7	182.6	263.3
BH-501	**BH-501-24**	7.620	8.382	0.75	0.50	8.12	0.01	0.4	3.2	0.6	2.2	0.9	0.2	0.9	0.3	0.2	7.3	9.0
BH-501	**BH-501-24 Dup**	7.620	8.382	0.75	0.50	8.12	0.01	0.4	3.0	0.5	2.0	0.8	0.2	0.8	0.2	0.2	6.7	8.2
BH-501	**BH-501-25**	7.620	8.382	0.75	0.60	8.22	0.01	0.2	2.4	0.6	2.3	0.9	0.2	1.0	0.3	0.3	6.4	8.2
BH-501	**BH-501-26**	7.620	8.382	0.75	0.70	8.32	0.01	0.1	1.0	0.6	2.2	0.9	0.2	1.0	0.3	0.3	4.8	6.5

BH-601	**601-01**	3.048	3.810	0.51	0.43	3.48	0.25	15.7	19.1	13.3	79.4	13.5	21.2	92.3	22.4	6.7	140.9	283.5
BH-601	**601-02**	3.810	4.572	0.41	0.55	4.36	0.36	18.5	27.3	5.8	75.0	31.5	27.2	115.4	25.2	5.9	158.0	331.8
BH-601	**601-03**	3.810	4.572	0.41	0.55	4.36	0.36	27.6	45.7	24.4	132.4	54.2	37.9	162.5	35.6	8.5	284.3	528.8
BH-601	**601-04**	4.572	5.334	0.59	0.30	4.87	0.17	15.0	34.5	32.7	106.4	43.3	21.5	89.4	20.4	6.1	231.9	369.3
BH-601	**601-04**	4.572	5.334	0.59	0.30	4.87	0.17	15.5	35.1	22.2	102.3	43.4	20.7	89.2	20.0	5.5	218.5	353.8
BH-601	**601-05**	4.572	5.334	0.59	0.52	5.09	0.17	27.8	56.0	59.7	186.1	78.7	39.5	173.0	39.0	10.8	408.3	670.6
BH-601	**601-06**	5.334	6.096	0.59	0.30	5.63	0.17	13.0	20.3	23.3	74.7	30.5	13.6	59.2	13.1	3.5	161.8	251.1
BH-601	**601-07**	5.334	6.096	0.55	0.49	5.82	0.21	6.7	11.4	13.3	44.8	16.4	8.7	36.0	8.7	4.0	92.6	150.0
BH-601	**601-07**	5.334	6.096	0.55	0.49	5.82	0.21	6.9	11.6	12.7	43.7	16.7	8.6	36.2	8.6	3.4	91.5	148.3
BH-601	**601-08**	5.334	6.096	0.55	0.70	6.03	0.21	63.0	174.9	76.1	345.8	136.8	72.1	310.8	70.0	21.3	796.6	1270.7
BH-601	**601-08**	5.334	6.096	0.55	0.70	6.03	0.21	63.7	176.5	68.5	339.9	137.6	71.6	315.0	70.3	19.4	786.1	1262.4
BH-601	**601-09**	6.096	6.858	0.55	0.32	6.42	0.21	68.8	182.7	104.0	347.6	140.0	62.2	272.0	61.6	19.2	843.2	1258.2
BH-601	**601-10**	6.096	6.858	0.59	0.62	6.72	0.17	0.3	2.4	0.7	2.7	1.1	0.2	0.9	0.3	0.2	7.2	8.8
BH-601	**601-11**	6.096	6.858	0.59	0.70	6.80	0.17	6.0	14.8	7.7	33.9	13.8	5.3	26.0	5.9	1.4	76.3	114.9
BH-601	**601-11**	6.096	6.858	0.59	0.70	6.80	0.17	5.8	14.7	8.0	34.7	13.9	5.6	26.1	6.2	1.9	77.2	117.0
BH-601	**601-12**	6.858	7.620	0.59	0.25	7.11	0.17	7.6	17.9	13.4	47.1	19.6	7.4	35.4	8.0	2.0	105.6	158.3
BH-601	**601-12**	6.858	7.620	0.59	0.25	7.11	0.17	7.5	17.3	14.0	48.4	19.6	7.5	35.7	8.2	2.7	106.9	161.0
BH-601	**601-13**	6.858	7.620	0.56	0.40	7.26	0.21	69.6	131.3	114.3	385.6	158.1	57.0	268.4	60.0	17.1	858.8	1261.4
BH-601	**601-14**	6.858	7.620	0.56	0.55	7.41	0.21	0.4	1.4	0.8	3.3	1.4	0.3	1.4	0.4	0.3	7.3	9.7
BH-601	**601-15**	7.620	8.382	0.50	0.30	7.92	0.27	10.9	29.7	14.4	78.3	33.0	13.3	59.1	13.8	4.2	166.2	256.5
BH-601	**601-16**	7.620	8.382	0.50	0.60	8.22	0.27	1.7	3.6	2.6	9.2	4.4	1.3	6.8	1.5	0.3	21.4	31.4
BH-601	**601-16**	7.620	8.382	0.50	0.60	8.22	0.27	1.7	3.5	2.7	9.4	4.3	1.3	6.8	1.5	0.5	21.6	31.7
BH-601	**601-17**	8.382	9.144	0.74	0.54	8.92	0.03	0.2	0.4	0.5	2.3	0.8	0.4	1.7	0.4	0.2	4.3	7.0
BH-602	**602-01**	3.048	3.810	0.46	0.47	3.52	0.30	17.5	20.0	29.2	138.7	46.3	28.4	119.5	29.2	8.4	251.8	437.3
BH-602	**602-02**	3.810	4.579	0.44	0.46	4.27	0.33	32.6	53.6	42.9	207.1	80.8	47.1	201.0	45.1	12.9	417.0	723.2
BH-602	**602-03**	3.810	4.579	0.44	0.66	4.47	0.33	8.8	16.2	14.6	64.2	26.2	10.8	48.5	11.0	3.2	130.0	203.6
BH-602	**602-03**	3.810	4.579	0.44	0.66	4.47	0.33	8.9	15.9	20.6	66.4	25.9	11.3	48.4	11.3	4.0	137.8	212.7
BH-602	**602-04**	4.579	5.334	0.65	0.30	4.88	0.11	0.2	0.9	0.8	2.8	1.2	0.2	1.1	0.3	0.2	5.8	7.6
BH-602	**602-05**	4.579	5.334	0.65	0.50	5.08	0.11	12.2	24.6	24.8	103.9	42.4	16.8	73.8	16.7	5.9	208.0	321.1
BH-602	**602-05**	4.579	5.334	0.65	0.50	5.08	0.11	13.7	24.7	33.4	105.4	41.5	17.1	71.9	16.4	5.8	218.7	329.9
BH-602	**602-06**	4.579	5.334	0.65	0.70	5.28	0.11	6.4	12.1	11.4	50.0	21.2	8.7	38.3	8.5	2.4	101.1	159.0
BH-602	**602-07**	5.334	6.096	0.57	0.30	5.63	0.19	34.2	77.8	50.5	207.9	87.4	38.2	165.9	37.0	11.2	457.8	710.1
BH-602	**602-08**	5.334	6.096	0.57	0.39	5.72	0.19	14.0	29.1	19.7	88.7	36.7	16.8	73.3	16.4	4.8	188.2	299.6
BH-602	**602-09**	5.334	6.096	0.57	0.51	5.84	0.19	19.5	45.4	34.8	115.1	48.0	21.1	92.3	21.0	6.5	262.8	403.6
BH-602	**602-10**	5.334	6.096	0.57	0.67	6.00	0.19	0.3	3.1	0.7	3.0	1.2	0.5	2.1	0.5	0.3	8.3	11.6
BH-602	**602-11**	6.096	6.858	0.61	0.18	6.28	0.15	55.9	175.8	87.8	288.1	119.2	51.4	222.9	51.0	15.8	726.7	1067.8
BH-602	**602-12**	6.096	6.858	0.61	0.43	6.53	0.15	55.4	183.1	54.6	268.0	111.9	52.4	218.4	51.4	15.5	673.1	1010.8
BH-602	**602-13**	6.096	6.858	0.61	0.66	6.76	0.15	29.0	83.4	33.7	149.0	62.7	27.6	124.3	27.4	7.8	357.9	545.0
BH-602	**602-14**	6.858	7.620	0.47	0.39	7.25	0.30	26.9	65.9	30.7	130.7	56.0	22.7	108.9	23.8	6.2	310.1	471.8
BH-602	**602-15**	6.858	7.620	0.47	0.70	7.56	0.30	0.5	2.7	1.1	4.1	1.7	0.5	2.5	0.6	0.3	10.1	14.1
BH-602	**602-16**	7.620	8.382	0.62	0.34	7.96	0.14	0.4	1.6	0.5	2.1	0.9	0.2	0.9	0.2	0.1	5.5	7.0
BH-602	**602-17**	7.620	8.382	0.62	0.44	8.06	0.14	0.7	2.5	0.9	3.7	1.5	0.4	1.7	0.5	0.4	9.3	12.3
BH-602	**602-18**	7.620	8.382	0.62	0.64	8.26	0.14	0.7	2.6	0.9	3.7	1.4	0.4	1.7	0.5	0.4	9.3	12.3
BH-602	**602-19**	8.382	9.144	0.39	0.50	8.88	0.37	1.0	3.7	1.4	6.0	2.5	0.8	3.8	0.9	0.4	14.4	20.4
BH-602	**602-19**	8.382	9.144	0.39	0.50	8.88	0.37	1.0	3.7	1.5	5.8	2.6	0.8	3.8	0.9	0.2	14.6	20.3
BH-602	**602-20**	8.382	9.144	0.39	0.70	9.08	0.37	0.8	2.6	1.2	4.4	1.8	0.6	2.9	0.7	0.3	10.8	15.3
BH-603	**603-01**	3.048	3.810	0.56	0.30	3.35	0.20	26.7	37.7	49.3	220.2	71.1	45.4	190.6	44.0	14.5	404.9	699.6
BH-603	**603-02**	3.048	3.810	0.56	0.53	3.58	0.20	27.3	40.5	31.2	145.0	53.7	43.8	175.9	37.8	9.0	297.7	564.2
BH-603	**603-03**	3.810	4.579	0.51	0.39	4.20	0.26	14.0	27.7	20.2	93.7	37.2	20.0	82.1	18.9	5.8	192.7	319.5
BH-603	**603-04**	3.810	4.579	0.51	0.52	4.33	0.26	11.0	26.7	17.6	84.6	34.8	16.7	69.9	16.5	5.0	174.7	282.8
BH-603	**603-05**	4.579	5.334	0.56	0.28	4.86	0.20	5.1	12.7	16.0	51.4	20.8	8.9	37.9	8.7	3.7	105.9	165.1
BH-603	**603-05**	4.579	5.334	0.56	0.28	4.86	0.20	5.3	12.9	12.8	50.9	21.4	9.0	39.3	8.7	3.0	103.2	163.2
BH-603	**603-06**	4.579	5.334	0.56	0.68	5.26	0.20	32.6	74.5	58.8	190.6	79.6	31.6	138.2	31.2	9.6	436.1	646.7
BH-603	**603-07**	5.334	6.096	0.59	0.30	5.63	0.17	116.9	299.8	209.2	678.0	277.2	117.4	482.7	110.1	36.6	1581.1	2327.9
BH-603	**603-07**	5.334	6.096	0.59	0.30	5.63	0.17	120.1	305.3	204.5	672.0	282.2	114.9	494.6	110.5	36.4	1584.2	2340.6
BH-603	**603-08**	5.334	6.096	0.59	0.50	5.83	0.17	14.6	48.4	19.3	86.3	36.9	14.8	63.1	14.0	4.2	205.6	301.7
BH-603	**603-09**	5.334	6.096	0.59	0.64	5.97	0.17	50.6	154.4	75.6	246.2	104.1	43.0	188.5	42.0	12.7	630.9	917.1
BH-603	**603-10**	6.096	6.858	0.59	0.23	6.33	0.17	97.0	260.0	149.3	482.1	199.6	82.8	364.1	81.5	26.0	1188.1	1742.5
BH-603	**603-10**	6.096	6.858	0.59	0.23	6.33	0.17	98.9	261.0	108.1	469.5	200.4	80.9	366.8	80.3	23.6	1138.0	1689.6
BH-603	**603-11**	6.096	6.858	0.59	0.36	6.46	0.17	0.3	2.9	0.6	2.4	1.0	0.2	0.8	0.2	0.2	7.4	8.8
BH-603	**603-12**	6.096	6.858	0.59	0.59	6.69	0.17	0.2	0.3	0.5	2.0	0.7	0.3	1.4	0.3	0.2	3.6	5.8
BH-603	**603-13**	6.858	7.620	0.59	0.67	7.53	0.17	0.5	0.6	0.6	2.5	0.9	0.5	2.1	0.5	0.3	5.2	8.5
BH-603	**603-14**	6.858	7.620	0.59	0.30	7.16	0.17	0.2	1.6	0.7	2.5	1.1	0.2	1.0	0.3	0.2	6.0	7.7
BH-603	**603-15**	6.858	7.620	0.59	0.43	7.29	0.17	0.1	1.0	0.7	2.4	1.0	0.2	0.8	0.2	0.2	5.3	6.7
BH-603	**603-16**	7.620	8.382	0.63	0.61	8.23	0.13	0.4	1.3	1.3	4.7	2.0	0.5	2.4	0.6	0.5	9.6	13.6
BH-603	**603-17**	7.620	8.382	0.63	0.20	7.82	0.13	0.6	1.4	1.1	3.9	1.7	0.5	2.3	0.6	0.3	8.7	12.4
BH-603	**603-18**	7.620	8.382	0.63	0.33	7.95	0.13	0.2	0.6	0.8	2.9	1.2	0.3	1.3	0.3	0.3	5.7	7.9
BH-603	**603-19**	8.382	9.144	0.47	0.58	8.96	0.29	0.2	0.6	0.7	2.7	1.1	0.2	1.0	0.3	0.2	5.2	6.9
BH-603	**603-20**	8.382	9.144	0.47	0.44	8.82	0.29	0.3	0.3	0.7	2.7	1.1	0.4	1.7	0.4	0.3	5.2	8.0
BH-603	**1**	8.382	9.144	0.47	0.66	9.04	0.29	0.2	0.3	0.6	2.3	0.9	0.3	1.2	0.3	0.2	4.4	6.3
BH-604	**604-01**	1.524	2.286	0.52	0.33	1.85	0.24	2.7	2.2	2.7	15.2	0.8	3.8	15.6	4.1	1.6	23.6	48.7
BH-604	**604-01**	1.524	2.286	0.52	0.33	1.85	0.24	2.8	2.4	2.5	14.9	1.1	3.9	15.7	4.1	1.2	23.7	48.6
BH-604	**604-02**	1.524	2.286	0.52	0.55	2.07	0.24	38.7	37.8	35.6	213.5	22.0	50.5	216.3	54.3	15.8	347.7	684.6
BH-604	**604-02**	1.524	2.286	0.52	0.55	2.07	0.24	36.1	38.4	20.9	212.1	21.3	53.0	219.5	56.0	15.9	328.7	673.2
BH-604	**604-03**	1.524	2.286	0.52	0.67	2.19	0.24	20.3	20.7	12.5	121.8	8.4	29.2	116.4	30.2	8.6	183.7	368.2
BH-604	**604-04**	2.286	3.048	0.47	0.46	2.75	0.29	11.5	14.1	11.2	99.0	14.1	23.5	96.7	23.7	7.6	149.9	301.4
BH-604	**604-05**	2.286	3.048	0.47	0.62	2.91	0.29	22.0	34.4	32.6	163.6	63.7	38.9	148.8	36.3	14.2	316.3	554.5
BH-604	**604-06**	3.048	3.810	0.54	0.30	3.35	0.22	3.9	6.2	8.9	28.4	10.5	6.4	25.0	5.5	2.2	57.9	97.1
BH-604	**604-06**	3.048	3.810	0.54	0.30	3.35	0.22	3.8	6.4	4.4	27.9	10.9	6.5	25.3	5.6	1.8	53.4	92.7
BH-604	**604-07**	3.048	3.810	0.54	0.46	3.51	0.22	32.3	54.5	18.1	177.5	65.0	61.4	222.6	46.2	10.7	347.3	688.2
BH-604	**604-07**	3.048	3.810	0.54	0.46	3.51	0.22	32.1	55.5	21.0	173.3	65.2	60.9	221.6	45.1	9.7	347.1	684.3
BH-604	**604-08**	3.810	4.579	0.23	0.70	4.51	0.54	24.3	40.1	57.2	190.1	71.5	35.4	141.2	31.5	12.5	383.2	603.8
BH-604	**604-09**	4.579	5.334	0.69	0.27	4.85	0.06	11.9	27.1	26.4	103.8	42.7	18.1	72.7	16.3	6.5	211.9	325.6
BH-604	**604-10**	4.579	5.334	0.69	0.31	4.89	0.06	11.6	26.8	27.9	109.6	45.2	20.4	81.7	18.5	7.6	221.2	349.3
BH-604	**604-11**	4.579	5.334	0.69	0.46	5.04	0.06	0.3	1.0	1.0	3.5	1.5	0.4	1.8	0.5	0.4	7.2	10.3
BH-604	**604-12**	4.579	5.334	0.69	0.69	5.27	0.06	7.6	9.2	10.1	41.8	16.7	11.7	45.9	9.6	2.5	85.4	155.2
BH-604	**604-12**	4.579	5.334	0.69	0.69	5.27	0.06	7.7	9.6	8.5	40.7	17.0	11.4	46.3	9.5	1.8	83.5	152.6
BH-604	**604-13**	5.334	6.096	0.68	0.18	5.51	0.08	73.9	116.1	133.1	423.4	166.6	75.9	314.3	71.2	24.6	913.1	1398.9
BH-604	**604-13**	5.334	6.096	0.68	0.18	5.51	0.08	64.5	120.4	69.6	411.5	167.4	78.1	317.0	72.8	23.7	833.4	1325.0
BH-604	**604-14**	5.334	6.096	0.68	0.24	5.57	0.08	28.8	46.8	40.0	163.4	66.2	28.5	123.0	27.5	9.1	345.2	533.3
BH-604	**604-15**	5.334	6.096	0.68	0.43	5.76	0.08	62.5	173.0	110.0	352.8	146.1	59.8	256.7	57.5	19.4	844.3	1237.8
BH-604	**604-16**	5.334	6.096	0.68	0.58	5.91	0.08	8.7	34.2	13.6	44.6	18.8	7.7	34.2	7.5	2.3	120.0	171.8

BH-604	**604-16**	5.334	6.096	0.68	0.58	5.91	0.08	8.9	35.1	9.7	43.2	19.0	7.5	34.3	7.4	1.9	115.9	166.9
BH-604	**604-17**	6.096	6.858	0.75	0.22	6.32	0.01	77.3	238.2	108.4	337.5	142.0	60.2	271.2	59.6	17.6	903.3	1311.9
BH-604	**604-17**	6.096	6.858	0.75	0.22	6.32	0.01	77.8	243.5	72.0	330.5	142.7	59.9	274.8	60.3	16.5	866.5	1277.9
BH-604	**604-18**	6.096	6.858	0.75	0.49	6.59	0.01	2.2	9.0	2.2	9.6	4.1	1.6	8.0	1.7	0.5	27.1	38.9
BH-604	**604-18**	6.096	6.858	0.75	0.49	6.59	0.01	2.3	9.2	2.0	9.1	4.3	1.5	8.1	1.7	0.3	26.9	38.4
BH-604	**604-19**	6.858	7.620	0.63	0.39	7.25	0.13	1.7	5.9	1.5	6.5	2.8	1.1	5.4	1.2	0.4	18.4	26.5
BH-604	**604-19**	6.858	7.620	0.63	0.39	7.25	0.13	1.8	5.9	1.4	6.2	2.9	1.0	5.4	1.2	0.0	18.2	25.8
BH-604	**604-20**	6.858	7.620	0.63	0.53	7.39	0.13	0.1	2.2	0.6	2.2	1.0	0.2	0.9	0.2	0.2	6.1	7.6
BH-604	**#2**	7.620	8.382	0.63	0.36	7.98	0.13	0.1	0.1	0.6	2.2	0.9	0.1	0.7	0.2	0.2	4.0	5.1
BH-604	**#3**	7.620	8.382	0.63	0.61	8.23	0.13	0.1	0.1	0.9	3.6	1.4	0.3	1.1	0.3	0.4	6.1	8.2
BH-604	**#4**	8.382	9.144	0.69	0.30	8.68	0.07	0.1	0.2	0.8	3.3	1.3	0.3	1.2	0.3	0.4	5.8	8.0
BH-604	**#5**	8.382	9.144	0.69	0.55	8.93	0.07	0.2	0.9	0.9	3.2	1.3	0.3	1.1	0.3	0.3	6.4	8.5
BH-701	**701-1**	4.572	5.334	0.32	0.58	5.15	0.44	18.5	17.5	15.2	33.7	11.1	10.2	48.5	12.0	2.2	96.0	168.9
BH-701	**701-2**	4.572	5.334	0.32	0.70	5.27	0.44	85.6	38.8	35.8	81.7	27.1	24.0	115.3	26.9	6.7	268.9	441.7
BH-701	**701-3**	5.334	6.096	0.16	0.73	6.06	0.60	81.1	36.8	34.0	77.4	25.7	22.7	109.3	25.5	6.4	254.9	418.8
BH-701	**701-4**	6.096	6.858	0.10	0.55	6.65	0.66	58.6	28.7	32.7	78.0	22.4	25.3	117.7	27.1	6.0	220.6	396.6
BH-701	**701-5**	6.858	7.620	0.63	0.24	7.10	0.13	5.9	19.0	11.6	38.8	16.4	5.8	28.0	6.3	1.9	91.7	133.8
BH-701	**701-6**	7.772	8.534	0.63	0.36	8.13	0.13	0.2	3.4	0.9	3.3	1.3	0.3	1.3	0.3	0.3	9.1	11.3
BH-701	**701-7**	7.772	8.534	0.63	0.54	8.31	0.13	0.2	3.0	0.7	2.5	1.0	0.2	0.8	0.2	0.2	7.4	8.8
BH-701	**701-8**	7.772	8.534	0.63	0.68	8.45	0.13	0.2	3.3	0.8	3.1	1.3	0.3	1.2	0.3	0.3	8.7	10.8
BH-701	**701-9**	9.144	9.906	0.57	0.46	9.60	0.19	1.5	4.7	2.8	9.6	3.9	1.3	6.5	1.5	0.5	22.5	32.4
BH-701	**701-10**	9.144	9.906	0.57	0.70	9.84	0.19	0.2	0.9	0.7	2.6	0.9	0.2	1.1	0.3	0.3	5.2	7.1
BH-701	**701-11**	10.668	11.125	0.43	0.43	11.10	0.03	0.2	0.5	0.4	1.6	0.5	0.2	0.9	0.2	0.2	3.2	4.7
BH-701	**701-12**	10.668	11.125	0.43	0.70	11.37	0.03	0.1	0.5	0.3	1.4	0.4	0.2	0.7	0.2	0.2	2.8	4.0
BH-701	**701-13**	11.278	11.887	0.48	0.10	11.38	0.13	1.3	3.9	2.5	8.5	3.5	1.2	5.9	1.3	0.5	19.6	28.6
BH-701	**701-14**	11.278	11.887	0.48	0.41	11.69	0.13	0.1	0.4	0.2	0.8	0.2	0.1	0.3	0.1	0.1	1.7	2.2
BH-701	**701-15**	11.887	12.497	0.52	0.21	12.10	0.09	0.2	0.4	0.3	1.3	0.5	0.2	1.0	0.2	0.1	2.7	4.2
BH-701	**701-16**	11.887	12.497	0.52	0.52	12.41	0.09	0.1	0.1	0.2	0.9	0.2	0.1	0.6	0.2	0.2	1.5	2.6
BH-702	**702-1**	6.096	6.706	0.46	0.34	6.44	0.15	67.1	66.3	65.9	214.0	84.5	35.7	164.7	35.8	10.4	497.9	744.4
BH-702	**702-2**	6.096	6.706	0.46	0.53	6.63	0.15	104.7	88.7	109.2	352.2	142.1	70.6	280.1	60.2	20.6	796.8	1228.4
BH-702	**702-3**	6.706	7.315	0.60	0.16	6.87	0.01	92.2	69.9	90.2	289.4	117.5	55.2	217.7	46.9	27.8	659.2	1006.9
BH-702	**702-4**	6.706	7.315	0.60	0.38	7.09	0.01	119.7	80.5	110.5	353.1	146.5	65.3	254.0	62.9	26.3	810.3	1218.8
BH-702	**702-5**	6.706	7.315	0.60	0.58	7.29	0.01	138.0	113.3	126.1	407.6	168.4	77.8	301.3	74.3	30.8	953.4	1437.6
BH-702	**702-6**	7.315	7.925	0.60	0.22	7.54	0.01	223.5	336.3	204.5	636.0	264.2	118.5	468.6	132.2	49.6	1664.5	2433.4
BH-702	**702-7**	7.315	7.925	0.60	0.42	7.74	0.01	0.8	4.0	1.7	6.1	2.4	0.7	3.1	0.7	0.3	15.1	19.9
BH-702	**702-8**	7.315	7.925	0.60	0.60	7.92	0.01	0.1	0.4	0.3	1.4	0.4	0.1	0.6	0.2	0.1	2.6	3.6
BH-702	**702-9**	7.925	8.534	0.60	0.18	8.10	0.01	18.3	47.9	32.3	105.2	42.7	16.1	73.9	16.6	5.1	246.4	358.0
BH-702	**702-10**	7.925	8.534	0.60	0.31	8.23	0.01	9.8	27.9	17.2	57.1	23.3	8.4	39.1	8.8	2.8	135.3	194.2
BH-702	**702-11**	7.925	8.534	0.60	0.56	8.48	0.01	0.1	0.1	0.2	1.0	0.2	0.2	0.8	0.2	0.2	1.8	3.3
BH-702	**702-12**	8.534	9.144	0.60	0.20	8.73	0.01	0.4	1.2	0.8	3.1	1.1	0.4	1.6	0.4	0.2	6.6	9.2
BH-702	**702-13**	8.534	9.144	0.60	0.40	8.93	0.01	0.3	1.1	0.8	2.9	0.0	0.4	1.8	0.5	0.3	5.0	8.0
BH-702	**702-14**	8.534	9.144	0.60	0.58	9.11	0.01	0.2	0.2	0.3	1.2	0.4	0.2	0.7	0.2	0.2	2.2	3.5
BH-702	**702-15**	9.144	9.754	0.60	0.20	9.34	0.01	0.7	1.7	1.3	4.7	1.8	0.7	3.2	0.8	0.4	10.1	15.0
BH-702	**702-16**	9.144	9.754	0.60	0.36	9.50	0.01	0.5	1.1	1.0	3.7	1.3	0.6	2.5	0.6	0.4	7.6	11.6
BH-702	**702-17**	9.144	9.754	0.60	0.54	9.68	0.01	0.2	0.4	0.5	2.2	0.7	0.2	1.1	0.3	0.2	3.9	5.9
BH-702	**702-18**	9.754	10.363	0.60	0.15	9.90	0.01	1.1	2.4	1.9	6.4	2.6	1.0	4.6	1.1	0.4	14.4	21.4
BH-702	**702-19**	9.754	10.363	0.60	0.40	10.15	0.01	0.2	0.6	0.3	1.3	0.5	0.1	0.6	0.2	0.1	2.9	4.0
BH-702	**702-20**	9.754	10.363	0.60	0.55	10.30	0.01	0.2	0.5	0.3	1.2	0.5	0.2	0.7	0.2	0.2	2.7	3.9
BH-702	**702-21**	10.363	10.973	0.60	0.19	10.55	0.01	2.8	6.0	4.7	15.2	6.2	2.4	11.3	2.6	0.8	35.0	52.1
BH-702	**702-22**	10.363	10.973	0.60	0.37	10.73	0.01	0.2	0.5	0.4	1.2	0.4	0.2	0.9	0.2	0.1	2.6	4.0
BH-702	**702-23**	10.363	10.973	0.60	0.60	10.96	0.01	0.2	0.4	0.3	0.8	0.3	0.2	0.8	0.2	0.1	2.0	3.3
BH-702	**702-24**	12.192	12.802	0.60	0.17	12.36	0.01	1.5	2.9	2.6	8.7	3.5	1.5	6.9	1.6	0.5	19.2	29.6
BH-702	**702-25**	12.192	12.802	0.60	0.35	12.54	0.01	1.5	3.1	2.8	9.3	3.7	1.5	7.1	1.6	0.5	20.5	31.3
BH-702	**702-26**	12.192	12.802	0.60	0.54	12.73	0.01	0.4	0.0	0.8	3.2	1.0	0.6	2.5	0.7	0.4	5.4	9.6
BH-703	**703-1**	4.572	5.182	0.15	0.60	5.17	0.46	17.8	19.2	25.6	80.7	11.0	20.6	87.5	22.0	5.7	154.2	290.0
BH-703	**703-2**	5.791	6.401	0.37	0.52	6.31	0.24	14.3	13.1	15.8	33.5	15.9	13.8	59.4	12.8	2.9	92.6	181.6
BH-703	**703-3**	6.401	7.010	0.60	0.20	6.60	0.01	160.9	68.9	133.3	448.5	160.4	89.7	334.9	84.0	35.7	972.0	1516.3
BH-703	**703-4**	6.401	7.010	0.60	0.40	6.80	0.01	0.1	1.6	0.5	2.1	0.8	0.1	0.6	0.2	0.1	5.0	6.1
BH-703	**703-5**	6.401	7.010	0.60	0.58	6.98	0.01	139.1	103.8	127.0	414.0	167.3	75.3	296.3	73.5	30.8	951.2	1427.0
BH-703	**703-6**	7.010	7.620	0.60	0.20	7.21	0.01	167.7	62.3	172.6	558.4	223.8	364.7	416.1	99.2	42.3	1184.7	2107.2
BH-703	**703-7**	7.010	7.620	0.60	0.40	7.41	0.01	0.1	0.9	0.6	2.4	0.7	0.2	0.9	0.3	0.2	4.6	6.2
BH-703	**703-8**	7.010	7.620	0.60	0.55	7.56	0.01	0.1	1.0	0.5	2.1	0.8	0.2	0.8	0.3	0.2	4.5	6.0
BH-703	**703-9**	7.620	8.230	0.60	0.21	7.83	0.01	4.1	7.8	7.2	23.9	9.8	3.6	17.1	3.9	1.2	52.8	78.6
BH-703	**703-10**	7.620	8.230	0.60	0.42	8.04	0.01	0.1	0.5	0.3	1.3	0.2	0.1	0.6	0.2	0.2	2.5	3.6
BH-703	**703-11**	7.620	8.230	0.60	0.58	8.20	0.01	0.1	0.3	0.4	1.3	0.4	0.2	1.0	0.3	0.2	2.5	4.2
BH-703	**703-12**	8.230	8.839	0.60	0.20	8.43	0.01	7.2	9.7	11.0	36.4	14.4	6.7	30.5	6.9	2.0	78.8	124.9
BH-703	**703-13**	8.230	8.839	0.60	0.40	8.63	0.01	0.9	1.3	1.7	6.2	2.1	1.2	5.4	1.4	0.9	12.3	21.2
BH-703	**703-14**	8.230	8.839	0.60	0.55	8.78	0.01	0.1	0.3	0.3	1.3	0.4	0.3	1.1	0.3	0.2	2.5	4.3
BH-703	**703-15**	8.839	9.449	0.60	0.19	9.03	0.01	1.4	1.9	2.1	7.4	2.8	1.3	6.0	1.4	0.4	15.6	24.7
BH-703	**703-16**	8.839	9.449	0.60	0.37	9.21	0.01	0.3	0.5	0.5	1.9	0.6	0.4	1.6	0.4	0.2	3.9	6.5
BH-703	**703-17**	8.839	9.449	0.60	0.54	9.38	0.01	0.2	0.4	0.4	1.5	0.5	0.2	0.9	0.2	0.2	2.9	4.4
BH-703	**703-18**	9.449	10.058	0.36	0.42	9.87	0.25	0.9	1.1	1.2	4.2	1.6	0.8	3.7	0.9	0.2	8.9	14.5
BH-703	**703-19**	9.449	10.058	0.36	0.58	10.03	0.25	0.1	0.2	0.3	0.9	0.3	0.2	0.7	0.2	0.2	1.8	3.1
BH-703	**703-20**	10.058	10.668	0.20	0.60	10.66	0.41	0.1	0.1	0.2	0.9	0.2	0.2	0.8	0.2	0.1	1.4	2.8
BH-703	**703-21**	10.668	11.278	0.40	0.50	11.17	0.21	0.2	0.2	0.4	1.0	0.2	0.2	1.0	0.3	0.1	1.9	3.5
BH-703	**703-22**	11.278	11.887	0.15	0.58	11.86	0.46	0.2	0.2	0.3	0.8	0.2	0.2	0.9	0.2	0.1	1.7	3.1
BH-703	**703-23**	11.887	12.497	no data	0.55	12.44	0.61	0.2	0.2	0.6	1.4	0.5	0.4	1.7	0.5	0.3	2.9	5.8
BH-703	**703-24**	11.887	12.497	no data	0.60	12.49	0.61	0.2	0.1	0.5	1.2	0.4	0.3	1.4	0.4	0.3	2.4	4.7
BH-704	**701-17**	5.486	6.096	0.50	0.30	5.79	0.11	7.5	31.6	15.4	51.9	22.4	8.7	37.6	8.4	2.6	128.7	185.9
BH-704	**701-18**	5.486	6.096	0.50	0.58	6.07	0.11	0.5	3.8	1.3	5.2	2.2	0.7	3.2	0.8	0.4	12.9	18.1
BH-704	**701-19**	6.096	6.706	0.35	0.54	6.64	0.26	30.4	47.4	42.8	141.1	59.1	26.8	133.3	28.1	6.4	320.8	515.4
BH-704	**701-20**	6.096	6.706	0.35	0.60	6.70	0.26	1.4	4.3	2.0	7.1	3.0	1.2	5.9	1.3	0.3	17.8	26.4
BH-704	**701-21**	6.706	7.315	0.60	0.20	6.91	0.01	0.2	1.2	0.5	2.0	0.8	0.2	0.9	0.2	0.2	4.7	6.2
BH-704	**701-22**	6.706	7.315	0.60	0.35	7.06	0.01	0.2	0.9	0.4	1.6	0.6	0.1	0.6	0.2	0.1	3.7	4.7
BH-704	**701-23**	6.706	7.315	0.60	0.60	7.31	0.01	0.2	0.9	0.4	1.6	0.6	0.2	0.8	0.2	0.2	3.7	5.1
BH-704	**701-24**	6.706	7.315	0.60	0.40	7.11	0.01	0.2	1.0	0.4	1.6	0.6	0.1	0.6	0.2	0.1	3.8	4.8
BH-704	**701-25**	7.315	7.925	0.25	0.65	7.97	0.36	0.3	0.7	0.5	2.0	0.7	0.2	1.1	0.3	0.2	4.2	6.1
BH-704	**701-26**	7.925	8.534	0.60	0.30	8.22	0.01	0.2	0.6	0.4	1.6	0.6	0.2	0.8	0.2	0.1	3.4	4.7
BH-704	**701-27**	7.925	8.534	0.60	0.50	8.42	0.01	0.2	0.8	0.5	2.2	0.8	0.2	1.0	0.3	0.3	4.6	6.4
BH-704	**701-28**	8.534	9.144	0.15	0.50	9.03	0.46	0.2	0.2	0.3	1.3	0.1	0.1	0.5	0.2	0.1	2.0	2.9
BH-704	**701-29**	9.144	9.754	0.40	0.40	9.54	0.21	0.1	0.2	0.3	1.3	0.4	0.2	0.7	0.2	0.1	2.3	3.5

BH-704	**701-30**	9.144	9.754	0.40	0.60	9.74	0.21	0.1	0.6	0.4	1.7	0.7	0.2	0.8	0.2	0.1	3.5	4.8
BH-704	**701-31**	9.754	10.363	0.60	0.20	9.95	0.01	0.5	0.9	1.3	5.9	2.0	0.7	2.9	0.8	0.5	10.6	15.4
BH-704	**701-32**	9.754	10.363	0.60	0.40	10.15	0.01	0.1	0.1	0.4	2.0	0.7	0.2	0.9	0.3	0.2	3.4	4.9
BH-704	**701-33**	9.754	10.363	0.60	0.60	10.35	0.01	0.1	0.1	0.4	1.8	0.6	0.2	0.9	0.3	0.2	3.0	4.6
BH-704	**701-34**	10.363	10.973	0.60	0.20	10.56	0.01	0.2	0.3	0.5	2.1	0.7	0.3	1.2	0.3	0.2	3.7	5.6
BH-704	**701-35**	10.363	10.973	0.60	0.40	10.76	0.01	0.2	0.2	0.5	2.1	0.7	0.3	1.3	0.3	0.2	3.6	5.8
BH-704	**702-27**	10.363	10.973	0.60	0.55	10.91	0.01	0.1	0.1	0.4	1.9	0.6	0.2	0.9	0.3	0.1	3.2	4.7
BH-704	**702-28**	10.973	11.582	0.60	0.20	11.17	0.01	0.1	0.1	0.4	1.8	0.5	0.2	1.0	0.3	0.3	3.0	4.8
BH-704	**702-29**	10.973	11.582	0.60	0.40	11.37	0.01	0.2	0.1	0.5	2.3	0.6	0.3	1.4	0.4	0.2	3.7	6.0
BH-704	**702-30**	10.973	11.582	0.60	0.55	11.52	0.01	0.2	0.1	0.4	2.0	0.6	0.3	1.3	0.3	0.2	3.3	5.4
BH-704	**702-31**	11.582	12.192	0.30	0.20	11.78	0.31	0.2	0.2	0.5	2.0	0.6	0.2	1.1	0.3	0.2	3.5	5.3

Degradation potential batch test data:

Soil Sample (NOI and Batch Experinment)

Units are µg/g or mg/Kg (Wet Soil)

Sample	Benzene	Toluene	Ethylbenzene	P,M-xylene	O-xylene	BTEX	1,3,5-TMB	1,2,4-TMB	1,2,3-TMB	Naphthalene	Total BTEX, TMB's and Naphthalene
603-18	0.2	0.6	0.8	2.9	1.2	5.7	0.3	1.3	0.3	0.3	7.9
603-19	0.2	0.6	0.7	2.7	1.1	5.2	0.2	1.0	0.3	0.2	6.9
Lab Blank (Standards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lab Blank (Standards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Lab Blank (Solvent)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lab Blank (Solvent)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trip Blank	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Trip Blank	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

Con = no persulfate added

Units are µg/L (ppb) Note: All data is dilution corrected Non-Con = 100mg/L persulfate added

Sample Identification	Date		Benzene	Toluene	Ethylbenzene	P,M-xylene	O-xylene	Total BTEX	1,3,5-Trimethyl-Benzene	1,2,4-Trimethyl-Benzene	1,2,3-Trimethyl-Benzene	Naphthalene	Total µg/L	*F1 Fraction* (nC6 to nC10)	*F2 Fraction* nC10 to nC16	*F3 Fraction* (nC16 to nC3	*Total (F1, F2, F3)* µg/L
		MDL (Oct 2009)	1.11	0.83	0.77	1.46	0.37	4.55	0.74	0.82	0.76	2.20					
		LOQ	3.95	3.36	4.49	7.89	5.38	25.08	3.14	2.88	3.58	6.63					
Bottle #1 Well 501	17-May-10		163.2	1056.8	1201.9	4629.8	1342.6	8394.24	429.2	1804.0	534.6	327.8	19884.1	15273.6	3617.2	25.3	18916.2
Bottle #2 Well 501	17-May-10		211.8	1099.9	1282.7	4868.5	1427.5	8890.40	472.4	1996.8	577.6	307.0	21134.6	16703.5	4682.4	183.0	21568.9
GW 501 Initial Beginning-1	18-May-10		182.6	1101.5	1264.9	4860.1	1408.5	8817.50	454.1	1902.7	562.4	338.1	20892.3	16155.1	3941.9	14.9	20111.9
GW 501 Initial Beginning-2	18-May-10		177.0	1063.0	1220.5	4688.8	1359.0	8508.31	437.9	1834.3	542.0	325.7	20156.6	15576.5	3787.1	12.0	19375.6
GW 501 Initial End-3	18-May-10		166.4	1038.0	1203.9	4636.0	1348.6	8393.00	438.8	1844.0	548.2	338.5	19955.4	15400.2	3762.4	25.2	19187.8
GW 501 Initial End-4	18-May-10		172.6	1050.0	1214.8	4677.6	1357.9	8472.81	441.2	1858.0	549.5	334.9	20129.2	15562.9	3845.5	15.4	19423.8
GW Con 1A	18-May-10		161.1	1042.2	1205.3	4656.4	1361.8	8426.86	442.4	1865.3	555.5	348.7	20065.5	15444.6	3830.5	27.2	19302.3
GW Con 1B	18-May-10		166.3	1039.5	1203.3	4647.7	1358.1	8414.95	442.3	1859.3	552.0	345.6	20029.2	15477.8	3834.3	25.2	19337.3
GW Con 1C	18-May-10		160.3	1027.2	1186.5	4581.5	1337.4	8292.90	434.6	1826.8	542.4	337.5	19727.2	15220.7	3814.4	28.3	19063.3
GW Non-Con 1A	18-May-10		120.9	1023.3	1180.6	4651.9	1366.5	8343.27	468.9	1870.5	551.9	337.8	19915.7	15006.1	3818.8	32.7	18857.6
GW Non-Con 1B	18-May-10		159.9	1023.6	1183.5	4661.6	1370.0	8398.43	470.0	1873.1	553.5	338.8	20032.2	15062.0	3804.9	41.5	18908.4
GW Non-Con 1C	18-May-10		127.4	1005.3	1157.7	4562.1	1340.8	8193.30	458.1	1832.5	540.0	331.9	19549.2	14755.6	3723.9	31.8	18511.3
Soil Con 1A	18-May-10	Dilution=8ml H2O/30ml sar	150.9	989.5	1124.5	4342.0	1269.8	7876.76	401.1	1690.0	502.5	308.1	18655.2	14291.7	3422.7	23.5	17738.0
Soil Con 1B	18-May-10	Dilution=8ml H2O/30ml sar	116.6	944.6	1074.7	4154.3	1217.6	7507.87	379.7	1614.0	481.8	292.5	17783.8	13453.2	3237.1	12.6	16702.9
Soil Con 1C	18-May-10	Dilution=8ml H2O/30ml sar	131.8	984.8	1123.0	4336.4	1267.0	7842.94	397.7	1681.3	499.1	303.0	18566.9	14104.6	3357.9	24.4	17486.9
Soil Non-Con 1A	18-May-10	Dilution=8ml H2O/30ml sar	88.4	840.7	933.6	3695.1	1103.0	6660.78	349.5	1429.7	424.2	263.7	15788.6	11788.0	2817.5	32.9	14638.3
Soil Non-Con 1B	18-May-10	Dilution=8ml H2O/30ml sar	82.2	892.4	1012.5	3999.2	1184.2	7170.50	380.7	1548.4	460.0	278.8	17008.9	12750.0	3080.3	26.8	15857.1
Soil Non-Con 1C	18-May-10	Dilution=8ml H2O/30ml sar	88.0	915.6	1028.4	4073.8	1215.5	7321.33	387.9	1581.1	473.5	291.6	17376.8	13032.4	3133.9	38.1	16204.4
Blank-1	18-May-10		3.4	0.0	0.7	2.2	0.0	6.33	0.0	0.0	0.0	0.0	12.7	52.5	18.3	27.4	98.2
Blank-2	18-May-10		2.6	0.0	0.0	1.8	0.0	4.39	0.0	0.0	2.3	0.0	11.1	39.4	8.8	20.0	68.2
GW Con 2A	19-May-10		122.5	1001.5	1154.9	4458.7	1308.8	8046.40	420.1	1772.6	530.6	328.9	19145.0	14513.8	3606.6	19.8	18140.2
GW Con 2B	19-May-10		147.0	1088.9	1254.3	4839.5	1416.7	8746.34	454.3	1918.9	571.9	352.7	20790.5	15841.9	3975.5	21.9	19839.2
GW Con 2C	19-May-10		151.3	1038.6	1196.6	4612.9	1348.7	8348.04	432.2	1824.6	543.2	333.6	19829.6	15157.2	3809.2	11.2	18977.6
GW Non-Con 2A	19-May-10		62.0	777.7	873.1	3885.5	1196.0	6794.42	374.4	1695.3	501.2	333.1	16492.8	12290.2	3270.4	17.9	15578.4
GW Non-Con 2B	19-May-10		62.5	736.2	825.6	3667.6	1125.4	6417.32	351.8	1600.3	468.8	310.3	15565.9	11655.9	3102.7	16.8	14775.3
GW Non-Con 2C	19-May-10		68.3	769.0	870.2	3852.1	1168.4	6728.04	370.3	1663.3	483.6	314.1	16287.3	12204.2	3194.2	29.7	15428.0
Soil Con 2A	19-May-10	Dilution=8ml H2O/30ml sar	122.0	1005.5	1136.6	4383.0	1285.1	7932.20	397.9	1680.6	503.4	297.9	18744.2	14130.6	3345.8	9.7	17486.1
Soil Con 2B	19-May-10	Dilution=8ml H2O/30ml sar	118.5	988.2	1117.2	4312.5	1264.3	7800.63	389.9	1656.3	495.6	291.9	18434.9	13885.0	3281.2	9.1	17175.3
Soil Con 2C	19-May-10	Dilution=8ml H2O/30ml sar	117.7	977.1	1107.3	4274.0	1253.1	7729.28	387.7	1641.7	491.5	287.4	18266.8	13774.4	3248.5	17.6	17040.5
Soil Non-Con 2A	19-May-10	Dilution=8ml H2O/30ml sar	60.6	701.6	769.1	3372.1	1015.2	5918.60	304.3	1368.5	392.2	250.4	14152.6	10598.7	2498.5	18.0	13115.2
Soil Non-Con 2B	19-May-10	Dilution=8ml H2O/30ml sar	48.4	710.2	779.4	3460.0	1073.1	6071.07	303.2	1451.9	433.5	285.2	14616.0	10834.6	2692.8	28.7	13556.1
Soil Non-Con 2C	19-May-10	Dilution=8ml H2O/30ml sar	59.4	700.4	774.3	3396.0	1024.9	5954.99	305.7	1393.3	399.2	253.9	14262.1	10724.1	2535.3	20.4	13279.8
Blank-1	19-May-10		2.5	0.0	0.0	1.9	0.0	4.40	0.0	0.0	1.9	0.0	10.7	33.1	9.1	5.9	48.0
Blank-2	19-May-10		1.7	0.0	0.0	1.1	0.0	2.89	0.0	0.0	0.0	0.0	5.8	22.6	9.0	12.4	44.1
GW Con 3A	25-May-10		88.6	949.0	1074.0	4145.8	1226.3	7483.72	373.8	1600.8	489.2	284.8	17716.1	13179.6	3228.7	21.0	16429.4
GW Con 3B	25-May-10		94.9	1011.0	1143.8	4410.6	1304.7	7964.92	398.7	1703.3	519.1	305.4	18856.5	14041.1	3429.9	9.8	17480.8
GW Con 3C	25-May-10		87.5	960.3	1087.6	4202.9	1239.2	7577.55	379.6	1625.2	494.0	284.0	17937.9	13343.4	3319.8	8.2	16671.4
GW Non-Con 3A	25-May-10		38.4	225.3	158.5	863.4	385.3	1670.88	0.0	23.1	14.7	0.0	3379.6	2487.2	3796.7	103.4	6387.3
GW Non-Con 3B	25-May-10		26.7	211.7	193.4	1180.4	455.0	2067.16	0.0	369.2	57.6	138.6	4699.7	3375.4	3077.9	69.5	6522.9
GW Non-Con 3C	25-May-10		39.6	218.1	117.9	677.5	301.9	1354.90	0.0	20.7	12.1	0.0	2742.6	2062.3	3921.3	135.4	6119.0
Soil Con 3A	25-May-10	Dilution=8ml H2O/30ml sar	89.1	969.5	1069.9	4127.0	1226.2	7481.72	353.4	1516.6	466.9	258.2	17558.6	12943.6	2856.2	43.7	15843.5
Soil Con 3B	25-May-10	Dilution=8ml H2O/30ml sar	90.1	1011.3	1121.6	4320.7	1283.8	7827.54	371.0	1589.1	488.6	275.6	18379.3	13546.6	2959.5	8.7	16514.8
Soil Con 3C	25-May-10	Dilution=8ml H2O/30ml sar	90.6	999.9	1109.6	4294.6	1271.3	7766.07	371.1	1585.5	486.5	269.9	18245.1	13460.2	2979.1	8.5	16447.7
Soil Non-Con 3A	25-May-10	Dilution=8ml H2O/30ml sar	43.1	362.8	388.3	1837.8	625.7	3257.65	56.4	932.8	163.2	148.9	7816.6	5829.8	1928.2	23.1	7781.0
Soil Non-Con 3B	25-May-10	Dilution=8ml H2O/30ml sar	39.4	342.7	365.3	1750.2	604.5	3102.09	48.0	896.8	153.3	147.8	7450.0	5567.3	1863.4	19.5	7450.1
Soil Non-Con 3C	25-May-10	Dilution=8ml H2O/30ml sar	45.2	339.0	366.0	1760.3	601.9	3112.51	45.8	909.1	151.3	141.6	7472.8	5646.5	1934.2	35.0	7615.7
Blank-1	25-May-10		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	16.2	6.3	18.0	40.5
GW Con 4A	1-Jun-10		91.3	984.6	1119.0	4326.8	1275.0	7796.69	393.4	1681.2	509.6	294.9	18472.6	13765.4	3432.7	2.7	17200.8
GW Con 4B	1-Jun-10		93.8	1008.9	1140.7	4395.3	1305.5	7944.11	396.0	1696.4	520.9	305.6	18807.2	13966.4	3458.9	13.4	17438.6
GW Con 4C	1-Jun-10		75.3	975.2	1106.5	4277.2	1277.9	7712.12	385.4	1662.6	513.7	304.6	18290.5	13465.9	3386.4	13.9	16866.2
GW Non-Con 4A	1-Jun-10		11.4	9.7	0.0	1.6	0.0	22.65	4.9	3.6	775.9	0.0	829.6	831.4	4450.8	171.6	5453.8
GW Non-Con 4B	1-Jun-10		20.4	11.0	0.0	4.0	0.0	35.43	4.7	1.7	723.8	0.0	801.1	690.9	4174.5	162.8	5028.1
GW Non-Con 4C	1-Jun-10		7.1	13.9	0.0	1.2	0.0	22.15	5.4	3.1	799.7	0.0	852.5	768.8	4552.1	190.7	5511.6
Soil Con 4A	1-Jun-10	Dilution=8ml H2O/30ml sar	80.1	**913.0**	1006.6	3890.3	1157.6	7047.57	329.5	1420.2	438.9	239.2	16523.0	12163.1	2613.19	33.06	14809.4
Soil Con 4B	1-Jun-10	Dilution=8ml H2O/30ml sar	79.3	894.5	974.5	3734.7	1127.1	6810.30	311.3	1340.6	424.5	231.9	15928.9	11669.6	2474.5	48.4	14192.6
Soil Con 4C	1-Jun-10	Dilution=8ml H2O/30ml sar	75.7	896.5	980.3	3761.6	1133.5	6847.63	312.0	1345.3	425.1	233.7	16011.4	11693.7	2515.3	22.8	14231.8
Soil Non-Con 4A	1-Jun-10	Dilution=8ml H2O/30ml sar	30.1	87.0	3.5	33.6	17.0	171.12	0.0	16.8	17.7	0.0	376.7	742.4	1560.3	21.0	2323.8
Soil Non-Con 4B	1-Jun-10	Dilution=8ml H2O/30ml sar	19.9	125.0	54.2	224.9	127.4	551.40	0.0	19.6	7.4	0.0	1129.7	1006.9	1490.6	23.7	2521.2
Soil Non-Con 4C	1-Jun-10	Dilution=8ml H2O/30ml sar	28.7	13.6	0.0	18.9	20.6	81.77	3.7	12.1	15.1	20.1	214.6	571.3	781.3	18.1	1370.7
Blank-1	1-Jun-10		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	5.1	2.4	11.0	18.5
Blank-2	1-Jun-10		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.8	0.0	8.6	29.4
GW Con 5A	8-Jun-10		109.3	1048.8	1172.3	4521.5	1341.5	8193.31	403.7	1733.9	533.4	306.6	19364.1	14407.8	3514.21	10.57	17932.6
GW Con 5B	8-Jun-10		111.7	1046.3	1160.9	4455.9	1331.8	8106.59	391.1	1683.9	523.9	300.5	19112.5	14179.3	3447.21	19.09	17645.6
GW Con 5C	8-Jun-10		116.5	1057.6	1180.1	4538.0	1348.1	8240.38	403.6	1731.5	533.9	308.3	19458.0	14492.4	3541.87	15.35	18049.6
GW Non-Con 5A	8-Jun-10	Problem here MFT internal	0.0	0.0	2.0	0.0	0.0	2.05	9.9	3.5	859.9	1.7	879.1	1461.3	5755.49	168.78	7385.6
GW Non-Con 5B	8-Jun-10	Problem here MFT internal	3.2	0.0	1.3	0.0	0.0	4.51	5.8	2.6	922.5	0.0	940.0	1380.4	6176.20	155.29	7711.9
GW Non-Con 5C	8-Jun-10	Problem here MFT internal	2.7	0.0	1.3	0.0	0.0	4.05	10.2	3.0	900.8	0.0	922.1	1422.2	6094.73	139.51	7656.5
Soil Con 5A	8-Jun-10	Dilution=8ml H2O/30ml sar	105.7	980.6	1057.9	4078.7	1218.9	7441.68	336.3	1457.7	454.6	239.5	17371.5	12816.9	2676.12	33.94	15526.9
Soil Con 5B	8-Jun-10	Dilution=8ml H2O/30ml sar	105.3	994.6	1069.8	4127.5	1239.9	7537.00	335.7	1454.4	458.0	241.7	17563.7	12900.0	2669.45	22.94	15592.4
Soil Con 5C	8-Jun-10	Dilution=8ml H2O/30ml sar	110.4	1044.5	1133.1	4360.0	1307.2	7955.26	361.9	1565.5	489.8	262.2	18590.0	13684.8	2946.70	23.60	16655.1
Soil Non-Con 5A	8-Jun-10	Dilution=8ml H2O/30ml sar	10.2	1.6	0.0	7.1	4.1	23.07	0.0	4.3	12.8	0.0	63.2	414.5	478.89	34.10	927.5
Soil Non-Con 5B	8-Jun-10	Dilution=8ml H2O/30ml sar	15.2	2.1	0.0	6.8	2.3	26.47	0.0	4.8	12.5	0.0	70.3	447.5	517.19	13.87	978.6
Soil Non-Con 5C	8-Jun-10	Dilution=8ml H2O/30ml sar	13.1	1.7	0.0	7.5	0.0	22.21	0.0	4.6	14.0	0.0	63.0	456.2	518.34	59.61	1034.2
Blank-1	8-Jun-10		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	1.0	3.5	16.7	21.2
Blank-2	8-Jun-09		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	19.2	5.81	18.19	43.2
GW Con 6A	22-Jun-09		104.5	1041.8	1157.2	4421.0	1335.3	8059.77	388.7	1667.6	523.9	291.3	18991.0	14067.0	3531.2	4.7	17602.9
GW Con 6B	22-Jun-09		103.2	1026.8	1144.3	4388.9	1316.5	7979.80	385.9	1659.0	519.2	290.4	18814.2	13955.5	3535.8	5.9	17497.3
GW Con 6C	22-Jun-09		108.0	1026.4	1140.6	4355.1	1317.6	7947.71	381.6	1638.3	516.6	289.9	18721.8	13882.5	3468.2	17.8	17368.5
GW Non-Con 7A	22-Jun-09		0.0	0.0	1328.5	0.0	30.6	1359.05	10.2	1.2	15.2	0.0	2744.7	4213.5	679.5	25.4	4918.4
GW Non-Con 7B	22-Jun-09		6.3	0.0	1320.5	0.0	28.4	1355.21	9.5	0.0	13.2	0.0	2733.1	4145.9	649.1	46.1	4841.1
GW Non-Con 7C	22-Jun-09		4.4	8.6	1247.6	0.0	25.0	1285.53	4.7	0.0	25.8	0.0	2601.6	3672.9	269.2	25.2	3967.3
GW Non-Con 6A	22-Jun-09	Dilution=8ml H2O/30ml sar	5.9	12.3	1657.2	0.0	32.3	1707.65	0.0	1.6	15.5	0.0	3432.3	4997.0	562.7	53.6	5613.3
GW Non-Con 6B	22-Jun-09	Dilution=8ml H2O/30ml sar	10.4	0.0	1636.2	0.0	30.5	1677.05	9.5	1.5	16.0	0.0	3381.1	5056.2	679.8	31.8	5767.7
GW Non-Con 6C	22-Jun-09	Dilution=8ml H2O/30ml sar	6.7	0.0	1652.3	0.0	35.1	1694.20	9.3	0.0	15.1	0.0	3412.9	5012.8	616.5	30.8	5660.0
Soil Con 6A	22-Jun-09	Dilution=8ml H2O/30ml sar	89.9	907.2	983.3	3741.1	1153.0	6874.49	304.7	1330.1	427.5	270.3	16081.6	11690.9	2608.2	70.7	14369.9
Soil Con 6B	22-Jun-09	Dilution=8ml H2O/30ml sar	96.5	957.5	1041.5	3982.3	1215.0	7292.82	326.1	1416.0	452.2	286.5	17066.5	12448.7	2766.4	9.8	15224.9
Soil Con 6C	22-Jun-09	Dilution=8ml H2O/30ml sar	89.7	963.5	1044.8	4018.9	1216.5	7333.52	328.8	1420.9	452.4	285.2	17154.3	12472.9	2793.3	5.7	15271.9
Soil Non-Con 6A	22-Jun-09	Dilution=8ml H2O/30ml sar	3.3	1.4	0.0	0.0	2.7	7.41	0.0	0.0	6.4	0.0	21.2	133.9	54.8	23.9	212.7
Soil Non-Con 6B	22-Jun-09	Dilution=8ml H2O/30ml sar	0.0	0.0	0.0	0.0	4.8	4.78	0.0	0.0	9.7	0.0	19.3	154.2	53.0	5.8	213.0
Soil Non-Con 6C	22-Jun-09	Dilution=8ml H2O/30ml sar	0.0	0.0	0.0	0.0	4.3	4.33	0.0	0.0	9.0	0.0	17.6	138.4	54.4	6.4	199.2
Blank-1	22-Jun-09		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	24.7	0.0	4.1	28.8
Blank-2	22-Jun-09		0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	10.9	1.2	6.4	18.5

Appendix B: Analytical Methods

Groundwater and soil samples were analyzed for persulphate and hydrocarbons at the Organic Chemistry Laboratory, Department of Earth and Environmental Sciences, University of Waterloo. Sulphate was analyzed in the Rudolph Group Ion Chromatograph Laboratory and sodium was analyzed in the Blowes Group Trace Metal Analysis Laboratory, Department of Earth and Environmental Sciences.

1.1 Hydrocarbon (groundwater)

Aqueous hydrocarbon samples and standards were equilibrated to room temperature prior to extraction. To extract a sample or standard, the Teflon® screw cap of the vial was quickly removed and 5.0 mL of sample was removed with a glass/stainless syringe. Immediately following this, 2.0 mL of methylene chloride (the extracting agent) containing the internal standards m-fluorotoluene and fluorobiphenyl was added. The vial is then quickly resealed and mixed at 350 rpm on a platform shaker for 20 min. After shaking, the vial was inverted and the phases were allowed to separate for 30 min. Approximately 1.0 mL of the methylene chloride phase was removed from the inverted vial with a gas tight glass syringe, through the Teflon® septum. The solvent was added to a Teflon® sealed auto-sampler vial for injection into the Gas Chromatograph. Samples were analyzed with a HP 5890 capillary gas chromatograph, a HP7673A auto-sampler, and a flame ionization detector. Three µL of methylene chloride was injected in splitless mode onto a 0.25 mm x 30 m long DB5 capillary column with a stationary phase film thickness of 0.25 µm. The chromatographic run time was 10 minutes. Data integration was completed with a HP 3396A integrator (Freitas, 2009, VanderGriendt, 2010).

Calibrations were made in internal standard mode and standards were run in triplicate at five or more different concentrations covering the expected sample range. Preparation of standards consisted of mixing DI water with concentrated stock standards of methanol. Then they were extracted and analyzed by gas chromatography in the same way as samples. A multiple point linear regression was performed to determine the linearity and slope of the calibration curve. Quality control information on calibration curves such as percent relative standard deviation and percent error and blank information were included with reported data. Extraction duplicates were performed on samples and results were acceptable when they agreed within 10%. Method Detection Limits (MDLs) were 1.1 µg/L for benzene, 0.8 μg/L for toluene, 0.8 μg/L for ethylbenzene, 1.5 μg/L for p/m-xylene, 0.4 μg/L for o-xylene, 0.7 μg/L for 1,3,5-trimethylbenzene (TMB), 0.8 μg/L for 1,2,4-TMB and 1,2,3 TMB, and 2.2 μg/L for naphthalene.

1.2 Hydrocarbon (soil)

Aqueous hydrocarbon samples were equilibrated to room temperature prior to extraction. BTEX, trimethylbenzene isomers (TMB's) and naphthalene analyses were performed by solvent extraction with methylene chloride followed by gas chromatography. The vials with the soil samples and methylene chloride were shaken at 350 rpm for 18 hours and then settled for approximately 3 weeks. Consequently, samples were reweighted to ensure there was no solvent loss during this period. A 0.7 mL aliquot of extraction solvent was placed in a Teflon® sealed auto-sampler vial and injected into a HP 5890 capillary GC equipped with a 0.25 mm × 30 m long DB5 capillary column with a stationary phase film thickness of 0.25 μm, a HP7673A auto-sampler, and a flame ionization detector. The method detection limits for benzene was 0.03 mg/Kg of wet soil, 0.03 mg/Kg for toluene, 0.01 mg/Kg for ethylbenzene, 0.03 mg/Kg for p/m-xylene, 0.02 mg/Kg for o-xylene, 0.02 mg/Kg for 1,3,5-trimethylbenzene (TMB), 0.03 mg/Kg for 1,2,4-TMB, 0.01 mg/Kg 1,2,3 TMB, and 0.03 mg/Kg for naphthalene.

1.3 Persulphate

Persulphate is highly reactive hence; samples were analyzed within days of being collected in the field. While awaiting analysis, samples would be refrigerated and stored at approximately 4^0C.

1.3.1 Persulphate (groundwater)

In order to determine the sodium persulphate concentration, samples were prepared by placing 0.1mL of sample in a 20 mL glass vial. Afterwards, 0.9 mL of DI water, 10 mL of 2.5 N H_2SO_4 (Sulfuric Acid) solution and 0.1 mL of 0.4 N of ferrous ammonium sulfate solution were added. The contents were mixed and allowed to react for 40 min. Finally, 0.2 mL of 0.6 N NH_4SCN (Ammonium Thiocyanate) solution was added, and the absorbance was read with a spectrophotometer at a wavelength of 450 nm. The calibration curve established by the procedures described above using

$Na_2S_2O_8$ solutions ranging from 200 to 2000 mg/L showed a high linear correlation coefficient of $R^2 = 0.99$ (Huang, 2002).

1.3.2 Persulphate (soil)

Samples were equilibrated to room temperature and were shaken at 350 rpm for a few hours. The samples were then allowed to settle and 0.1 mL of aqueous solution was extracted from each vial using a glass/stainless syringe and transferred into a 20 mL glass vial. Following this, the steps outlined in Section 4.2.3.1 were completed.

1.4 Sulphate

1.4.1 Sulphate (groundwater)

Sulphate analysis was conducted using an ion chromatograph. 2 mL of aqueous sample was initially transferred into appropriate glass vials for the ion chromatograph auto-sampler. Simultaneously, 2 mL's of anion standard at a variety of concentrations were also transferred into glass vials to be run in conjunction with blanks every 10 samples.

1.4.2 Sulphate (soil)

This procedure used the same method outlined in Section 1.4.1 with the following modifications. Samples were shaken at 350 rpm for a few hours so they would equilibrate to room temperature. The samples were then allowed to settle and 2 mL of aqueous solution was extracted from each vial using a glass/stainless syringe and transferred into glass vials for the chromatograph auto-sampler.

1.5 Sodium

Sodium samples were filtered through a 0.45μm syringe filter and acidified used concentrated nitric acid prior to analysis.

1.5.1 Sodium (groundwater)

The sodium analysis was conducted on the Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) using an iCAP series from Thermo Instruments.

After every 10 samples, a standard and a blank were run to assume quality control. Standards ranged between 1 ppm to 100 ppm and showed a very high correlation coefficient of $R^2 = 0.9999$.

1.5.2 Sodium (soil)

This procedure used the method outlined in Section 4.2.5.1 however with the following modification. Samples were equilibrated to room temperature by shaking at 350rpm for a few hours. The samples were then allowed to settle and 15 mL of aqueous solution was extracted from each vial using a glass/stainless syringe and filtered using a 0.45μm syringe filter and acidified with concentrated nitric acid prior to analysis.

1.6 Electrical Conductivity and Temperature (groundwater)

An Orion model 135 meter was used to measure conductivity and temperature in the field. The Orion meter's conductivity probe has a built-in temperature sensor which allows for each electrical conductivity measurement to be temperature corrected and reported at standard temperature of 20 ^{o}C.

The conductivity meter was manually calibrated using a standard calibration solution of 1413 μS/cm. The reported relative accuracy of the Orion meter is ±0.005 while the temperature probe has a relative accuracy of ±1.0 ^{o}C.

1.7 pH and Temperature (groundwater)

An Orion Model 290A pH meter was used to measure pH in the field. The portable pH/ISE meter was used in conjunction with a temperature that was able to give real time pH and temperature data. The recorded pH measurements were temperature corrected and reported at 20 ^{o}C.

Before every sampling episode, the pH meter was manually calibrated using standard pH solutions of 4, 7, and 10 pH units. The 290A meter compares the theoretical values to the measured values to determine if the buffer is within range. The reported relative accuracy of the pH meter is ±0.005 while the temperature probe has a relative accuracy of ±1.0 ^{o}C.

1.8 Analytical Data quality control

In addition to field quality controls, each laboratory run consisted of analyzing laboratory equipment blanks. Laboratory equipment blanks were taken and analyzed to show whether the equipment used was a source of cross-contamination between samples.

Appendix C: Borehole logs

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Borehole ID: BH-301 (MW-301)

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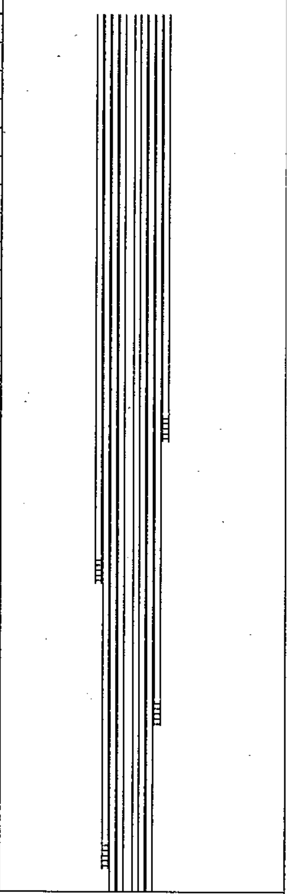
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
ft m							Ground Surface	0.00
3–4 ft, 1 m	na	BH-301-1A	◆	75	0	▨	SAND and GRAVEL moist, brown, large cobbles	-1.00
	na	BH-301-1B		200	13	▨	trace silt, no cobbles	
2 m	na	BH-301-2A		75	40	▨		-2.00
	na	BH-301-2B		25	40	▨		
	na	BH-301-3A		5% LEL	67	▨		
	na	BH-301-3B		10% LEL	67	▨	moist to wet, green/grey staining from 2.7 to 3.0 m bgs	
3 m	na	BH-301-4		20% LEL	35	▨	dry to moist, grey	-3.00
4 m	na	BH-301-5		35% LEL	71	▨	moist	-4.00
	na	BH-301-6A		25% LEL	92	░	SAND dry to moist, grey, fine	
5 m	na	BH-301-6B		>100% LEL	92	░	brown, very fine, odours	-5.00
	na	BH-301-7A		>100% LEL	96	▒	sandy GRAVEL dry to moist, brown, trace silt, odours	
20 ft, 6 m	na	BH-301-7B		95% LEL	96	▒		-6.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

Sample BH-301-6B submitted for analysis of BTEX and PHC F1-F4.

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Borehole ID: BH-301 (MW-301)

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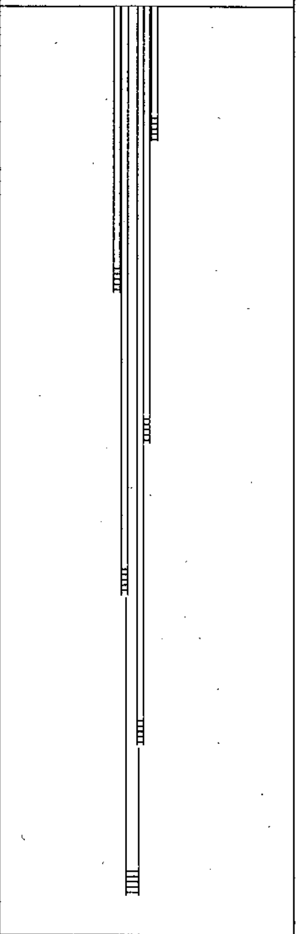
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
	na	BH-301-8A		40% LEL	83			
21	na	BH-301-8B		100% LEL	83		sand seam from 6.5 to 6.7m bgs	
22	na	BH-301-8C		80% LEL	83			
23 7 24	na	BH-301-9	◆	>100% LEL	100		SAND wet, brown, fine, some silt. odours trace gravel	-7.00
25 26	na	BH-301-10A		45% LEL	100		no gravel	
8	na	BH-301-10B		>100% LEL	100		grey gravel seam from 8.1 to 8.2 m bgs	-8.00
27	na	BH-301-10C		5% LEL	100			
28 29 9	na	BH-301-11		25% LEL	100		trace gravel no gravel	-9.00
30 31	na	BH-301-12A		100% LEL	100		gravelly SAND moist to wet, brown, large cobbles present	
32	na	BH-301-12B		45% LEL	100			
33 10	na	BH-301-13A		30% LEL	100		brown/grey, no cobbles	-10.00
34	na	BH-301-13B		35% LEL	100			
35	na	BH-301-14A	◆	325	100			
36 11	na	BH-301-14B		200	100			-11.00
37	na	BH-301-14C		175	100		3 cm silt seam at 11.4 m bgs	
38 39 12 40	na	BH-301-15		375	33		large cobbles End of borehole at 12.2 m bgs	-12.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

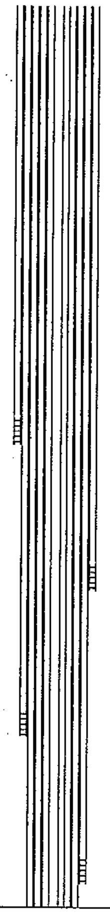
Samples BH-301-9 and BH-301-14A submitted for analysis of BTEX and PHC F1-F4.

[redacted]

Borehole ID: BH-302 (MW-302)

Page 1 of 3

DEPTH (ft / m)	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
0 / 0							Ground Surface	0.00
1	na	BH-302-1A		<25	76		**SAND and GRAVEL** moist, brown, large cobbles grey, silty, no cobbles, odours	-1.00
	na	BH-302-1B		5% LEL	76			
2	na	BH-302-2		5% LEL	72			-2.00
3	na	BH-302-3		15% LEL	59			-3.00
	na	BH-302-4A		5% LEL	43			
	na	BH-302-4B		20% LEL	43			
4	na	BH-302-5		45% LEL	55		gravelly SAND moist, grey, trace silt, staining from 4.3 to 4.4 m bgs	-4.00
	na	BH-302-6A		30% LEL	55		SAND moist, grey, trace silt black staining, odours	
5	na	BH-302-6B	◆	40% LEL	55			-5.00
	na	BH-302-6C		50% LEL	55		SAND and GRAVEL dry to moist, brown/grey, some silt	
6	na	BH-302-7		90% LEL	87			-6.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

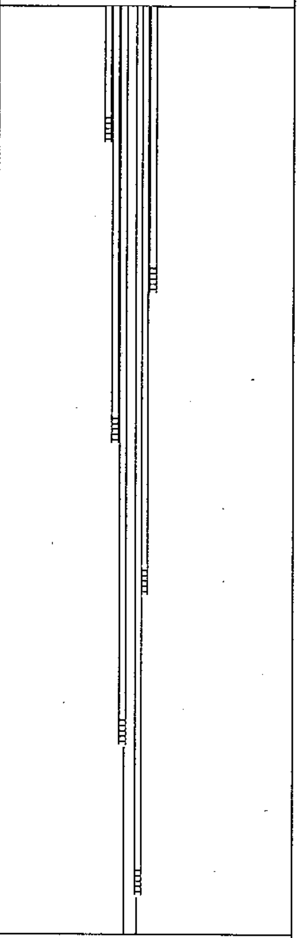
◆ = Sample submitted for laboratory analysis

Sample BH-302-6B submitted for analysis of BTEX and PHC F1-F4.

[redacted]

Borehole ID: BH-302 (MW-302)

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
21	na	BH-302-8A	◆	>100% LEL	100		SAND dry to moist, brown, fine	
22	na	BH-302-8B		>100% LEL	100		very fine	
23 7 24	na	BH-302-9		>100% LEL	100		staining at 6.9 m bgs, some layers of finer sand	-7.00
25 26 8	na	BH-302-10A		15% LEL	75		wet	-8.00
27	na	BH-302-10B		5% LEL	52			
28	na	BH-302-11A		5% LEL	100		grey, fine to medium	
29 9	na	BH-302-11B		300	100		SAND and GRAVEL wet, brown/grey	
	na	BH-302-11C		5% LEL	100		SAND moist to wet, brown/grey, fine	-9.00
30 31	na	BH-302-12A		5% LEL	100		SAND and GRAVEL moist to wet, brown/grey	
32	na	BH-302-12B		375	100		SAND and GRAVEL moist to wet, brown/grey	
10 33 34	na	BH-302-13A		150	87		sandy GRAVEL moist to wet, brown/grey	-10.00
	na	BH-302-13B		100	87		sandy SILT moist to wet, brown, cobbles	
35 36 11 37	na	BH-302-14		375	100		gravelly SAND wet, grey, some silt	-11.00
38 39	na	BH-302-15A		5% LEL	100		SAND moist to wet, grey, coarse	
12 40	na	BH-302-15B		400	100		SILT moist to wet, grey	-12.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

Sample BH-302-8A submitted for analysis of BTEX and PHC F1-F4.

[redacted]

Borehole ID: BH-302 (MW-302)

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DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
							SAND moist to wet, grey, trace gravel	
	na	BH-302-16	◆	150	100		SAND and GRAVEL moist to wet, grey	
	na	BH-302-17		75	48		GRAVEL wet, large cobbles	-13.00
							End of borehole at 13.4 m bgs	

DEPTH: 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

13 14 15 16 17 18

ELEVATION (m): -13.00 -14.00 -15.00 -16.00 -17.00 -18.00

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

Sample BH-302-16 submitted for analysis of BTEX and PHC F1-F4.

[redacted]

Borehole ID: BH-303 (MW-303)

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DEPTH scale: ft 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19; m 0 1 2 3 4 5

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
							Ground Surface	0.00
	na	BH-303-1A		25	83		SAND and GRAVEL dry to moist, brown, trace silt	-1.00
	na	BH-303-1B		5% LEL	83		grey	
	na	BH-303-2		15% LEL	33		brown/grey, some silt	-2.00 -3.00
							No Recovery	
	na	BH-303-3		10% LEL	27		silty SAND and GRAVEL dry to moist, dark brown	-4.00
	na	BH-303-4		15% LEL	7		moist, wood pieces present	-5.00
	na	BH-303-5A		20% LEL	80		dry to moist, large cobbles	

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole ID: BH-303 (MW-303)

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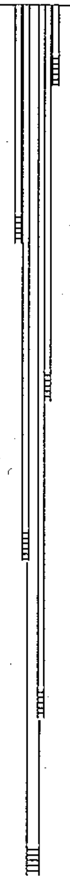
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
6 20	na	BH-303-5B	◆	>100% LEL	80		SAND dry to moist, brown, some gravel, some silt, some gravel	-6.00
21	na	BH-303-6A		50% LEL	100		sandy, silty GRAVEL dry to moist, grey/black staining	
22	na	BH-303-6B		35% LEL	100		SAND and GRAVEL dry to moist, brown, trace silt	
	na	BH-303-6C		>100% LEL	100		SAND wet, brown, staining, odours 4 cm silt seam at 7.4 m bgs	
23 7 24	na	BH-303-7A		>100% LEL	100			-7.00
	na	BH-303-7B		125	100		grey, medium	
25	na	BH-303-7C		150	100		trace gravel	
26 8	na	BH-303-8A		5% LEL	80			-8.00
27	na	BH-303-8B		225	80		grey, fine to medium, staining	
28 29	na	BH-303-9A	◆	5% LEL	100			
9	na	BH-303-9B		100	100		SILT moist, brown, large cobbles	-9.00
30 31 32	na	BH-303-10		75	40		GRAVEL moist, grey, trace sand, odours present	
33 10 34	na	BH-303-11A	◆	200	36		SAND wet, brown, large cobbles	-10.00
35	na	BH-303-11B		75	36		SAND and GRAVEL wet, brown/grey	
36 11 37 38							No Recovery End of borehole at 11.4 m bgs	-11.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

Samples BH-303-5B, BH-303-9A & BH-303-11A submitted for analysis of BTEX and PHC F1-F4.

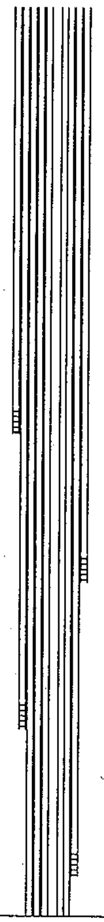
[redacted]

Borehole ID: BH-304 (MW-304)

Page 1 of 2

[redacted]

DEPTH (ft / m)	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
0 / 0							Ground Surface	0.00
3–5 / 1	na (sampled from augers)	BH-304-1		<25	61		SAND and GRAVEL moist, light brown, trace silt, large cobbles	-1.00
5–7.5 / 2							No Sample	-2.00
7.5–9	na	BH-304-2A		5% LEL	100		SAND and GRAVEL moist, dark brown	
9–9.5	na	BH-304-2B	◆	10% LEL	100		SAND moist, green/black staining	
9.5–10 / 3	na	BH-304-2C		10% LEL	100		SAND and GRAVEL moist, light brown, some silt	-3.00
10–12.5	na	BH-304-3	◆	20% LEL	69			
12.5–13.5 / 4	na	BH-304-4A		70% LEL	100		SAND dry to moist, brown, fine	-4.00
13.5–15	na	BH-304-4B		15% LEL	100		SAND and GRAVEL dry to moist, brown, coarse, some silt	
15–17.5 / 5	na	BH-304-5		50% LEL	100			-5.00
17.5–19	na	BH-304-6A	◆	55% LEL	100			
19–20 / 6	na	BH-304-6B		>100% LEL	100		SAND moist, brown/grey, fine, black staining from 5.9 to 6.0 m bgs	-6.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

[redacted]

◆ = Sample submitted for laboratory analysis

Sample BH-304-2B submitted for analysis of pH.
Samples BH-304-3 submitted for analysis of BTEX and PHC F1-F4.
Sample BH-303-6A submitted for analysis of BTEX, PHC F1-F4 & pH.

[redacted]

Borehole ID: BH-304 (MW-304)

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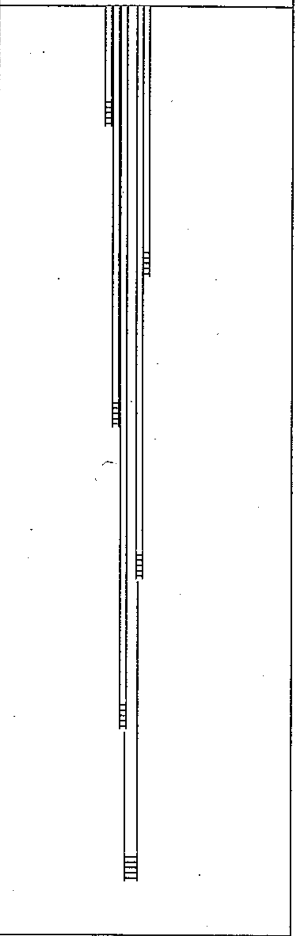
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
21	na	BH-304-7A		>100% LEL	100			
22	na	BH-304-7B		40% LEL	100		sandy GRAVEL moist,brown/grey, large cobbles wet	
23 7 24	na	BH-304-8		20% LEL	72			-7.00
25 26 8 27	na	BH-304-9		25	100			-8.00
28 29 9	na	BH-304-10		50	81		sandy, silty, GRAVEL wet, brown,	-9.00
30 31 32	na	BH-304-11	◆	200	100		gravelly SAND wet, brown, large cobbles	
33 10 34	na	BH-304-12		125	27		SAND and GRAVEL wet, brown/grey	-10.00
35 36 11 37	na	BH-304-13		200	65		SAND wet, brown/grey	-11.00
38	na	BH-304-14A		175	100			
39	na	BH-304-14B		125	100		silty SAND and GRAVEL moist to wet, light brown End of borehole at 11.9 m bgs	
12 40								-12.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

Sample BH-304-11 submitted for analysis of BTEX and PHC F1-F4.

[redacted]

Borehole/Monitoring Well ID: BH-401 (MW-401)

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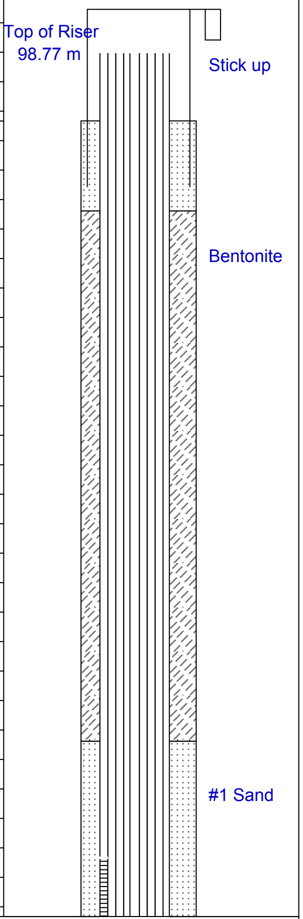
DEPTH ft m	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
-2 -1							Ground Surface	[illegible]
0 1 2 3 — 1 4							Not sampled	97.00
5 6 — 2 7	na	BH-401-1		5% LEL	11		SAND and GRAVEL moist, brown, some silt, cobbles, odours	96.00
8 9	na	BH-401-2		40% LEL	51		silty, grey staining	
10 — 3 11 12	na	BH-401-3		30% LEL	40		moist to wet, dark grey shiny staining	95.00
13 — 4	na	BH-401-4A		60% LEL	69		gravelly SAND wet, brown/grey, coarse, odours, black staining at 3.8 m bgs	94.00
14 15	na	BH-401-4B		60% LEL	69		brown, trace silt, cobbles	
16 — 5	na	BH-401-5A		>100% LEL	44		SAND moist to wet, brown/grey, fine, odours	93.00
17	na	BH-401-5B		>100% LEL	44		gravelly SAND wet, brown/grey, coarse, odours	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-401 (MW-401)

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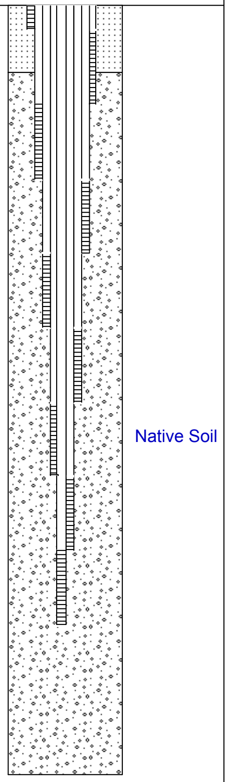
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
18	na	BH-401-6A		>100% LEL	87		grey, medium to coarse, cobbles	
19 6	na	BH-401-6B		>100% LEL	87		SAND and GRAVEL wet, brown/grey, silty, odours, some staining on silty parts	92.00
20	na	BH-401-7A		>100% LEL	100		grey, no silt, coarse	
21 22	na	BH-401-7B		>100% LEL	100		SAND moist to wet, brown, fine, odours	
23 7 24	na	BH-401-8		>100% LEL	100		very fine from 6.8 to 6.9 m bgs wet, fine to medium	91.00
25 26 8 27	na	BH-401-9		>100% LEL	100		grey, fine	90.00
28 29	na	BH-401-10A		35% LEL	100		fine to medium	
9 30	na	BH-401-10B		250	100		brown/grey, trace silt, faint odours	89.00
31	na	BH-401-11A		35% LEL	100		no silt, odours	
32	na	BH-301-11		5% LEL	100		gravelly SAND wet, brown/grey, medium to coarse, trace silt, cobbles	88.00
33 10 34								
35 36 11 37							End of borehole at 10.5 m bgs	87.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

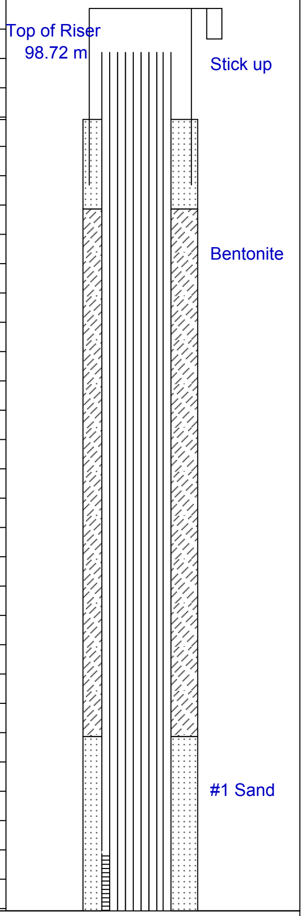
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-402 (MW-402)

Page 1 of 2

DEPTH ft / m	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
-2 -1								
0							Ground Surface	97.98 98.00
1 2 3 4 1							Not sampled	97.00
5 6 7 2	na	BH-402-1		20% LEL	5		silty SAND dry to moist, brown, cobbles, odours	96.00
8 9 3	na	BH-402-2		35% LEL	51		silty SAND and GRAVEL moist, grey, cobbles, odours, grey staining	95.00
10 11 12	na	BH-402-3		20% LEL	44			
13 14 4	na	BH-402-4		10% LEL	27		less sand, dark grey shiny staining	94.00
15 16 17 5	na	BH-402-5		70% LEL	24		SAND and GRAVEL wet, grey, cobbles, odours, black staining	93.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

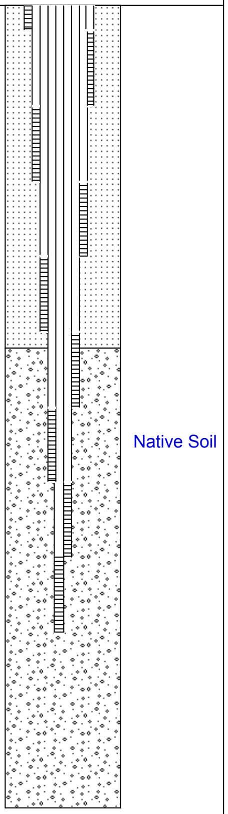
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-402 (MW-402)

Page 2 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
18	na	BH-402-6A		35% LEL	79			
19	na	BH-402-6B		65% LEL	79		brown, medium	
6	na	BH-402-6C		>100% LEL	79		moist to wet, fine, bands of black staining	92.00
20	na	BH-402-7A		>100% LEL	100		wet, grey, no staining	
21 22	na	BH-402-7B		>100% LEL	100		moist, brown, fine to medium, bands of black staining	
23 7 24	na	BH-402-8		>100% LEL	100		SAND moist to wet, brown, fine to medium, some gravel from 7.3 m to 7.4 m bgs, odours	91.00
25 26 8	na	BH-402-9A		>100% LEL	100			90.00
27	na	BH-402-9B		>100% LEL	100		fine	
28	na	BH-402-10A		10% LEL	73		moist	
29 9	na	BH-402-10B		30% LEL	73		moist to wet	89.00
30 31 32	na	BH-402-11		60% LEL	69		brown/grey medium	
33 10 34								88.00
35 36 11 37							End of borehole at 10.7 m bgs	87.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

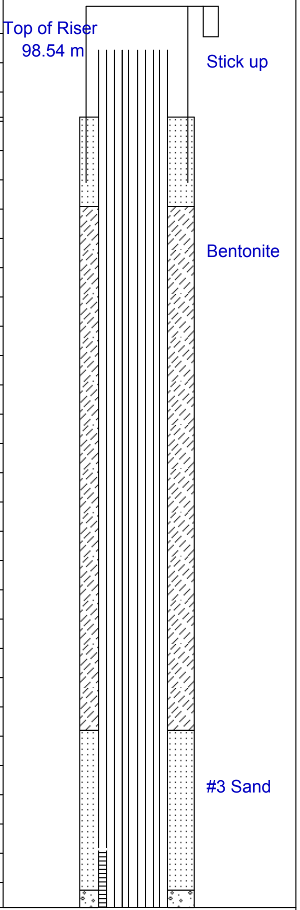
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-403 (MW-403)

Page 1 of 2

DEPTH ft / m	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
-2 -1							Ground Surface	98.00 97.83
0 1 2 3 / 1 4							Not sampled	97.00
5 6 7 / 2	na	BH-403-1		50% LEL	67		silty SAND and GRAVEL moist, dark brown, odours	96.00
8 9	na	BH-403-2		15% LEL	64		cobbles	95.00
10 / 3 11	na	BH-403-3A		40% LEL	71		wood pieces	
12	na	BH-403-3B		55% LEL	71		SAND moist, light brown/grey, fine, some gravel, trace silt, cobbles	
13 / 4	na	BH-403-4A		35% LEL	87		brown/grey	94.00
14	na	BH-403-4B		85% LEL	87		moist to wet, medium, fine sand from 4.3 m to 4.4 m bgs	
15 16 / 5	na	BH-403-5A		>100% LEL	100		SAND and GRAVEL wet, brown, some silt, cobbles, odours, black staining	93.00
17	na	BH-403-5B		>100% LEL	100			



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

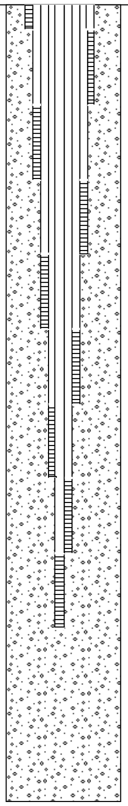
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-403 (MW-403)

Page 2 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
18 19 6	na	BH-403-6		70% LEL	100		SAND moist to wet, brown, fine to medium	92.00
20 21	na	BH-403-7A		375	100		sandy GRAVEL wet, grey, cobbles, odours	
22	na	BH-403-7B		250	100		SAND wet, brown, fine	91.00
23 7 24	na	BH-403-8		5% LEL	100			
25 26 8 27	na	BH-403-9		5% LEL	100		moist to wet, faint odours	90.00
28	na	BH-403-10A		5% LEL	100		wet, brown/grey, medium to coarse	
29 9	na	BH-403-10B		425	100		sandy GRAVEL wet, grey, trace silt, cobbles	89.00
30 31 32	na	BH-403-11		375	100		gravelly SAND wet, grey, medium to coarse, cobbles	88.00
33 10 34 35								
36 11 37							End of borehole at 10.7 m bgs	87.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

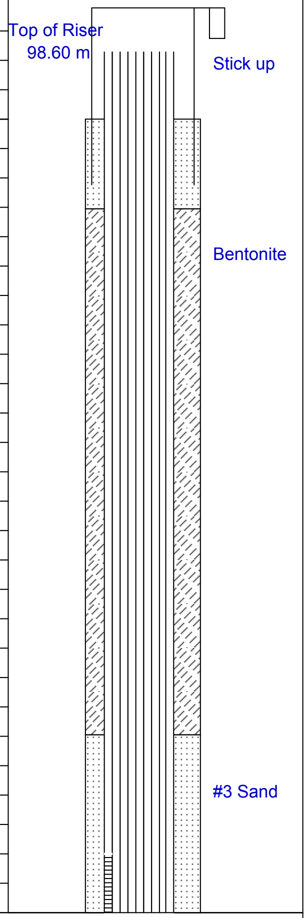
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-404 (MW-404)

Page 1 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
ft m								
-2								
-1								98.00
0							Ground Surface Not sampled	97.80
1								
2								
3 1								97.00
4								
5								
6								96.00
2								
7								
8								
9								95.00
10 3								
11								
12								94.00
13 4								
14								
15							No recovery - cobble stuck ahead of augers in ground	
16								93.00
5								
17								



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-404 (MW-404)

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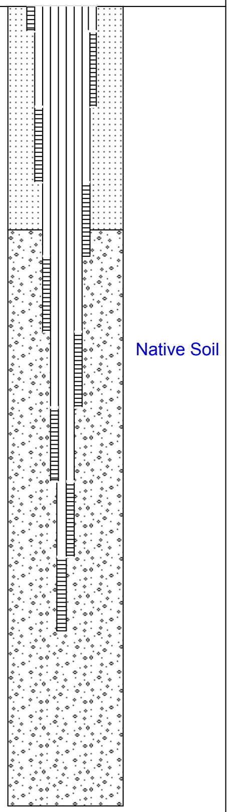
[redacted]

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)	
18 19 6 20 21 22 23 7 24 25 26 8 27 28 29 9 30 31 32 10 33 34 35 36 11 37							End of borehole at 10.7 m bgs	92.00 91.00 90.00 89.00 88.00 87.00	

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

[redacted]

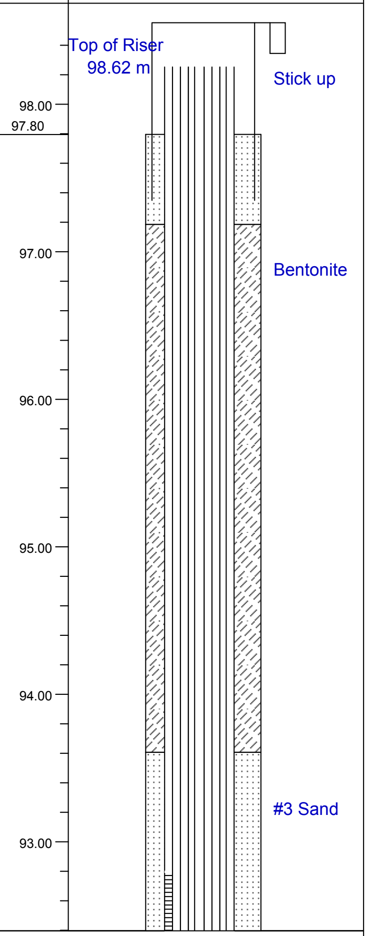
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-405 (MW-405)

Page 1 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
ft m								
0							Ground Surface	97.80
							Not sampled	
15	na	BH-405-1A		70% LEL	100		gravelly SAND moist to wet, brown, medium	
16	na	BH-405-1B		95% LEL	100		wet, grey, medium to coarse	
17	na	BH-405-1C		>100% LEL	100			



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-405 (MW-405)

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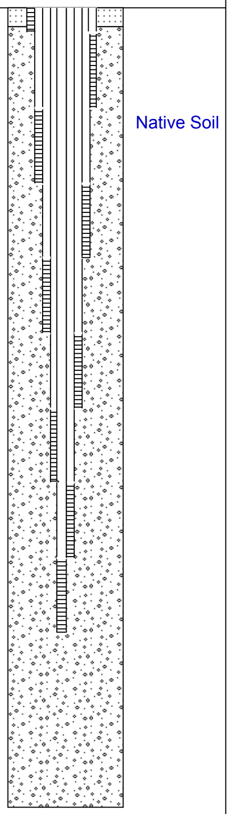
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
18	na	BH-405-2A		>100% LEL	100		SAND wet, brown, medium to coarse, trace gravel, cobbles, odours	
19 6 20	na	BH-405-2B		>100% LEL	100		fine to very fine	92.00
21	na	BH-405-3A		>100% LEL	83		some gravel, bands of black staining	
22	na	BH-405-3B		25% LEL	83		sandy GRAVEL moist, brown, some silt, odours	91.00
23 7 24	na	BH-405-4		10% LEL	100		SAND moist to wet, brown/grey, medium to coarse, trace gravel, cobbles, odours, 5 cm band of fine sand at 7.6 m bgs	
25	na	BH-405-5A		35% LEL	100		some gravel	90.00
26 8	na	BH-405-5B		5% LEL	100		brown, fine, trace gravel	
27	na	BH-405-5C		250	100		sandy GRAVEL brown/grey, some silt, cobbles, odours	
28	na	BH-405-6A		5% LEL	100			
29 9	na	BH-405-6B		125	100		SAND wet, brown, medium to coarse, faint odours	89.00
30 31							silty SAND and GRAVEL moist to wet, brown, cobbles	
32 33 10 34								88.00
35 36 11 37							End of borehole at 10.7 m bgs	87.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

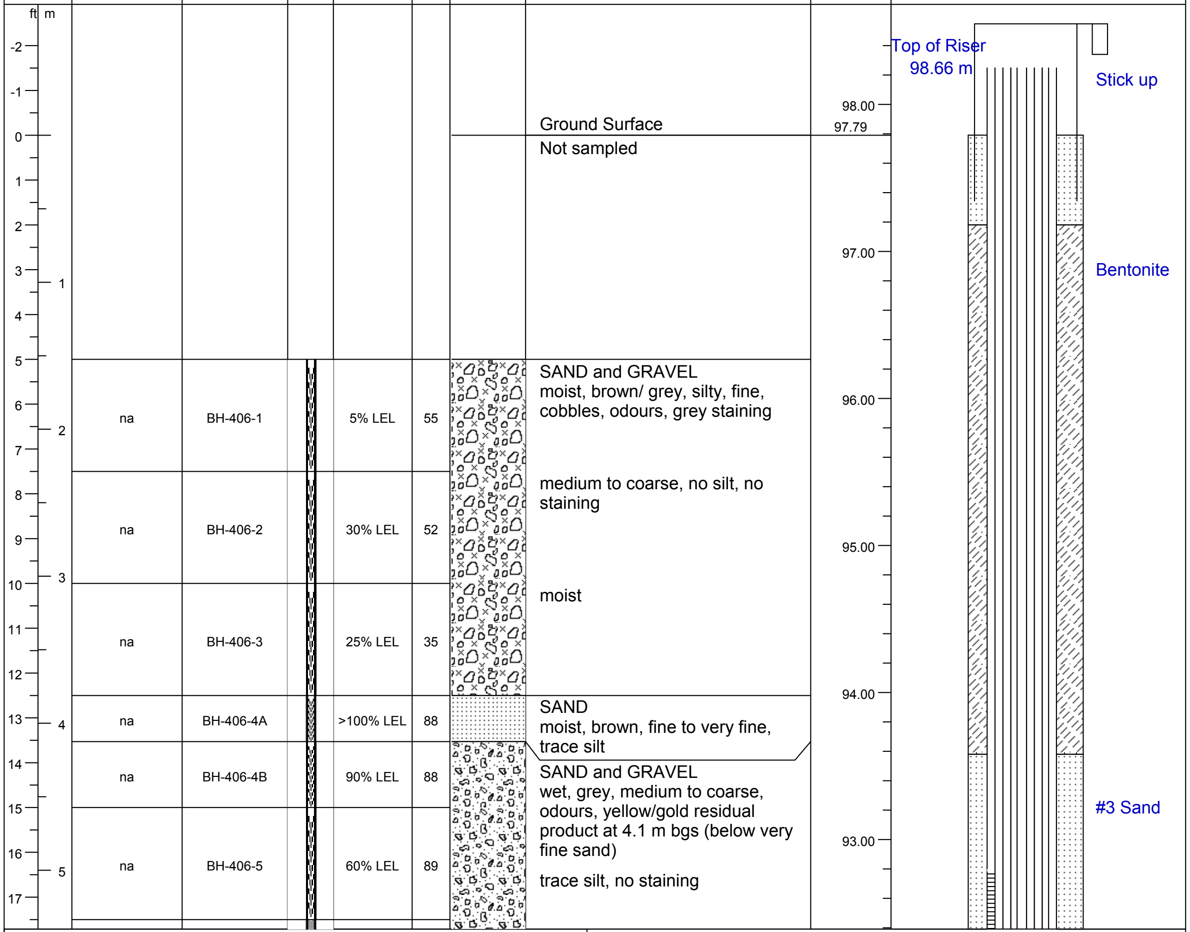
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-406 (MW-406)

Page 1 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
0							Ground Surface Not sampled	97.79
	na	BH-406-1		5% LEL	55		SAND and GRAVEL moist, brown/ grey, silty, fine, cobbles, odours, grey staining	
	na	BH-406-2		30% LEL	52		medium to coarse, no silt, no staining	
	na	BH-406-3		25% LEL	35		moist	
	na	BH-406-4A		>100% LEL	88		SAND moist, brown, fine to very fine, trace silt	
	na	BH-406-4B		90% LEL	88		SAND and GRAVEL wet, grey, medium to coarse, odours, yellow/gold residual product at 4.1 m bgs (below very fine sand)	
	na	BH-406-5		60% LEL	89		trace silt, no staining	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-406 (MW-406)

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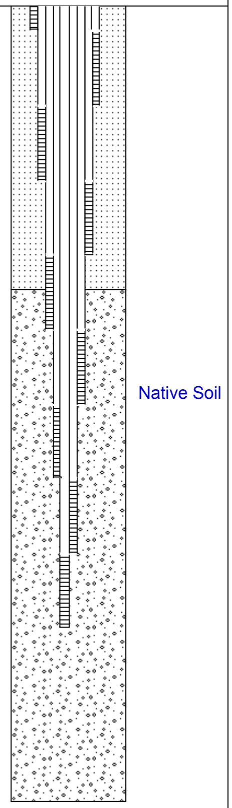
[redacted]

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
18	na	BH-406-6A		50% LEL	64		hard packed silt at 5.7 m bgs	
19 6 20	na	BH-406-6B		>100% LEL	64		SAND moist to wet, brown, fine, odours, bands of black staining at 6.1 m bgs	92.00
21	na	BH-406-7A		>100% LEL	100		fine to medium, trace gravel, fine sand at 6.6 m bgs	
22	na	BH-406-7B		90% LEL	100		sandy GRAVEL moist, brown/grey, coarse, some silt, odours, shiny black staining at 6.7 m bgs	91.00
23 7 24	na	BH-406-8		>100% LEL	75		wet, coarse, no silt	
25 26 8	na	BH-406-9A		10% LEL	100		SAND moist to wet, brown/grey, coarse, odours	90.00
27	na	BH-406-9B		5% LEL	100		wet, fine, some gravel	
28 29	na	BH-406-10A		375	100		GRAVEL wet, grey, faint odours	89.00
9 30	na	BH-406-10B		150	100		sandy GRAVEL wet, brown, some silt, faint odours	
31 32	na	BH-406-11		5% LEL	100		SAND wet, grey, medium to coarse, some gravel and silt, faint odours	88.00
33 10 34								
35 36 11 37							End of borehole at 10.7 m bgs	87.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

[redacted]

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-501(MW-501)

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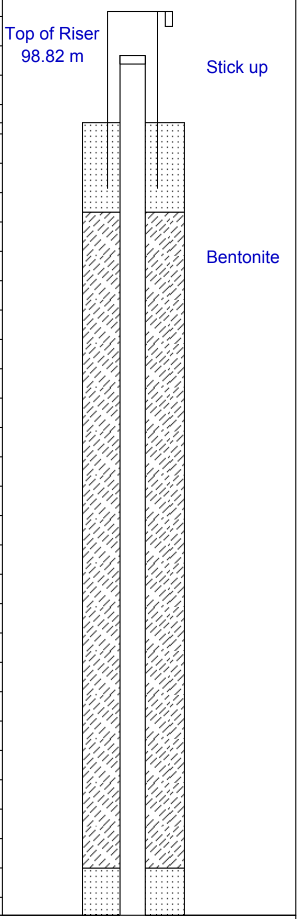
[redacted]

DEPTH (ft)	DEPTH (m)	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
0								Ground Surface	98.08
0–15	0–4.6							Not sampled	98.00 97.00 96.00 95.00 94.00
15–17	5	na	BH-501-1		na	0		No recovery	93.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

[redacted]

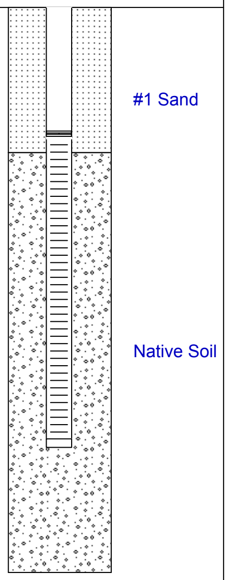
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-501(MW-501)

Page 2 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
18								
	na	BH-501-2A		75% LEL	100		SAND and GRAVEL wet, grey, medium to coarse, cobbles, odours, grey staining and sheen on sample	
19								
6	na	BH-501-2B		>100% LEL	100		brown/grey, no staining	
20								92.00
21	na	BH-501-3A		>100% LEL	100		gravelly SAND wet, brown, medium to coarse, cobbles, odours, grey staining from 6.5 m to 6.7 m bgs	
22	na	BH-501-3B		>100% LEL	100		SAND moist to wet, brown, fine to medium, odours	
23 / 7	na	BH-501-4A		>100% LEL	100			91.00
24	na	BH-501-4B		40% LEL	100		very fine, staining at 7.3 m bgs	
	na	BH-501-4C		>100% LEL	100		gravel from 7.5 m to 7.55 m bgs	
25	na	BH-501-4D		>100% LEL	100			
26 / 8	na	BH-501-5A		>100% LEL	100		gravelly SAND wet, grey, medium, cobbles, strong odours	90.00
27	na	BH-501-5B		5% LEL	100		SAND wet, brown, fine to very fine, faint odours	
28								
29 / 9								
30							End of borehole at 9.1 m bgs	89.00
31								
32								
33 / 10								88.00
34								
35								
36 / 11								87.00
37								



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

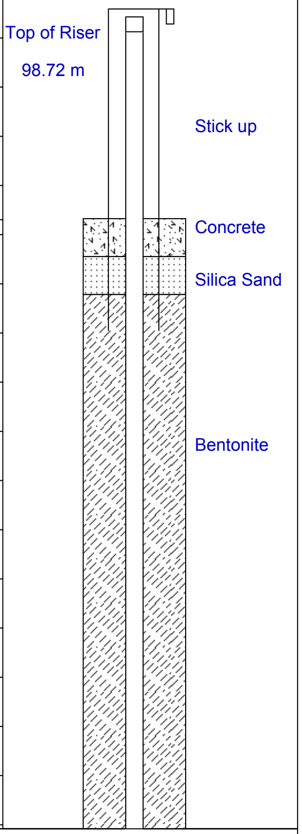
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-601(MW-601)

Page 1 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
ft m								
-4								
-3								
-2								
-1								98.00
0 0							Ground Surface	97.86
							Not sampled	
1								
2								
3 1								97.00
4								
5								
6								96.00
2								
7								
8								



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

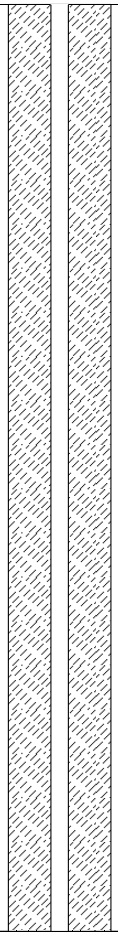
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-601(MW-601)

Page 2 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
9 3								95.00
10 11 12	na	BH-601-1		25% LEL	68		silty, gravelly SAND moist, grey, trace clay, fine to coarse gravel, fine sand, large cobbles, odours	
13 4 14	na	BH-601-2		70% LEL	54		dry to moist, light brown	94.00
15	na	BH-601-3A		85% LEL	79		SAND moist, brown, trace gravel, very fine to fine, odours	
16 5 17	na	BH-601-3B		40% LEL	79		gravelly SAND moist, grey, fine to coarse, odours	93.00
18 19 6 20	na	BH-601-4		80% LEL	73		moist to wet, brown/grey, trace silt black staining at 6.1 m bgs	92.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-601(MW-601)

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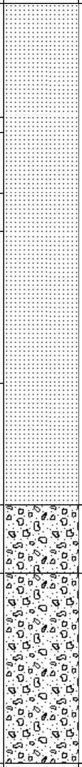
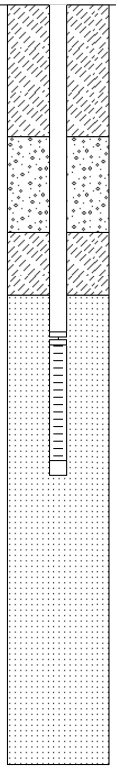
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
21	na	BH-601-5A		>100% LEL	79		SAND wet, grey, fine, odours 2 cm brown SILT seam at 6.6 m bgs	
	na	BH-601-5B		50% LEL	79			
22	na	BH-601-5C		>100% LEL	79		fine to medium	
	na	BH-601-6A		>100% LEL	74		free product at 7.0 m bgs	91.00
23 7 24	na	BH-601-6B		>100% LEL	74		brown/grey, fine, odours, no free product	
25 26 8	na	BH-601-7A		70% LEL	66			90.00
27	na	BH-601-7B		25% LEL	66		silty, gravelly SAND wet, light grey, fine to coarse sand, cobbles	
28 29 9	na	BH-601-8		225	98		sandy GRAVEL and SILT wet, grey, cobbles, odours	89.00
30 31 32							End of borehole at 9.1 m bgs	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

Monitoring well equipped with dedicated inertial foot valve and polyethylene tubing for sampling.

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-602 (MW-602)

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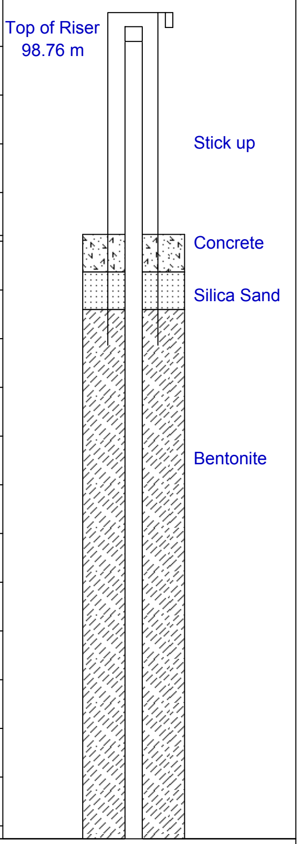
DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)	
ft m									
-4									
-3									
-2									
-1								98.00	
0 0							Ground Surface Not sampled	97.82	
1									
2									
3 1								97.00	
4									
5									
6								96.00	
7 2									
8									



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

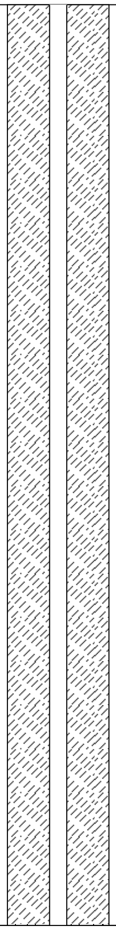
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-602 (MW-602)

Page 2 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
9 3								95.00
10 11 12	na	BH-602-1		15% LEL	61		silty, gravelly SAND moist to wet, grey, some clay, cobbles, odours	
13 4	na	BH-602-2A		75% LEL	59		SAND moist, brown/grey, fine, odours 1 cm SILT seam at 4.1 m bgs	94.00
	na	BH-602-2B		50% LEL	59			
14	na	BH-602-2C		30% LEL	59		gravelly SAND moist, grey, odours	
15	na	BH-602-3A		50% LEL	86			
16	na	BH-602-3B		375	86		SAND moist, brown, some silt, very fine, odours, staining at 4.9 m bgs	93.00
5	na	BH-602-3C		>100% LEL	86			
17	na	BH-602-3D		75% LEL	86		no silt, fine gravelly SAND dry to moist, brown/grey, odours, staining at 5.1 m bgs	
18	na	BH-602-4A		>100% LEL	76		SAND moist, brown, some gravel, fine to very fine, odours	
	na	BH-602-4B		>100% LEL	76			
19 6 20	na	BH-602-4C		>100% LEL	76		moist to wet, grey, no gravel, odours, black staining	92.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

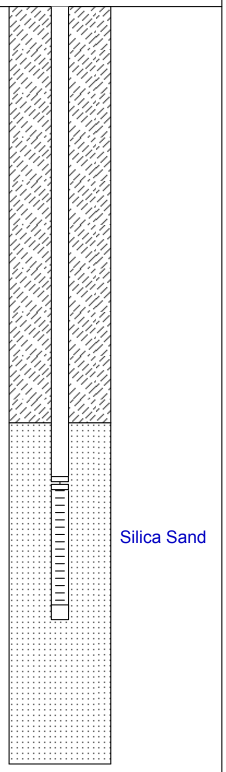
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-602 (MW-602)

Page 3 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
	na	BH-602-5A		>100% LEL	81		moist, brown/grey, some gravel, fine to coarse sand	
21 22	na	BH-602-5B		>100% LEL	81		1cm silt seam at 6.0 m bgs black staining from 6.0 m to 6.1 m bgs wet, grey, odours brown/grey, fine to very fine, 2 cm silt seam at 6.7 m bgs	
	na	BH-602-5C		>100% LEL	81		grey, trace gravel, medium to coarse	91.00
23 — 7	na	BH-602-6A		60% LEL	62		brown, fine, odours, 3 cm gravel seam at 7.0 m bgs sheen on sample from 7.1 to 7.3 m bgs	
24	na	BH-602-6B		5% LEL	62		silty, sandy GRAVEL wet, brown/grey	
25	na	BH-602-7A		175	83		cobbles	90.00
26 — 8 27	na	BH-602-7B		475	83		SAND wet, brown/grey, some gravel, fine to medium	
28	na	BH-602-8A		375	52		no gravel	
29 — 9	na	BH-602-8B		400	52		silty, sandy GRAVEL moist, brown/grey	89.00
30 31 32							End of borehole at 9.1 m bgs	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

Monitoring well equipped with dedicated inertial foot valve and polyethylene tubing for sampling.

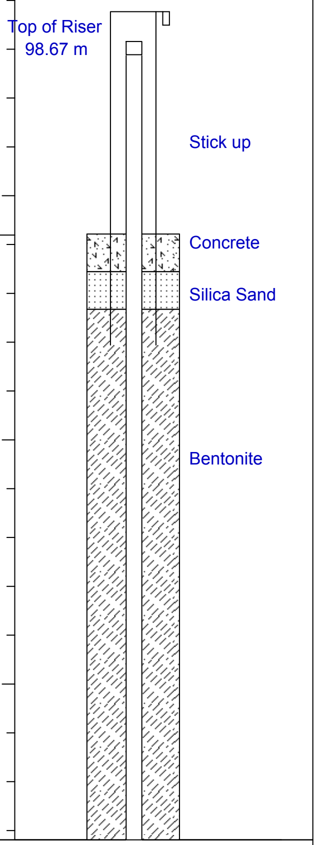
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-603 (MW-603)

Page 1 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
ft -4 / m								
-3								
-2								
-1								98.00
0 / 0							Ground Surface Not sampled	97.84
1								
2								
3 / 1								97.00
4								
5								
6								96.00
7 / 2								
8								



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

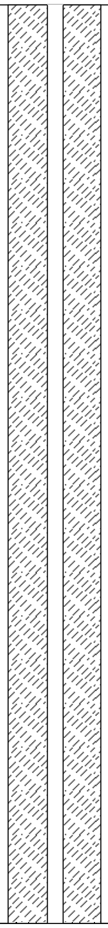
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-603 (MW-603)

Page 2 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
9 3								95.00
10–12	na	BH-603-1		40% LEL	75		silty SAND and GRAVEL dry to moist, grey, cobbles, odours	
12–15 4	na	BH-603-2		90% LEL	68		gravelly SAND moist, grey, medium to coarse, odours, dark grey staining from 3.8 m to 4.0 m bgs, 10 cm band of fine sand at 4.0 m bgs	94.00
15–16	na	BH-603-3A		35% LEL	74			93.00
16–17 5	na	BH-603-3B		95% LEL	74		SAND moist, grey, some gravel, fine to medium, dark grey staining	
17–18	na	BH-603-4A		>100% LEL	79		brown/grey, no gravel or staining	
19	na	BH-603-4B		>100% LEL	79		brown, trace silt, very fine	92.00
19–20 6	na	BH-603-4C		>100% LEL	79		moist, brown/grey, some gravel, fine to coarse	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

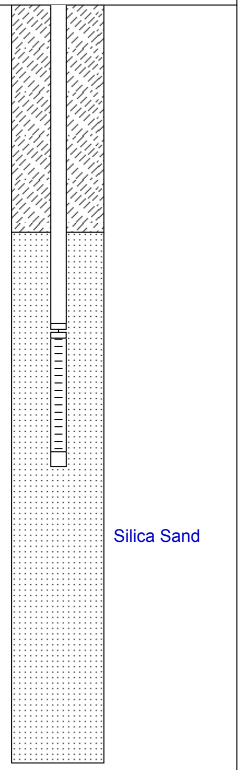
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-603 (MW-603)

Page 3 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
21 22	na	BH-603-5A		>100% LEL	79		odours, 1 cm silt seam at 6.6 m bgs, black staining at 6.7m bgs	
	na	BH-603-5B		500	79		gravelly SAND wet, brown/grey, medium to coarse, odours	91.00
23 7	na	BH-603-6A		5% LEL	79		SAND wet, brown, fine to medium, odours, rainbow sheen	
24	na	BH-603-6B		25% LEL	79		sandy GRAVEL wet, brown/grey, medium to coarse sand, cobbles, odours	
25 26 8	na	BH-603-7A		5% LEL	84		SAND wet, brown/grey, some gravel, medium	90.00
27	na	BH-603-7B		300	84		some silt, fine to very fine	
28 29 9	na	BH-603-8		200	63		gravelly, silty SAND wet, grey, fine to coarse	89.00
30 31 32							End of borehole at 9.1 m bgs	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

Monitoring well equipped with dedicated inertial foot valve and polyethylene tubing for sampling.

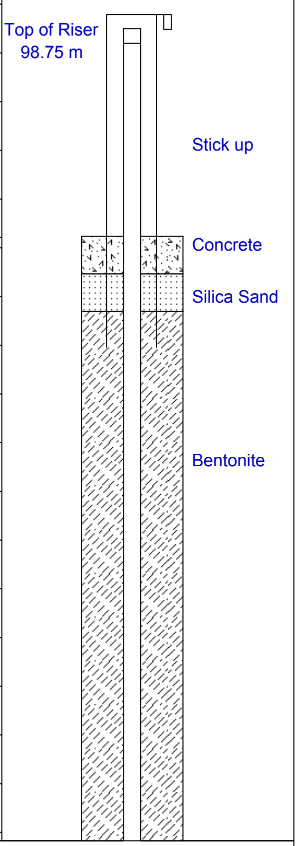
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-604 (MW-604)

Page 1 of 3

DEPTH ft	DEPTH m	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
-4									
-3									
-2									
-1									98.00
0	0							Ground Surface	97.84
								Not sampled	
1									
2									
3	1								97.00
4									
5								gravelly, silty SAND FILL moist, dark grey, odours	
6	2	na	BH-604-1		20% LEL	69			96.00
7									
8									



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis

[redacted]

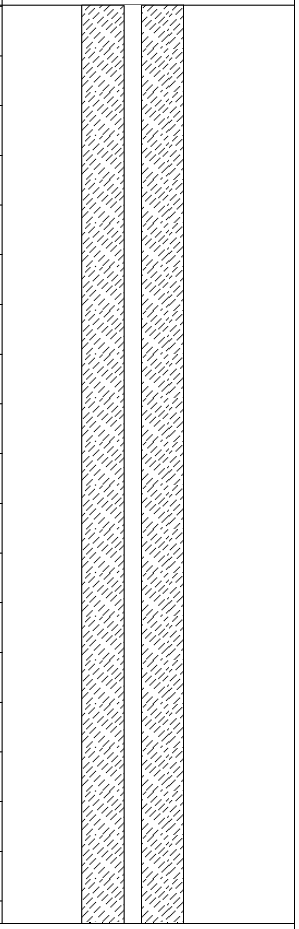
Borehole/Monitoring Well ID: BH-604 (MW-604)

Page 2 of 3

BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION
na	BH-604-2		25% LEL	63		
na	BH-604-3A		25% LEL	72		
na	BH-604-3B		80% LEL	72		gravelly SAND moist, brown/grey, fine, odours
na	BH-604-4		30% LEL	30		silty SAND moist, grey, cobbles, odours, black staining
na	BH-604-5A		30% LEL	92		SAND moist, brown/grey, some gravel, trace silt, medium to coarse, grey staining at 4.8 m bgs
na	BH-604-5B		20% LEL	92		silty SAND moist, brown/grey, trace gravel, very fine to medium
na	BH-604-5C		70% LEL	92		SAND moist, brown/grey, some gravel, trace silt, medium to coarse, odours
na	BH-604-6A		100% LEL	91		
na	BH-604-6B		100% LEL	91		some silt, no gravel
na	BH-604-6C		>100% LEL	91		moist to wet, brown, no silt, fine, grey staining in very fine sand at 5.8 m bgs

DEPTH: 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20; 3, 4, 5, 6

ELEVATION (m): 95.00, 94.00, 93.00, 92.00



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

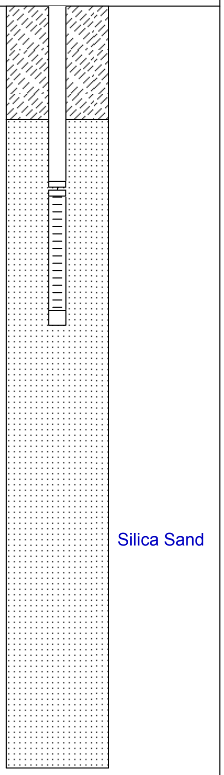
◆ = Sample submitted for laboratory analysis

[redacted]

Borehole/Monitoring Well ID: BH-604 (MW-604)

Page 3 of 3

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
21 22	na	BH-604-7		>100% LEL	100		wet, trace silt	91.00
23 — 7 24	na	BH-604-8A		15% LEL	84			
	na	BH-604-8B		225	84		gravelly, silty SAND wet, brown/grey, medium to coarse, cobbles	
25 26 — 8	na	BH-604-9A		75	84		silty, sandy GRAVEL wet, brown/grey	90.00
27	na	BH-604-9B		250	84		SAND wet, brown/grey, trace gravel, fine to coarse sand	
28 29	na	BH-604-10A		375	92		grey, fine	89.00
— 9	na	BH-604-10B		75	92		sandy, silty GRAVEL wet, grey	
30 31 32							End of borehole at 9.1 m bgs	



(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

Monitoring well equipped with dedicated inertial foot valve and polyethylene tubing for sampling.

◆ = Sample submitted for laboratory analysis

[redacted]

Borehole ID: BH-701

Page 1 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
							Ground Surface	0.00
							Not sampled	
	NA	BH-701-1	◆	70% LEL	43	▒	SAND moist, light brown, fine to medium, odours, grey staining	
	NA	BH-701-2A		20% LEL	24	▨	sandy GRAVEL moist, brown/grey, trace silt, medium to coarse	
	NA	BH-701-2B		40% LEL	24	▨	light brown, medium	
	NA	BH-701-3		45% LEL	13	▨	moist to wet	

ft: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

m: 0 1 2 3 4 5 6

ELEVATION (m): 0.00 -1.00 -2.00 -3.00 -4.00 -5.00 -6.00

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-701

Page 2 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
23 24 7	NA	BH-701-4		NA	0		No sample	-7.00
25								
26	NA	BH-701-5A	◆	>100% LEL	81		sandy GRAVEL wet, brown, fine to medium, strong odours	
27 28 8	NA	BH-701-5B		350	81		SAND wet, light brown, fine, odours	-8.00
29 9	NA	BH-701-6		NA	0		No sample	-9.00
30 31	NA	BH-701-7A		400	77		SAND wet, brown, trace silt, medium, gravelly sand from 9.5 to 9.7 m bgs	
	NA	BH-701-7B		5% LEL	77			
32	NA	BH-701-7C		125	77		some silt, fine	
33 34 10	NA	BH-701-8		NA	0		No sample	-10.00
35 36 11	20-50-60	BH-701-9		5% LEL	96		gravelly SAND moist to wet, light brown, fine, slight odours, very dense	-11.00
37								
	20-40-60-60	BH-701-10A		450	80		wet, dark brown	
38	20-40-60-60	BH-701-10B		75	80		light brown, fine sand from 11.5 to 11.7 m bgs	
39 40 12	20-50-50-50	BH-701-11		200	87		brown/grey, fine to medium, very dense	-12.00
41 42 43 44 45 13							End of borehole at 12.5 m bgs	-13.00

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-702

Page 1 of 2

DEPTH ft	DEPTH m	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)	
0	0							Ground Surface	0.00	
1 2 3	1							Not sampled	-1.00	
4 5 6	2								-2.00	
7 8 9 10	3								-3.00	
11 12 13	4								-4.00	
14 15 16	5								-5.00	
17 18 19 20	6								-6.00	
21		NA	BH-702-1	◣	>100% LEL	77	▒	SAND wet, brown, some gravel, fine to medium, odours		
22				◣			▒	trace gravel		

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-702

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
23 7	NA	BH-702-2		>100% LEL	100			-7.00
24	NA	BH-702-3A		>100% LEL	100		gravelly sand from 7.3 to 7.5 m bgs wet, light brown, fine	
25	NA	BH-702-3B	◆	25% LEL	100			
26 8 27	NA	BH-702-4A	◆	15% LEL	100		gravelly SAND wet, brown, fine to medium, odours	-8.00
28	NA	BH-702-4B		100	100		SAND wet, light brown, fine	
29	NA	BH-702-5A		5% LEL	92		gravelly SAND wet, brown, medium to coarse	
9 30	NA	BH-702-5B		50	92			-9.00
	NA	BH-702-6A		5% LEL	100		more gravel, fine to medium	
31	NA	BH-702-6B		150	100		less gravel	
32 10 33	NA	BH-702-7		50	92		sandy GRAVEL wet, brown, some sand, medium light brown, medium to coarse	-10.00
34 35	NA	BH-702-8		125	100			
36 11 37 38 39 12							No sample	-11.00 -12.00
40 41	NA	BH-702-9		5% LEL	100		gravelly SAND moist to wet, light brown, fine to medium	
42 13 43 44 45							End of borehole at 12.8 m bgs	-13.00

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-703

Page 1 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)	
ft m							Ground Surface	0.00	
ft: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 m: 0 1 2 3 4							Not sampled	-1.00 -2.00 -3.00 -4.00	
ft: 16 17 m: 5	NA	BH-703-1	◆	10% LEL	78		gravelly SAND moist, dark brown/grey, some silt, trace clay	-5.00	
ft: 18	NA	BH-703-2		NA	0		No sample		
ft: 19 20 m: 6	NA	BH-703-3	◆	15% LEL	62		gravelly silty SAND moist to wet, light grey	-6.00	
ft: 21 22	NA	BH-703-4		>100% LEL	100		SAND moist to wet, brown, fine to medium		

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-703

Page 2 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
23 — 7						░		-7.00
24	NA	BH-703-5	◆	20% LEL	100	░	wet, some silt, medium	
25 — 26 — 8	NA	BH-703-6A		100	100	░	moist to wet, trace silt, fine	-8.00
	NA	BH-703-6B		100	100	░	gravel seam from 8.0 to 8.1 m bgs	
27	NA	BH-703-6C			100	░		
28	NA	BH-703-7A		5% LEL	100	░	light brown, medium some silt	
	NA	BH-703-7B		5% LEL	100	░	fine	
29 — 9 — 30	NA	BH-703-8A		100	67	▨	SAND and GRAVEL wet, light brown, trace silt, medium to coarse, light grey silt seam from 9.2 to 9.4 m bgs	-9.00
31	NA	BH-703-8B		125	67	▨		
32	NA	BH-703-9		75	60	▨		
33 — 10 — 34	NA	BH-703-10A		25	42	░	SAND wet, light brown, some gravel, medium	-10.00
35	NA	BH-703-10B		<25	42	░	light brown/grey, some silt, fine	
36 — 11 — 37	NA	BH-703-11		<25	67	▨	SAND and GRAVEL wet, light grey	-11.00
38	NA	BH-703-12		<25	25	▨	sandy GRAVEL wet, light grey, trace silt, coarse	
39 — 12 — 40	NA	BH-703-13		<25	43	▨		-12.00
41 — 42 — 13 — 43 — 44 — 45							End of borehole at 12.5 m bgs	-13.00

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-704

Page 1 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
ft m							Ground Surface	0.00
ft: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 m: 0 1 2 3 4 5							Not sampled	-1.00 -2.00 -3.00 -4.00 -5.00
ft: 18 19 m: 6	NA	BH-704-1	◆	5% LEL	83		gravelly SAND moist, light grey, trace silt, odours, staining	-6.00
ft: 20	NA	BH-704-2A		10% LEL	25		sandy GRAVEL wet, light grey, trace silt, slight odours	
ft: 21 22	NA	BH-704-2B	◆	10% LEL	25			

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

[redacted]

Borehole ID: BH-704

Page 2 of 2

DEPTH	BLOW COUNT (1)	SAMPLE ID	LOCATION	OVM (2)	RECOVERY (%)	GRAPHIC LOG	DESCRIPTION	ELEVATION (m)
23 7	NA	BH-704-3		50	100		SAND and GRAVEL moist to wet, light grey, slight odours	-7.00
24 25	NA	BH-704-4		75	33		SAND wet, light brown, trace silt, fine SAND and GRAVEL wet, light grey	
26 8	NA	BH-704-5A		50	67			-8.00
27	NA	BH-704-5B		50	67		SAND wet, light grey, some gravel and silt, fine	
28 29 9	NA	BH-704-6		50	25		sandy GRAVEL wet, light grey, some silt	-9.00
30 31	NA	BH-704-7		50	92			
32 10	NA	BH-704-8A		<25	100		SAND wet, light grey, trace silt, medium	-10.00
33	NA	BH-704-8B		<25	100		fine	
34 35	NA	BH-704-9		<25	100		medium	
36 11 37	NA	BH-704-10		<25	100		some gravel and cobbles	-11.00
38 39 12	NA	BH-704-11		<25	17		silty GRAVEL wet, light grey	-12.00
40 41 42 13 43 44 45							End of borehole at 12.2 m bgs	-13.00

(1) Blow count per 0.15 m using conventional hammer and split spoons
(2) Organic Vapour Meter (OVM) reading (ppmv unless noted)

◆ = Sample submitted for laboratory analysis.

NA = Not applicable

Appendix D: Pre vs. Post injection soil BTEX concentrations

Pre-injection residual BTEX concentrations were calculated using data from boreholes 501, 301, 302, 401 and 402. This was compared to post-injection residual BTEX concentrations using boreholes 701, 702, and 703. Post injection boreholes were taken no more than 0.8m away from the borehole in which it was being compared.

Each soil sample denoted a representative volume of aquifer material. The volume in each represented sample was based on its proximity to the next closest sample location. The BTEX concentration in each representative volume of soil was calculated and summed to give the estimated total residual BTEX before and after injection. Refer to Appendix A for the complete BTEX concentration in each borehole and its corresponding volume that it represents.

As shown in plan view in Figure 1, the field site was divided into areas that were approximately equal distances apart from each borehole. For example, the zone around borehole 301 was determined to represent 2.8 m2 of area as shown in Figure 1.

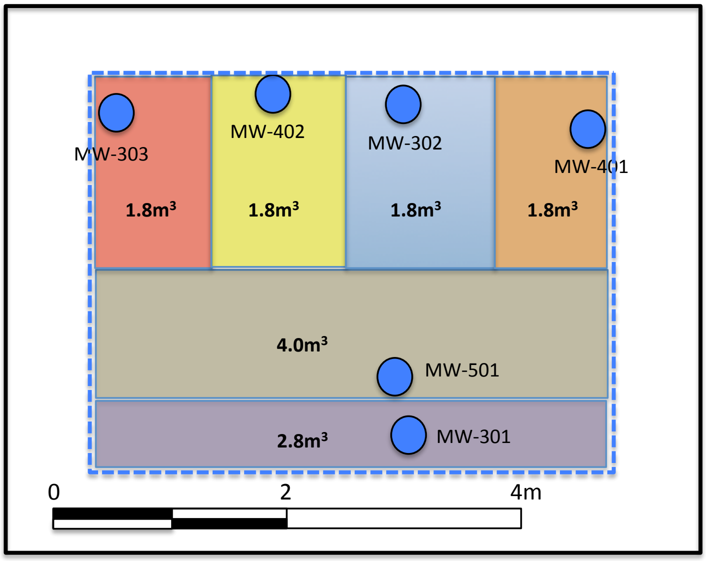


Figure 1: Plan view map illustrating the sub divided areas around each borehole

For example, MW301-11 was collected at a depth of 6.20m and contained 159.3 mg/kg of BTEX. MW301-10 and MW301-12 were collected at 5.83m and 6.40m respectively. The halfway point between MW301-10 and MW301-11 is 6.02m and the halfway point between MW301-11 and MW301-12 is 6.3m. Therefore, the depth of soil that MW301-11 represents is 6.30m – 6.02m = 0.28m as shown in Figure 2.

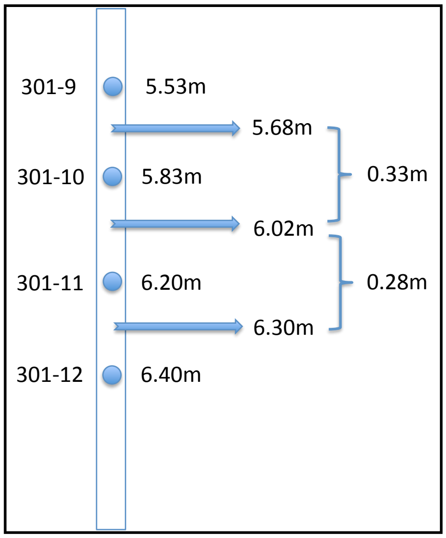


Figure 2: Calculated depth of representative volume of aquifer material.

Therefore, MW301-11 contains 0.28m x 2.8m2 = 0.79m3 volume of soil. The mass of each representative volume can be determined by assuming that the average density of the soil is 2000 kg/m3. Hence, in this case 0.79m3 would be equivalent to 1573kg of soil and could contain approximately 0.16kg of BTEX.

Once all the representative volumes are calculated and the total amount of BTEX is tabulated as shown in Appendix X the total BTEX pre-injection and post injection can be determined. Pre-injection BTEX mass for the study area was determined to be 39kg while the total BTEX mass post-injection was 31kg.

Appendix E: Theoretical treatability of dissolved phase BTEX based on xylene stoichiometry

Total volume of study area: 84 m^3

Average porosity (Holtze): 0.32

Sodium persulphate concentration = $\frac{200\ kg}{2000\ L} = 100g/L$

$$Porosity = \frac{V_{Water} + V_{Air}}{V_{Total}} = \frac{V_{Voids}}{V_{Total}}$$

$$0.32 = \frac{V_{Voids}}{84\ m^3}$$

$$V_{Voids} = V_{Pore\ water} = 26.88\ m^3 = 26880L$$

Based on calculations from Appendix J, 200kg of sodium persulphate can degrade 4.24106kg of xylene.

$$\frac{4241060\ mg}{26880\ L} = 157.78\ mg/L$$

Therefore, it can degrade the pore volume of the entire study area (26.88 m^3) up to an average concentration of 157.78 mg/L.

In other words, because the highest BTEX concentrations recorded do not exceed 25 mg/L, 200kg of sodium persulphate can degrade six times the pore volume of the entire study area (161.28 m^3) up to an average BTEX concentration of 26.5 mg/L.

Appendix F: SALTFLOW model assumptions and parameters

Numerical model, SALTFLOW, was used to solve this two-dimensional density-dependent groundwater flow and mass transport problem.

The model is based on the following assumptions:
Chemical reactions are neglected, porous media is homogeneous, fluid is incompressible, saturated flow, isothermal, isotropic, uniform viscosity, 3D symmetric system.

The following physical parameters were also defined:

Physical parameter	**Value**
Retardation	1
Longitudinal dispersivities	1.0 m
Transverse horizontal dispersivities	0.1 m
Transverse vertical dispersivities	0.005 m
Porosity	0.3
Hydraulic conductivity (K)	1 x 10^{-5} m/s
Gradient (i)	0.125
Flow Gradient (i)	0.005

Appendix G: Radius of influence for idealized injectate

Volume of cylinder = $\pi r^2 h$

$2000L = \pi(r^2)(2m)$

$r \approx 0.56m$

Assuming the uniform porosity is 0.3

$$r_{effective} = \frac{0.56m}{porosity} = \frac{0.56m}{0.3} = 1.88m$$

Appendix H: Dilution correction for groundwater organics

$Na_2S_2O_8 \rightarrow 2Na^+ + S_20_8^{2-}$ (Equation 2)

$S_2O_8^{2-} + 2e^- \rightarrow 2S0_4^{2-}$ (Equation 3)

Based on the relationship shown in Equation 2, 200kg of $Na_2S_2O_8$ will dissociates to 38.6kg of Na^+. Hence a solution of 100g/L of $Na_2S_2O_8$ would produce a sodium solution with a concentration of 19.32 g/L.

Using the following relationship, the volume of injected water vs the total volume is calculated based on sodium as the conservative tracer.

$$\frac{V_{Injected}}{V_{Total}} + \frac{V_{Background}}{V_{Total}} = 100\%$$

$$C_{Measured} = \frac{V_{Background}}{V_{Total}} C_{Background} + \frac{V_{Injected}}{V_{Total}} C_{Injected}$$

Combine and re-arrange:

$$\frac{V_{Injected}}{V_{Total}} = \frac{C_{Measured} - C_{Background}}{C_{Injected} - C_{Background}}$$

For example: MW301-6

$$\frac{V_{Injected}}{V_{Total}} = \frac{C_{Measured} - C_{Background}}{C_{Injected} - C_{Background}}$$

$$\frac{V_{Injected}}{V_{Total}} = \frac{1498.45\, {}^{mg}/_{L} - 678.75\, {}^{mg}/_{L}}{19.32\, {}^{g}/_{L} - 678.75\, {}^{mg}/_{L}}$$

$$\frac{V_{Injected}}{V_{Total}} = 0.044 \text{ x } 100\% = 4.4\%$$

Therefor 4.4% of the measured BTEX is due to the injected water and hence 95.6% is due to the surrounding groundwater from the site.

Therefor:

$$C_{BTEX\ Dilution\ corrected} = C_{BTEX\ Background} \times 95.6\%$$

$$C_{BTEX\ Dilution\ corrected} = 4370\ {}^{\mu g}/_{L} \times 95.6\%$$

$$C_{BTEX\ Dilution\ corrected} = 4177\ {}^{\mu g}/_{L}$$

The recorded concentration of BTEX at 301-6 was $3677\ {}^{\mu g}/_{L}$.

Hence it is presumed that a decrease of $4177\ {}^{\mu g}/_{L} - 3677\ {}^{\mu g}/_{L} = 500\ {}^{\mu g}/_{L}$ is due to non-dilution (ie degradation).

Appendix I: Dilution correction for inorganic soil samples

Volume of soil: 8mL

Average porosity (Holtze): 0.32

DI water in each vial: 20mL

$$Porosity = \frac{V_{Water} + V_{Air}}{V_{Total}} = \frac{V_{Voids}}{V_{Total}}$$

$$0.32 = \frac{V_{Voids}}{8\ mL}$$

$$V_{Voids} = 2.56\ mL$$

Assuming that the soil samples were approximately 80% saturated:

$V_{Voids} = 2.56\ mL \times 80\% = 2.048\ mL$

For example: BH702-2

The sodium concentration measured was 20.8 mg/L.

$$Concentration_1 \times Volume_1 = Concentration_2 \times Volume_2$$

$$Concentration_1 = \frac{(20.8\ {}^{mg}/_{L})\times(20mL + 2.048mL)}{2.048mL}$$

$$Concentration_1 = 223.9\ {}^{mg}/_{L}$$

Therefore the undiluted sodium concentration in the pore water is 223.9 mg/L.

Appendix J: Theoretical treatability of residual BTEX based on xylene

Assuming that Xylene (C_8H_{10}) is representative of the TPH mass, the stoichiometry of the reaction for the degradation of xylene and persulphate is shown below (Equation 1).

$C_8H_{10} + 21Na_2S_2O_8 + 16H_2O \rightarrow 8CO_2 + 42Na^+ \ 42SO_4^{2-} + 42H^+$ (Equation 1)

Based on this relationship, 200kg of $Na_2S_2O_8$ will dissociates to 161.32kg of $S_2O_8^{2-}$.

Based on the 21:1 ratio between $S_2O_8^{2-}$ and C_8H_{10}:
161.32kg of $S_2O_8^{2-}$ = 840.23 mol of $S_2O_8^{2-}$ = 40.01 mol of C_8H_{10} = 4.24106 kg of C_8H_{10}

Therefor, 200kg of persulphate is theoretical able to treat approximately 4.2 kg of xylene.

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