ILLINOIS POLLUTION CONTROL BOARD

Blake Leasing Company, LLC – Real Estate Series, as owner of Kirkland Quick Stop,	)	
Petitioner,	)	PCB No. 16-100
	)	(Water Well Setback Exception)
v.	)	
Illinois Environmental Protection Agency and Village of Kirkland,	)	
Respondents.	)	

NOTICE OF FILING

To: See Attached Certificate of Service

PLEASE TAKE NOTICE that on January 6, 2017, Blake Leasing Company, LLC – Real Estate Series filed with the Illinois Pollution Control Board, **Amended Petition for Water Well Setback Exception Pursuant to 415 ILCS 5/14.2(c)**, a copy of which is attached and served upon you.

Dated: January 6, 2017

Respectfully submitted,

On behalf of Blake Leasing Company, LLC – Real Estate Series

/s/Charles F. Helsten
Charles F. Helsten
One of Its Attorneys

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CERTIFICATE OF SERVICE

I, Charles F. Helsten, an attorney, certify that I have served the attached **Amended Petition for Water Well Setback Exception Pursuant to 415 ILCS 5/14.2(c)** on the named parties below by certified mail, return receipt requested, by 5:00 p.m. on January 6, 2017, by depositing the attached in the U.S. Mail at Rockford, Illinois, with proper postage or delivery charge prepaid.

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Petitioner,	)	PCB No. 16-100
	)	(Water Well Setback Exception)
v.	)	
Illinois Environmental Protection Agency and Village of Kirkland,	)	
Respondents.	)	

AMENDED PETITION FOR WATER WELL SETBACK EXCEPTION PURSUANT TO 415 ILCS 5/14.2(C)

Petitioner, Blake Leasing Company, LLC – Real Estate Series as owner of Kirkland Quick Stop, by and through its attorneys, Hinshaw & Culbertson, LLP, states as follows for its Amended Petition For Water Well Setback Exception Pursuant to 415 ILCS 5/14.2(c):

1. Petitioner, Blake Leasing Company, LLC – Real Estate Series ("Petitioner"), is the owner of the Kirkland Quick Stop ("KQS") gas station property located at 411 W. Main Street, Kirkland, DeKalb County, Illinois 60146 ("Subject Property" and/or "Site").

2. Petitioner presents this Petition to further address the prior release of petroleum product (unleaded gasoline and diesel) from underground storage tanks formerly located at the Subject Property.

3. The remediation of the Subject Property is in response to Leaking Underground Storage Tank/Illinois Emergency Management Agency Incident Number 891717 requesting closure of a petroleum release from regulated underground storage tanks located at the Subject Property.

4. Through initial groundwater testing results of on-site and off-site monitoring wells at and near the Subject Property, it was initially determined that the groundwater contaminants were located within the regulated setback zone for the two (2) municipal water

supply wells located in the Village of Kirkland. Specifically, active remediation was initially requested because it was believed that the Subject Property was located within the setback zone of the Village of Kirkland emergency backup water supply well, referred to as Well #11424, (and/or Well #1), and the main Village supply well, referred to as Well #11425 (and/or Well #2). Well 1 is located 75 feet East of the Northern boundary of the Subject Property and Well 2 is located 422 feet North of the Northern boundary of the Subject Property.

5. The Petitioner initially retained the environmental consulting firm, GeoThink, LLC ("GeoThink") to prepare a Corrective Action Plan and budget through which several different remedial alternatives were explored. At the time, the options considered were air sparging, ground water extraction (pump and treat) via extraction wells, ground water extraction via interceptor trench, and in-situ enhanced bioremediation. Geothink ultimately chose in-situ enhanced bioremediation as the recommended option, as it has been successful at other representative Leaking Underground Storage Tank ("LUST") sites in remediating BTEX and PNAs, and the level of groundwater cleanup required would be localized to three distinct areas on-site, and one distinct area off-site along the Subject Property's northern property line and adjoining Railroad Street.

6. On November 24, 2015, the Illinois Environmental Protection Agency ("IEPA") conditionally approved GeoThink's Corrective Action Plan upon receipt of a waiver from the Illinois Pollution Control Board to allow injection of bioremediation agents into the subsurface within the protective setback zone of the community water supply wells in question. However, in a letter dated January 21, 2016, the IEPA denied the Petitioner's requested relief from the setback requirements per Section 14.2(b) of the Act because the relief sought was outside the scope of provisional variance relief that the Agency felt it could grant.

7. On April 29, 2016, the Petitioner filed its initial Petition for Water Well Setback Exception Pursuant to 415 ILCS 5/14.2(c) requesting the use of injection wells as outlined within

GeoThinks' Corrective Action Plan. Based upon further investigation, testing and review, the Petitioner seeks to amend its initial Petition as set forth herein.

8. Subsequent to the filing of the initial Petition, the Petitioner retained the environmental consulting firm of St. John-Mittelhauser & Associates. St. John-Mittelhauser sampled groundwater monitoring wells at the Site on August 2 & 3, 2016 as well as November 14 & 15, 2016. Due to turbidity issues encountered in monitoring wells MW-30S and MW-30D during the November 2016 sampling event, those two wells were resampled on December 23, 2016. The Technical Report prepared by St. John-Mittelhauser & Associates, with accompanying Tables and Figures and an overview of the Best Available Technology, is attached hereto as Exhibit A and incorporated herein by this reference.

9. Testing results performed in August 2016 demonstrated and confirmed that both the area of residual contamination and the UST system owned and operated by the Petitioner are outside of the minimum setback zone for Well #2, the primary Village Community well. In addition, those test results demonstrated that the bedrock layer in the area in and around the Village is covered by approximately 30 feet or more of low permeability, silty glacial till. In addition, and related to the same, static water level measurements taken in close proximity to the main Village supply (Well #2) reflect that water levels in the upper most water-bearing unit (the upper alluvial sand aquifer where small amounts of residual contamination are still found) are not impacted by municipal well pumping activities in the lower bedrock aquifer, which in turn demonstrates there is no direct hydraulic connection between the two aquifers in question. As such, the August 2016 testing and sampling indicates that the 30 plus feet of glacial till material that separates the bedrock aquifers from the upper most alluvial aquifer at the site is an effective aquitard which significantly impedes the downward vertical migration of groundwater, and protects the bedrock aquifers in the vicinity of the site from downward vertical contaminant migration of any contaminants present in the upper most alluvial aquifer.

10. The August 2016 sampling and testing also showed no detectable concentrations of either dissolved or total lead in groundwater, indicating that lead detections previously reported at the site were the result of elevated turbidity levels in groundwater samples due to sampling methods previously employed. Rather, the test results from the August 2016 sampling exercise showed benzene concentrations slightly in excess of Tier 1, Class 1 Groundwater Remediation Objectives (GROs) in three (3) monitoring wells (MW-1, MW-3A, and MW-8), and PNA concentrations slightly in excess of GROs in only two (2) monitoring wells (MW-6 and MW-15). Field parameters collected during the sampling event indicate the dissolved oxygen concentration ranged from 0.02 mg/l to 0.39 mg/l in the five (5) monitoring wells mentioned herein. This indicates that the constituents of concern are undergoing aerobic biodegradation. The lack of further benzene and PNA migration in groundwater at the site is attributable to the general availability of dissolved oxygen in the shallow glacial groundwater. No other contaminants were detected in excess of allowable limits at any of the monitoring wells sampled at the site.

11. Moreover, the August 2016 sampling exercise indicated that elevated concentrations of dissolved iron in groundwater showed a direct inverse relationship to dissolved oxygen concentrations in groundwater (that is, where dissolved oxygen concentrations were low, dissolved iron concentrations were high). As such, the occurrence of organic constituents (such as benzene and PNAs) above their respective GROs in groundwater is then directly related to areas of groundwater beneath the site where dissolved oxygen has simply been depleted. This in turn indicates that significant and effective natural attenuation of these compounds is in fact taking place at the site under proper aerobic biodegradation conditions where adequate quantities of dissolved oxygen are present.

12. In summary, the August 2016 sampling exercise indicated the current presence of low concentrations of benzene and PNAs at the site not significantly above GROs. This fact, in

conjunction with the apparent ability of the onsite groundwater system to employ dissolved oxygen to attenuate these constituents prior to them migrating offsite suggests a weak residual contamination source, which could be readily addressed by the introduction of additional dissolved oxygen where necessary.

13. Upon obtaining the November sampling results for Wells MW-30S and MW-30D, it was observed that the data was inconsistent with observations related to the conceptual site model where COCs only occur in groundwater at locations where the DO in groundwater is depleted. However, field staff had reported difficulty in getting stabilized turbidity readings at these wells, and it was concluded that the very low concentrations of PNAs observed to occur in the wells during this sampling event could be the result of turbidity in the samples, thus the resampling of these wells was ordered in December 2016.

14. Upon resampling wells MW-30S and MW-30D on December 23, 2016 the wells were determined to yield more stable turbidity readings, and the consequent DO concentrations were 3.44 mg/L and 1.54 mg/L, respectively. Of significant note, laboratory results for this resampling indicated that all PNA and BETX compounds were non-detect in both wells. Dissolved iron concentrations were also determined to be below the detection limit.

15. A review of the data obtained during the August and November/December sampling events then results in the following observations:

a. None of the wells sampled in August or November had detectable concentrations of dissolved or total lead, indicating that lead detections previously reported at the Site were the result of elevated turbidity levels in groundwater samples due to the sampling methods previously employed (purging volumes and sampling with bailers).

b. Five wells on site exhibited organic constituents in excess of the GROs. Three wells, MW-1 (August and November), MW-3A (August and November), and MW-15 (August only) exhibited benzene concentrations in excess of the GRO. Two wells, MW-6 and MW-14, exhibited PNA concentrations in excess of the GROs.

c. Elevated concentrations of dissolved iron in groundwater show a direct inverse relationship to dissolved oxygen concentrations in groundwater. That is, where dissolved oxygen concentrations are low (<0.5 mg/L) dissolved iron concentrations are elevated (>1.0 mg/L).

d. The occurrence of the organic constituents (benzene and PNAs) exceeding the GRO in groundwater at the Site are directly related to areas in groundwater at the Site where dissolved oxygen has been depleted. This indicates that significant, natural attenuation of these compounds is taking place at the Site under aerobic biodegradation conditions.

e. The groundwater sampling data from the line of monitoring wells along the northern border of the Site, i.e., wells MW-18, MW-19, MW30S, and MW-30D, indicate that no petroleum constituents are migrating across the KQS property line to the north of the Site in excess of the GROs.

f. The occurrence of low concentrations of benzene and PNAs at the Site are not significantly above the GROs. This fact, in conjunction with the apparent ability of the onsite groundwater system to supply sufficient dissolved oxygen to attenuate these constituents prior to them migrating off-site, suggests a weak residual contamination source associated with a capillary fringe smear zone.

16. St. John-Mittelhauser's investigation also confirmed that the lithology of the Subject Property consists of fill and silty clay to a depth of approximately 5-7 feet below ground surface. Underlying these materials is a relatively homogenous layer of coarse grained sand and gravel to a depth of approximately 30 feet below ground surface. Underlying the sand and gravel is a relatively impermeable glacial till extending to a depth of approximately 70 feet below ground surface. Groundwater is encountered with the sand and gravel unit at a depth of approximately 9 feet below ground surface.

17. Based on the analytical results and the lithology below the Subject Property, it is apparent that aerobic biodegradation of the contaminants of concern is being hindered by the depletion of dissolved oxygen within the area of impact. Therefore, the Petitioner, at the recommendation of St. John-Mittelhauser, now believes, and requests a setback exception for, the use of air sparging as the Best Available Technology to effectuate the remediation of the Subject Property. In short, the low concentrations of benzene and PNAs in the groundwater at

the Subject Property can be effectively remediated by air sparging small areas of the site groundwater where they occur.

18. Air sparging is a proven technology to remediate sites where groundwater is contaminated with aerobically biodegradable hydrocarbons. The technology is most effective in sites with relatively homogenous coarse grained materials with an aquifer thickness greater than 5 feet and where the water table is at least 5 feet or greater below the ground surface. These characteristics are present at the Subject Property.

19. Air sparging works by injecting compressed air into the groundwater system below the site. The compressed air enters the groundwater system through a diffuser that creates smaller air bubbles to maximize the surface area and contact with the groundwater, and allows greater migration of the air away from the sparge points without dissolving first into the groundwater. As the compressed air more completely mixes with the groundwater system, oxygen dissolves into the groundwater (to its aqueous solubility of approximately 11 mg/L) thereby increasing the dissolved oxygen content of the groundwater. The dissolved oxygen is then transported via groundwater flow downgradient from the injection point. The dissolved oxygen in the groundwater is then available to facilitate natural aerobic biodegradation of the site contaminants in groundwater.

20. Per an August 31, 2001 Final Air Sparging Guidance Document prepared by Battelle for the Naval Facilities Engineering Command, cited and relied upon by St. John-Mittelhauser in its attached report, air sparging at an injection rate of one (1) standard cubic feet per minute, could result in as much as 10 kg/day of oxygen being introduced into the system. Given the low flow rate, long contact time, and the low concentrations of VOCs present at the site (the highest benzene result in groundwater at the site is 0.076 mg/L – MW-3A), only a very small amount of vapor will be produced in the subsurface. Due to this fact, low-flow air-

sparging systems are commonly installed without solvent vapor capture systems because they are not necessary.

21. The advantages of air sparging include:

a. Rapidly increases the dissolved oxygen content within the groundwater below the Site thereby promoting the biodegradation of the hydrocarbons with indigenous bacteria;

b. Specifically well-suited to the petroleum-based contaminants and the coarse-grained layer that exists beneath the surficial silt/clay layer at the Site;

c. Proven technology to remediate the residual concentrations of benzene and PNAs in the groundwater to meet their respective Class I GROs;

d. Does not require the injection of surfactants, bacteria, oxygen releasing compounds, or other non-naturally occurring constituents within the setback of the municipal wells;

e. The low COC concentrations at the Site will only require low-flow rate air sparging at the Site and will not require the use of a soil vapor extraction system;

f. Simplicity in system design and operation;

g. Is not impacted by freezing temperatures; and

h. Minimal cost as compared to other technologies.

22. Petitioner has considered other available technologies, however, and in addition to the other statements set forth herein, the use of air sparging at the Subject Property is the best available technology for the following reasons:

a. Pump and Treat

Although this technology could provide a means of reducing the benezene levels at the Site, it would not effect a significant reduction in the PNA levels at the Site because these chemicals exist mostly as bound to small organic matter and soils beneath the site and are not readily water soluble. A reduction in PNAs would likely only occur within a small radius of influence around each extraction well, and the remediation would not be uniform across the site.

b. In Situ Chemical Oxidation (ISCO)

While ISCO would likely serve to destroy much of the COCs present at the Site, it generally is not uniformly effective, and generally requires excavation and mixing of the soils at the Site with the chemical oxidants. Furthermore, the introduction of additional chemicals near the set-back zone of the municipal well is of concern. Accordingly, the injection of ISCO is not a feasible solution at the Site.

c. Enhanced In Situ Aerobic Bioremediation (EISAB)

Air sparging is a form of enhanced EISAB, which requires no further introduction of chemicals (other than air) near the municipal well set-back zone.

d. Nutrient Addition for Enhanced In Situ Aerobic Bioremediation

This method typically involves the injection of microbes, carbon sources (oils/fats/surfactants), and vitamins into the subsurface. This method was previously proposed and rejected by the Illinois Pollution Control Board. This method would also involve the injection of chemicals near and within the CWS set-back zones.

e. In-Well Air Stripping/Groundwater Circulating Wells

While this method would effectively eliminate the benzene contamination migrating off the Site, the source area of petroleum hydrocarbon at the Site would remain unremediated and result in the operation of this system for a prolonged period of time. Further, the PNAs present at the Site do not have appreciable vapor pressures, and therefore they will not volatilize with air-stripping, and would not be effectively remediated by this technology.

f. Monitored Natural Attenuation

This is effectively going on currently at the Site. St. John-Mittelhauser has presented figures showing the DO concentrations and COC concentrations at the Site. These figures show that the indigenous microbes have depleted the DO at the source area while aerobically degrading the petroleum COCs. Consequently, the existing DO levels are currently too low to effectively degrade the remaining contaminants to below the Class I GROs within the impacted area of the Site. St. John-Mittelhauser opines that increasing the DO concentrations with air sparging will allow further biodegradation of the hydrocarbon mass within the source area to a point where the Class I GROs can be met within groundwater on site in the existing groundwater monitoring network.

g. Phytoremediation

This treatment technology uses vegetation to breakdown COCs, but is not a feasible solution at the Site because it cannot be implemented at the portion of the Site where the great majority of the remaining petroleum hydrocarbon resides.

h. Reactive Barriers

This treatment would require that a large-scale excavation take place at the Site, and downgradient of the source zone (i.e., in the alley near the Canadian Pacific Railroad building) and would not reduce concentrations within the source area that currently exceed the Class I GROs. Additionally, the introduction of chemical oxidants would be necessary at the location of the barrier.

i. Surfactant Enhanced Aquifer Remediation (SEAR)

This method is similar to pump and treat, but requires the injection of a chemical surfactant to enhance COC recovery. This is not feasible near the municipal well set-back zone and it is highly probable that a significant amount of the remaining hydrocarbon mass in the source area is smeared across the capillary fringe due to seasonal fluctuation of the water table. The AS technology will remediate the capillary fringe. It is questionable if surfactant circulation and removal will be effective in the capillary fringe.

j. In Situ Thermal Treatment

This method essentially heats the groundwater to the point that VOCs change phase to gaseous vapor and then are removed via vapor extraction within the source area. While this method would be effective for benzene removal, the low volatilities and high boiling points of the PNAs would result in the technology being ineffective for these compounds.

k. Two-Phase (Dual Phase) Extraction

This method removes both the vapors from the soil and the liquid COCs from the groundwater via an extraction well. This technology is typically used at sites with recoverable, separate-phase petroleum hydrocarbon and likely will not be effective in meeting the Class I GROs at the Site. Additionally, it will not effect the reduction of PNAs for the reasons discussed above.

23. St. John-Mittelhauser's air sparging recommendation includes the installation of 12-15 air injection stringers via 1-inch diameter monitoring wells located within the area(s) of concern on Site. The cost estimate for the installation and operation of the air sparging system for a 2 year period ranges from a low of $80,000.00 to a high of $145,000.00.

24. The allowed setback requirements of Section 14.2 of the Act pose an arbitrary and unreasonable hardship upon the Petitioner, as generally, the use of air sparging injection wells located within a protected minimum setback zone established for potable water supply wells per Section 14.2 of the Act is prohibited. Additionally, because of the inability to use other remediation methods for the reasons set forth herein, the lack of the requested setback for the use of air sparging would prevent the Petitioner from having the ability to remediate the Subject Property of the low levels of contamination present. Further, only by remediating the Subject Property can the Petitioner receive an acceptable form of complete closure. Moreover, the

inability to effectuate the remediation outweighs any potential injury to the public or the environment should the setback be granted – (although the Petitioner has demonstrated herein that there will be no injury to the public or the environment as its proposed remediation involves only the use of oxygen). Additionally, the denial of the setback would deplete the value of the investment the Petitioner has made in the Subject Property, and decrease the value of the property to the Village as a whole. In short, remediating the Subject Property is not only in the best interest of the Petitioner, and the environment as a whole, but also in the best interest of the Village which enjoys the use of the Subject Property. The current setback imposes an unreasonable hardship upon the Petitioner to accomplish that which is in the best interest of all, i.e., remediation. However, a waiver pursuant to Section 14.2(b) of the Act, or an exception pursuant to 14.2(c) of the Act, may be obtained, thereby allowing the use of injection wells in a setback zone. The Petitioner seeks that Section 14.2(c) exception by way of this Petition.

25. In performing the remediation as outlined herein, the Petitioner will utilize the maximum feasible alternative setback as required by this Board to encompass and address the entire KQS site. Through the use of the Petitioner's BAT, the injection wells will not cause greater potential harm, nor will they constitute or pose a hazard or adversely impact Well 1 and Well 2. This is further clear in that the current USTs only reside within the minimum setback of Well 1, not Well 2.

26. The location and use of the injection wells as outlined herein will not constitute a significant hazard to the potable water supply wells. First, St. John-Mittelhauser's hydrogeologic testing at the site demonstrates that the shallow glacial drift aquifer is hydraulically isolated from the bedrock aquifer by the glacial till material that serves as an effective aquitard which significantly impedes the downward vertical migration of groundwater, and protects the bedrock aquifers in the vicinity of the site from downward vertical contaminant migration of any contaminants present in the upper most alluvial aquifer. Second, where the Petitioner's

previously proposed bio-remediation involved the injection of foreign elements into the groundwater system in close proximity to the community water supply wells, the Petitioner's new BAT proposes only injecting oxygen into the aquifer through the use of naturally occurring air, nothing else. St. John-Mittelhauser's investigation and testing demonstrate that there is a direct, inverse relationship, between the dissolved oxygen content in groundwater and the occurrence of petroleum hydrocarbon constitutes of concern - meaning, that where dissolved oxygen naturally occurs in groundwater there are no petroleum constituents of concern. The reason for this inverse relationship is that indigenous microorganisms use the naturally occurring dissolved oxygen to metabolize the petroleum constituents of concern and in that way naturally biodegrade them. However, when there are more petroleum constituents of concern than naturally occurring dissolved oxygen in the groundwater, the dissolved oxygen in groundwater becomes depleted, and the petroleum constituents of concern persist. The use of injecting additional oxygen into the aquifer is sufficient to naturally degrade the very low concentrations of petroleum constituents of concern occurring in the groundwater at the Subject Property.

27. On September 17, 2015, the Petitioner submitted its waiver request per Section 14.2(b) of the Act to the owner of the municipal water supply, the Village of Kirkland, to obtain the Village's permission to use injection wells to remediate the residual petroleum hydrocarbons to below Class I GROs. The Village executed that waiver release form on or about February 2, 2016.

28. For all of the reasons set forth herein, the Petitioner respectfully requests a setback zone exception pursuant to Section 14.2(c) of the Act to perform the remedial work, as outlined herein, still needed on the Subject Property.

WHEREFORE, Petitioner, Blake Leasing Company, LLC – Real Estate Series as owner of Kirkland Quick Stop, respectfully requests that this Honorable Board accept this Petition and grant the setback zone exception requested pursuant to 415 ILCS 14.2(c) as set forth herein, as well as such other and further relief as this Board deems just and proper.

Dated: January 6, 2017

Respectfully submitted,

On behalf of Blake Leasing Company, LLC – Real Estate Series

/s/ Charles F. Helsten
Charles F. Helsten
One of Its Attorneys

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CERTIFICATE OF SERVICE

I, Charles F. Helsten, an attorney, certify that I have served the attached **Amended Petition For Water Well Setback Exception Pursuant to 415 ILCS 5/14.2(c)** on the named parties below by certified mail, return receipt requested, by 5:00 p.m. on January 6, 2017, by depositing the attached in the U.S. Mail at Rockford, Illinois, with proper postage or delivery charge prepaid.

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
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Village of Kirkland
Attn: Mayor Les Bellah
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Hearing Officer
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/s/Charles F. Helsten

SM&A
ST. JOHN - MITTELHAUSER & ASSOCIATES

TECHNICAL REPORT

Support for the Petition Requesting an Exception to Operate Three Underground Storage Tanks and Perform Remedial Measures Within the Water Well Setback Zone for Two Community Wells Owned by the Village of Kirkland

Kirkland Quick Stop
411 Main Street
Kirkland, Illinois 60146

January 5, 2016

Prepared By:

St. John – Mittelhauser & Associates, Inc.
1401 Branding Avenue, Suite 315
Downers Grove, IL 60515

1.0 INTRODUCTION

Blake Leasing, LLC – Real Estate Series (Blake) is requesting an exception to the minimum setback zone for two community wells that the Village of Kirkland (Kirkland) operates. One of these wells is an emergency backup well located on and owned by the Canadian Pacific Railroad immediately north of the Kirkland Quick Stop (KQS) site and is leased by Kirkland for emergency backup purposes. This well is generally known as Well #1 or Well 11424 (five-digit IEPA identifier). A second Kirkland Community well, Well #2 or Well 11425, is located approximately 400 feet north of the KQS site and is one of two wells that primarily and routinely supplies potable water to the citizenry of Kirkland. A third well is located outside of town over a mile to the west and will be referred to as Well #3 in this document.

Currently, Blake is out of compliance with respect to the minimum setback zone of the two community wells because a) it has Underground Storage Tanks (USTs) containing petroleum products installed within the setback zone of Well #1, the backup well; and b) prior releases in the vicinity of the current USTs have resulted in constituent concentrations in shallow groundwater at locations on the KQS site exceeding the Tier 1, Class I Groundwater Remediation Objectives (GROs). To address these compliance issues, Blake submitted a Petition for Water Well Setback Exception on March 21, 2016. On June 15, 2016, IEPA responded to this Petition (Response) and likewise, on August 11, 2016 the IPCB issued its Opinion and Order (PCB-16-100) (Opinion). Collectively, the Response and the Order requested that at a minimum, Blake make the following demonstrations to support its Petition and address four elements contained at Section 35 Ill. Adm. Code 106.310[1]:

1. <u>The Petition Does Not Describe Why Blake Faces an Arbitrary and Unreasonable Hardship.</u>

2. <u>Blake Does Not Describe Why Enhanced Bioremediation is the Best Available Control Technology for the Kirkland Site</u> - The petition must contain a general description of the potential impacts of the potential route on groundwater and the potable well, and an explanation of the applicable technology that will be used to minimize risk. The IEPA indicated that petroleum constituents exceeding the GROs within the minimum setback zone of the well(s) should be removed or reduced to within regulatory limits and that the petitioner

[1] Elements 1-4 herein are each specifically and further addressed in the Petitioner's Amended Petition for Water Well Setback Exception Pursuant to 415 ILCS 5/14.2(c).

provide the IPCB a cost and technical feasibility evaluation of the selected remedial measure. Additionally, it will be demonstrated later in this memo that petroleum constituents exceeding the GROs only occur within the minimum setback zone of Well #1 and not Well #2.

3. Blake is Unclear About the Maximum Feasible Alternative Setback - The petitioner must address the IPCB order for a setback exception for the installation of currently operating USTs within the minimum setback of Well #1 (11424), and depending on the location of the USTs, the minimum setback zone of Well #2 (11425). However, it will be demonstrated later in this memo that the USTs only reside within the minimum setback zone of Well #1 and not Well #2.

4. Blake Does Not Adequately Describe Why No Significant Hazard to the Water Supply Will Result - The petitioner must demonstrate to the IPCB that the potential route is not a significant hazard to the potable wells.

Additionally, the IEPA encouraged the petitioner to resolve apparent discrepancies by providing current groundwater monitoring data.

This report has been developed to address the IPCB and IEPA concerns expressed above, and to provide the additional details supportive of these demonstrations. Some supporting site specific and background data development is presented first in order to provide sufficient understanding of site conditions.

2.0 HYDROGEOLOGY

2.1 Regional Hydrogeology

The KQS site is located along State Route 72 in Kirkland, Illinois in northwest DeKalb County (Figure 1). Detailed analysis of the groundwater geology of the Kirkland area is available from several Illinois State Geological Survey (ISGS) publications (R.C. Vaiden, et. al., 2004; David, G.L., 1970; Horberg, L., 1950; IEPA Bureau of Water, 2006) which indicate that the thickness of glacial sediments overlying bedrock in the vicinity of Kirkland is highly variable and ranges from 300 feet west of town in the Troy Bedrock Valley to less than 20 feet north of the Kishwaukee River immediately north of the site. Several detailed well logs are available for wells penetrating the glacial and bedrock units in the vicinity of Kirkland, including the Kirkland community wells. Several boring logs for these wells are provided as Attachment A. These well logs have been used to form the basis for developing two semi-regional geological cross-sections in the vicinity

of Kirkland. A third geological cross-section that depicts the geology in close proximity to the KQS site and includes the Community Wells #1 and #2 has also been developed. The locations of these three cross-sections can be reviewed on Figure 1. These cross-sections are identified as follows:

Cross-section A-A' (Figure 2) - This is an east to west cross-section from approximately ½ mile east of Kirkland to approximately one-mile west of Kirkland and passing through Community Well #2 (11425). This cross-section illustrates the relatively consistent elevation of the bedrock surface and the general nature of the glacial sediments above bedrock in the areas south of the Kishwaukee River. The exception to the relatively uniform nature of the bedrock surface occurs on the far west side of the cross-section where the buried Troy Bedrock Valley occurs. Community Well #3 (01613) is located there and the log from that well provides the geologic data for cross-section A-A' in that area.

Cross-section B-B' (Figure 3) - This is a north to south geological cross-section from approximately 1/3-mile north of the Kishwaukee River to one-mile south of Kirkland and again, passes through Community Well #2 (11425). This cross-section illustrates the thinning of the glacial sediments northward across the area and illustrates the occurrence of the Kishwaukee River alluvium that occurs from the river through areas south of the KQS site. The sand occurrence associated with the Kishwaukee River alluvium will be discussed in greater detail in the next section discussing the site hydrogeology.

Cross-section C-C' (Figure 4) - This is a north-to-south cross-section from the Community Well #2 (11425) south through the Kirkland backup Well #1 (11424) to the northern portion of the KQS site and was developed to provide a more detailed illustration of the geological unit occurrences in the vicinity of the KQS site. Recent work performed by St. John – Mittelhauser & Associates, Inc. (SMA) allows accurate representation of the surficial sediments and the depth and occurrence of the glacial till unit across the site to the area of Community Well #2 (11425). During the week of August 8, 2016, SMA personnel completed soil boring SB-38 adjacent to existing monitoring well MW-20 immediately south of the water tower and installed monitoring well MW-31 immediately outside of the well house for Community Well #2. During the installation of this boring and this well, soils were continuously sampled and logged by a

geologist to determine the nature and thickness of the sand and the occurrence of the upper surface of the glacial till in the vicinity of the site. The boring logs for SB-38 and MW-31 are provided in Attachment B.

The general sequence of geologic units that occur below the upper surface of the glacial till unit in the vicinity of the site are illustrated based on the detailed geologic log developed by Illinois State Geological Survey personnel for Kirkland Community Well #2 (11425) and is provided in Attachment A. This log indicates that the glacial till in the vicinity of the KQS site is approximately 30 feet in thickness and that Community Well #2 (11425) was constructed by first installing a 12-½ inch, steel surface casing from surface grade to 69 feet in depth, through all the glacial sediments and approximately nine feet into the upper surface of the Galena Dolomite. The well was then further advanced to 152 feet in depth into the Decorah Dolomite where an 8-inch, steel surface casing was installed inside the 12-½ inch surface casing. Below the 8-inch surface casing, the well is drilled and completed as an open hole to a total depth of 630 feet into the St. Peter Sandstone. The water produced from this well is collected from the lower Decorah Dolomite, the Platteville Dolomite and the St. Peter Sandstone (the Glenwood Shale is primarily an aquitard and is of low and/or inconsequential yield) between 152 and 630 feet in depth.

The nature of the installation of the Community backup Well #1 (11424) is also provided on cross-section C-C'. However, Well #1 (11424) was drilled in 1896 and does not have a detailed geologic log available. All that is known about this well is that it has a 7-inch, steel casing installed to a depth of 88 feet into the bedrock and is an open borehole below to a total depth of 737 feet. From this information it is illustrated on cross-section C-C' based on the detailed geologic data from the log of Community Well #2 (11425) that the water produced from this well is collected from the lower Galena Dolomite, the Decorah Dolomite, the Platteville Dolomite and the St. Peter Sandstone (the Glenwood Shale is primarily an aquitard and is of low and/or inconsequential yield) between 88 and 737 feet in depth.

2.2 Site Hydrogeology

Geological cross-section C-C' illustrates the occurrence and thickness of the glacial and bedrock units in close proximity to the KQS site. As mentioned in the previous section, additional site specific testing was performed by SMA (soil boring SB-38 and monitoring well MW-31) to verify

the continuity and depth of occurrence of the glacial till that occurs below the Kishwaukee alluvial surficial sand unit in the vicinity of the KQS site. Additionally, SMA personnel surveyed the surface grade and top of casing of all the monitoring wells installed for Blake from a United States Geological Survey bench mark that was located immediately north of the site between Community Wells #1 (11424) and #2 (11425). This new survey data allows determinations across the site to be reported in vertical elevation compared to mean sea level (MSL) North American Vertical Datum 88.

Upon completing the new survey of the monitoring wells described above, SMA personnel measured the static water level occurrence in each monitoring well at the KQS site prior to sampling the well and computed the elevation of those static water levels compared to MSL. The static water level elevations determined for the site on August 9, 2016 and November 14, 2016 are provided as Table 1. The cross-sections, boring logs and water level measurements for the KQS site indicate that groundwater saturates the coarse-grained sand and gravel lithologies that occur to a depth of approximately 30 feet in the vicinity of the site above the glacial till unit to form a water table aquifer. This shallow groundwater occurrence within the Kishwaukee alluvial, coarse-grained, surficial sediments can be reviewed in cross-section on Figure 4.

The static water level measurements in Table 1 were plotted in plan-view to create potentiometric surface maps for the water table aquifer in the vicinity of the site. The potentiometric surface map for August 9, 2016 is provided as Figure 5 and the potentiometric surface map for November 14, 2016 is provided as Figure 6. Figure 5 indicates that groundwater flow on August 9, 2016 was to the north-northwest and Figure 6 indicates that groundwater flow on November 14, 2016 was more to the northwest. These directions of groundwater flow are generally consistent with previous determinations of groundwater flow made for the site. The hydraulic gradient determined from both Figures 5 and 6 are 0.012 with a steepening of the gradient immediately north of the site in the vicinity of MW-20. A review of cross-section C-C' on Figure 4 indicates that occurrence of some fine-grained lithologies in the vicinity of MW-20 that are likely to cause the observed hydraulic gradient increase in this area and preserve the conservation of mass flow rate through the water table aquifer. A review of the surficial topography from the site to the Kishwaukee River indicates the topographic gradient from the site to the pool elevation within the river is 0.012, the same as the hydraulic gradient determined for

the site. Collectively, this data indicates that groundwater within the coarse-grained alluvial sediments associated with the Kishwaukee River form a water table aquifer saturating these sediments to a depth of approximately 30 feet where an underlying glacial till unit occurs, and the groundwater within this water table aquifer flows to the north-northwest to discharge to the Kishwaukee River under baseflow conditions.

The nature of the silty clay, glacial till that occurs below the alluvial water table aquifer in the vicinity of the site was examined at two locations immediately north of the site at soil boring SB-38 and monitoring well MW-31 (see Figure 1 and 4 for the locations in plan-view and cross-section). At both of these locations, the soil samples collected from the upper portion of the glacial till examined from these borings were determined to consist of a dense, dry, silty clay that should act to impede the vertical migration of groundwater from the shallow, alluvial, water table aquifer to the groundwater occurring within the bedrock units below. The ability of this silty clay till to act as an aquitard to prohibit vertical migration of groundwater was the subject of additional field testing by SMA is discussed later in this report.

3.0 SITE GROUNDWATER SAMPLING

SMA personnel sampled the groundwater monitoring wells at the KQS site on two occasions, August 2nd and 3rd, and November 14th and 15th, 2016. Due to turbidity issues in monitoring wells MW-30S and MW-30D during the November sampling event, those two wells were re-sampled on December 23, 2016. Previous sampling at the site had been performed by purging three to five well volumes from each well with a bailer. A review of the historical groundwater sampling data for the site indicated this likely resulted in elevated turbidity in the groundwater samples, false positives for some constituents and/or the reporting of more elevated concentrations for some constituents. As a result, SMA employed low-flow groundwater sampling techniques during the groundwater sampling at the site in early August. The low-flow sampling was facilitated through use of bladder pumps to achieve a minimal sustained drawdown with a maximum flow not to exceed 500 milliliters per minute. Well head flow through cells with general chemistry sensors for pH, temperature, specific conductance, dissolved oxygen, turbidity and oxidation/reduction potential were used to determine when parameter stabilization occurred.

The samples obtained from the monitoring wells were submitted for laboratory analysis of benzene, ethylbenzene, toluene and xylene; polynuclear aromatic compounds (PNAs); total lead and iron; and dissolved lead and iron.

The results of the SMA groundwater sampling in August and November (including the re-sampling of MW-30S and MW-30D in December) can be reviewed in Table 2. The August data is summarized on Figure 7. The November groundwater sampling data is summarized on Figure 8 and includes re-sampling data for monitoring wells MW-30S and MW-30D from December 23, 2016.

Upon obtaining the November groundwater sampling results for wells MW-30S and MW-30D, it was observed that the data was not consistent with observations related to the conceptual site model where COCs only occur in groundwater at locations where the DO in groundwater is depleted (described more fully below). The DO concentrations for wells MW-30S and MW-30D were determined to be 0.78 and 2.44 mg/L, respectively, during the November groundwater sampling event. Additionally during the November groundwater sampling event, SMA field staff reported difficulty in getting stabilized turbidity readings at these wells. As a result, it was concluded that the very low concentrations of PNAs observed to occur in the wells during the November sampling event could be the result of turbidity in the samples and wells MW-30S and MW-30D were resampled in December.

Upon re-sampling wells MW-30S and MW-30D on December 23, 2016 the wells were determined to yield more stable turbidity readings and the DO concentrations were determined to be 3.44 mg/L and 1.54 mg/L, respectively. The laboratory results for this resampling of the wells indicated that all PNA and BETX compounds were non-detect in both wells. Dissolved iron concentrations were also determined to be below the detection limit. The laboratory analyses for these samples can be reviewed in Table 2.

The December re-sampling data for monitoring wells MW-30S and MW-30D indicates that turbidity is likely to have caused the low level detections of PNA compounds slightly above the Class I GROs during the November sampling event and it is likely that these PNA constituents were sorbed to solids entering the well during sampling. Had these PNAs migrated to wells

MW-30S and MW-30D as soluble constituents, it would have been likely for benzene to migrate and occur in these wells like other wells at the site. This did not occur. As a result, field staff will be very careful to be watchful of turbidity during future sampling events at these wells.

The groundwater results from August and November/December sampling events can be compared to previous groundwater sampling events through a review of all of the groundwater sampling data developed for the site to date, provided in Table 3. The dissolved oxygen and total/dissolved iron concentrations determined in the wells during the August sampling event can be reviewed on Figures 9 and 10, respectively. The dissolved oxygen and total/dissolved iron concentrations determined in wells during the November sampling event can be reviewed on Figures 11 and 12, respectively. A review of the data contained in Table 2 and Figures 8, 9, 10, 11 and 12 results in the following observations related to constituent occurrence in groundwater at the KQS site:

- None of the wells sampled in August or November had detectable concentrations of dissolved or total lead, indicating that lead detections previously reported at the site were the result of elevated turbidity levels in groundwater samples due to the sampling methods previously employed (purging volumes and sampling with bailers).

- Five wells on site exhibited organic constituents in excess of the GROs. Monitoring wells MW-1 (August and November), MW-3A (August and November) and MW-15 (August only) exhibited benzene concentrations in excess of the GRO. Monitoring wells MW-1 (November only), MW-6 (August and November) and MW-14 (August and November) exhibited PNA concentrations in excess of the GROs.

- A review and comparison of Figures 9 to 10 and Figures 11 to 12 indicate, as would be expected, that elevated concentrations of dissolved iron in groundwater show a direct inverse relationship to dissolved oxygen concentrations in groundwater. That is, where dissolved oxygen concentrations are low (<0.5 mg/L) dissolved iron concentrations are elevated (>1.0 mg/L). From reviewing Table 2, the discrepancy between the dissolved and total iron concentration in some wells can be resolved through reviewing the dissolved oxygen data to determine that several of the total iron concentrations reported were significantly influenced by the turbidity in wells that exceeded 50 NTU.

- From a review and comparison of the groundwater sampling results for August and November (Figures 7 and 8) to the DO concentrations determined for those sampling events (Figures 9 and 11), indicates the occurrence of the organic constituents (benzene and PNAs) exceeding the GRO in groundwater at the site are directly related to areas in groundwater at the site where dissolved oxygen has been depleted (<0.5 mg/L). This observation indicates that significant, natural attenuation of these compounds is taking place at the site under aerobic biodegradation conditions.

- The groundwater sampling data from line of monitoring wells along the northern border of the site, wells MW-18, MW-19, MW-30S and MW-30D indicate that no petroleum constituents are migrating across the KQS property line to the north of the site in excess of the GROs.

- The occurrence of low concentrations of benzene and PNAs at the site are not significantly above the GROs. This fact, in conjunction with the apparent ability of the onsite groundwater system to supply sufficient dissolved oxygen to attenuate these constituents prior to them migrating off-site, suggests a weak residual contamination source associated with a capillary fringe smear zone.

4.0 UST LOCATIONS WITH RESPECT TO COMMUNITY WELL MINIMUM SETBACKS

Figure 13 illustrates the location of the USTs on the KQS site with respect to the 400-foot, minimum setbacks for Community Wells #1 (11424) and #2 (11425). It can be observed from a review of Figure 13 that the Blake USTs are within the minimum setback of backup Well #1 (11424) and are outside the minimum setback of Well #2 (11425). It can also be observed through a review and comparison of Figures 7 and 8 to Figure 13 that no petroleum constituents from the KQS site occur within the minimum setback of Well #2 (11425).

5.0 SITE SPECIFIC HYDROGEOLOGIC TESTING TO EVALUATE ROUTES OF EXPOSURE TO THE KIRKLAND COMMUNITY WELLS

During the week of August 8, 2016, SMA did further testing at the site to evaluate the hydraulic connection between the shallow groundwater occurrence in the Kishwaukee River alluvium (shallow aquifer) and the deeper bedrock aquifers where Community Wells #1 (11424) and #2 (11425) are completed. To do this, SMA contacted Village of Kirkland officials to obtain permission to perform additional drilling and testing on the Village property located immediately north of the KQS site. As described in Section 2 of this report, one soil boring (SB-38) was completed at approximately the mid-point between the north property boundary of the KQS site and Community Well #2 (11425) at the location of monitoring well MW-20, and a monitoring well (MW-31) was installed directly adjacent to, and north of, Community Well #2 (11425). Monitoring well MW-31 and existing monitoring well MW-30D [located directly adjacent to Community Wells #2 (11425) and #1 (11424), respectively] were then used to collect static water level measurements in the alluvial aquifer while the Community wells were pumping to determine if a hydraulic connection between the alluvial aquifer and the lower bedrock aquifers exists.

The first test was performed during the week of August 8, 2016 on Community Well #2 (11425) with monitoring well MW-31 as the shallow groundwater water level observation well. Monitoring well MW-31 is located approximately 13 feet from Community Well #2 (11425). Per the discussion with Village officials, Community Well #3 (located over a mile west of town) was utilized for the Village water needs during the prior week to allow the water level in Well #2 (11425) to rebound from prior pumping and reach static equilibrium. A 15 psi pressure transducer was installed in monitoring well MW-31 on the morning of August 9th to begin taking water level measurements in the well prior to performing the pump test and determine any antecedent trends in the water level data at the well. Community Well #2 (11425) was brought back on line on the morning of August 11th. Pumping at Community Well #2 (11425) was performed intermittently during the test period because it only operates on demand, based on the water level in the water tower. Prior to Well #2 (11425) being brought back on line on the morning of August 11th, the static water level was measured in the well by airline method. Subsequent water level measurements by airline method while Well #2 was operating, indicate that drawdown in the well was over nine feet in Well #2 (11425) during pumping. A plot of the water level data recorded in monitoring well MW-31 during the intermittent pumping of Well #2 (11425) is provided as Figure 14. Also supplied on Figure 14 is the relevant pumping data from Well #2 (11425) during the test period. A review of Figure 14 provides the following observations related to the pump test at Community Well #2 (11425):

- A review of the antecedent trend period data in MW-31 prior to pumping at Community Well #2 (11425) shows a diurnal fluctuation in the water levels of approximately 0.05 feet, which is likely to be caused by evapotranspiration. These diurnal effects were observed to continue throughout the performance of the pump test.

- During the pump test, Community Well #2 (11425) attained a flow rate between 275 gallons per minute (gpm) and 336 gpm when in operation over the four day period of the test.

- The water level measurements from MW-31 during the pumping intervals of Community Well #2 (11425) indicate no observable change related to the pumping. This data indicates that the 30 feet of glacial till that separates the bedrock aquifers from the alluvial aquifer at the site is an effective aquitard, which significantly impedes the vertical migration of groundwater between the units and protects the bedrock aquifers in the vicinity of the site from routes of contaminant migration occurring within the alluvial aquifer.

After the pump test in Community Well #2 was completed a similar short-term test of the backup Well #1 (11424) was attempted. This test was planned as a short term test because the water

generated from the backup well is not routed to the water tower unless there is a need for it and as a result, the water had to be discharged to the local storm sewer system. Similar to the previous pump test, the pressure transducer was set in monitoring well MW-30D (located approximately 19 feet from backup Well #1 (11424) on August 15th to measure the water levels there for approximately one day prior to the pump test on August 16th. Figure 15 provides the water level data from monitoring MW-30D for the antecedent trend period and for the 17 minute test period during which the backup Well #1 (11424) was pumped at a rate of 370 gpm. A review of Figure 15 provides the following observations related to the pump test at Community Well #1 (11424):

- Unlike the pump test at Well #2 (11425), the antecedent trend period did not indicate the occurrence of any diurnal effects. This could be because the antecedent trend period was only approximately 22 hours, or it could be because monitoring well MW-30D is well away from any vegetation and trees on the north side of the KQS site, near the railroad tracks, and not subject to local evapotranspiration effects.

- The antecedent trend period exhibits at least three water level responses in monitoring well MW-30D that resulted in the water level going up between 0.03 and 0.12 feet and then rapidly declining to a level below the static level before returning to equilibrium. It is unclear what caused these observed responses. Train traffic on the adjacent railroad tracks does not appear to have been the cause, but the movement of heavy trucks in close proximity to MW-30D could have been.

- Upon initiation of pumping in backup Well #1 (11424), the water level in monitoring well MW-30D increased 0.05 feet and then declined through the 17 minute duration of the pumping to approximately a 0.05 foot decrease by the end of the pumping period. This water level response in MW-30D does not appear to have been a hydraulic response to pumping (it would be very difficult to explain the 0.05 feet water level increase at the beginning of the test otherwise) and appears to have been some form of mechanical response to the test (e.g., vibrational occurrence due to the well pumping and resulting sinusoidal water level response).

6.0 SELECTED REMEDIAL MEASURE COST AND TECHNICAL FEASIBILITY

The low concentrations of benzene and PNAs in groundwater at the site can be effectively remediated by air sparging small areas of the site groundwater where they occur. Air sparging simply involves gently injecting small amounts of naturally occurring compressed air into the groundwater system on an intermittent basis to increase the DO concentrations and enhance

natural biodegradation of the organic contaminants. A more complete description of the costs and technical feasibility of performing air sparging at the site is provided in Attachment C to this report.

7.0 CONCLUSIONS

Recent investigations, data collection and analysis for the KQS site has resulted in the following itemization of conclusions related to the site.

1. The KQS site is underlain by a shallow, alluvial sand and gravel deposit associated with the South Branch of the Kishwaukee River. Groundwater occurs at a depth of approximately eight feet (seasonally) to form an unconfined, water table condition and groundwater saturates the alluvial sand and gravel to a depth of approximately 30 feet.

2. A silty clay glacial till occurs from approximately 30 feet to 60 feet in depth in the vicinity of the KQS site. Upon visual inspection, this glacial till deposit exhibits characteristics and is consistent with a low permeability aquitard unit that could be expected to significantly impede the vertical migration of groundwater.

3. Groundwater flow direction in the shallow sand and gravel alluvial aquifer was measured to be from north-northwest to northwest during the August and November sampling events.

4. Community Well #1 is an emergency backup well located on and owned by the Canadian Pacific Railroad immediately north of the KQS site and is leased by Kirkland for emergency backup purposes. A second Kirkland Community well, Well #2 is located approximately 400 feet north of the KQS site and is one of two wells that primarily and routinely supplies potable water to the citizenry of Kirkland. Kirkland Well #3 is located outside of town over a mile to the west and is the other primary well relied upon by the community for its water supply.

5. Well #2 has two steel surface casings that protect it from surficial communication with shallow groundwater. The deeper, 8-inch inner surface casing extends to 152 feet in depth into the Decorah Dolomite. Below the 8-inch surface casing, the well is drilled and completed as an open hole to a total depth of 630 feet into the St. Peter Sandstone. The water produced from this well is collected from the lower Decorah Dolomite, the Platteville Dolomite and the St. Peter Sandstone between 152 and 630 feet in depth.

6. Well #1 was drilled in 1896 and has a 7-inch, steel casing installed to a depth of 88 feet into the bedrock and is an open borehole below to a total depth of 737 feet. Based on the detailed geologic data from the log of Community Well #2 (less than 400 feet away), the water produced from this well is collected from the lower Galena Dolomite, the Decorah Dolomite, the Platteville Dolomite and the St. Peter Sandstone between 88 and 737 feet in depth.

7. The KQS groundwater monitoring well network was sampled in August and again in November 2016. Five wells on site exhibited organic constituents in excess of the GROs. Monitoring wells MW-1 (August and November), MW-3A (August and November) and MW-15 (August only) exhibited benzene concentrations in excess of the GRO. Monitoring wells MW-1 (November only), MW-(August and November) and MW-14 (August and November) exhibited PNA concentrations in excess of the GROs.

8. None of the wells sampled in August or November had detectable concentrations of dissolved or total lead, indicating that lead detections previously reported at the site were the result of elevated turbidity levels in groundwater samples due to the sampling methods previously employed (purging volumes and sampling with bailers).

9. Measurements of dissolved iron in groundwater show a direct inverse relationship to dissolved oxygen concentrations in groundwater. That is, where dissolved oxygen concentrations are low (<0.5 mg/L) dissolved iron concentrations are elevated (>1.0 mg/L). Additionally, the dissolved oxygen concentrations determined for the August and November sampling events indicates the occurrence of the organic constituents (benzene and PNAs) exceeding the GRO in groundwater at the site are directly related to areas in groundwater at the site where dissolved oxygen has been depleted (<0.5 mg/L). This observation indicates that significant, attenuation of these compounds is taking place at the site under naturally occurring, aerobic biodegradation conditions.
10. The groundwater sampling data from the line of monitoring wells along the northern border of the site, wells MW-18, MW-19, MW-30S and MW-30D indicate that no petroleum constituents are migrating across the KQS property line to the north of the site in excess of the GROs.

11. The USTs located on the KQS site are within the minimum setback of backup Well #1 and are outside the minimum setback of Well #2. It has also been demonstrated that no petroleum constituents from the KQS site occur within the minimum setback of Well #2.

12. To determine the competency of the 30-foot, sitly clay aquitard that separates the upper alluvial aquifer from the bedrock aquifers in the vicinity of the site, SMA performed a pump test on Community Supply Well #2. Community Supply Well #2 was intermittently pumped at between 275 and 336 gpm over a four day period while the static water level in new monitoring well MW-31 located 18 feet away from Well #2 and completed in the alluvial sand and gravel was monitored continuously to determine if there was any observed water level response. The lack of any observed response in MW-31 indicates that the 30 feet of glacial till that separates the bedrock aquifers from the alluvial aquifer at the site is an effective aquitard, which significantly impedes the vertical migration of groundwater between the units and protects the bedrock aquifers in the vicinity of the site from routes of contaminant migration occurring within the alluvial aquifer.

13. The low concentrations of benzene and PNAs in groundwater at the site can be effectively remediated by air sparging small areas of the site groundwater where they occur. Air sparging simply involves gently injecting small amounts of naturally occurring compressed air into the groundwater system on an intermittent basis to increase the dissolved oxygen concentrations and enhance natural biodegradation of the organic contaminants.

14. Based upon the testing and findings presented here, the use of an air sparging system is the Best Available Technology to effectuate the remediation of the KQS site. By using only the oxygen from naturally occurring air, air sparging does not constitute a significant hazard to the potable supply wells currently on Site. While Blake will utilize the maximum feasible setback zone while implementing the air sparging system, the current setback zone poses an arbitrary and unreasonable hardship to the remediation implementation, and therefore a setback exception is required.

8.0 CERTIFICATION STATEMENT

I certify and attest to directing and overseeing all aspects of the work described in this report and believe that the data and conduct of the work described herein comply with good and standard practices related to the conduct of geologic and hydrogeologic investigations, reporting and analysis.

Signed:

Ronald B. St. John, PHG, CPG
Illinois Professional Geologist
St. John – Mittelhauser & Associates, Inc.

Certified Professional Hydrogeologist
American Institute of Hydrogeology

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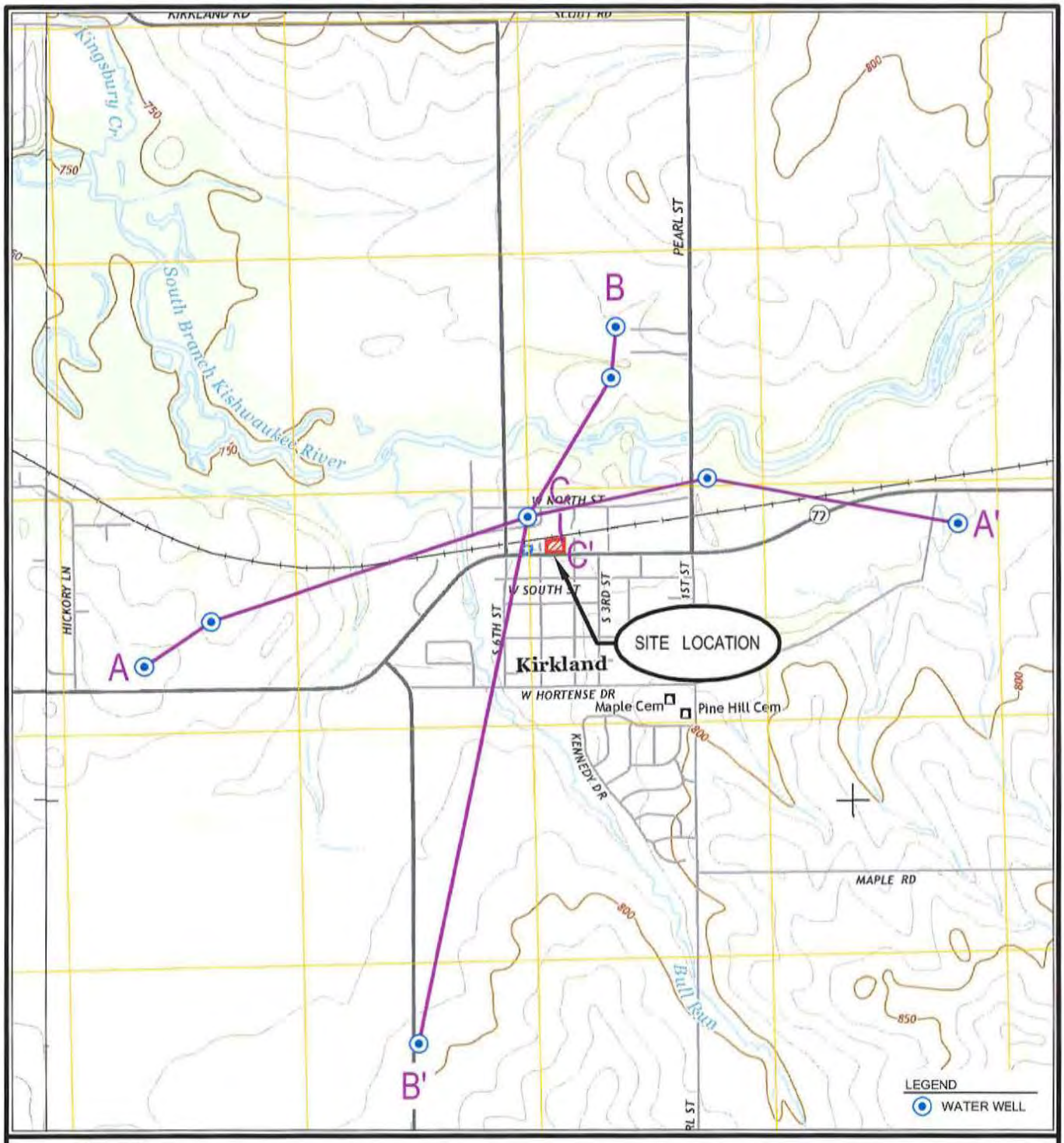
SM&A
ST. JOHN · MITTELHAUSER & ASSOCIATES

FIGURES



QUADRANGLE LOCATION

Scale 1:24000

0 1/2 1 MILE

1000 0 1000 2000 3000 FEET

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAP, KIRKLAND (2015), ILLINOIS)

CHECK BY	SRS
DRAWN BY	OS
DATE	8-4-16
SCALE	AS SHOWN
CAD NO.	16013.01D
PRJ NO.	15-16013

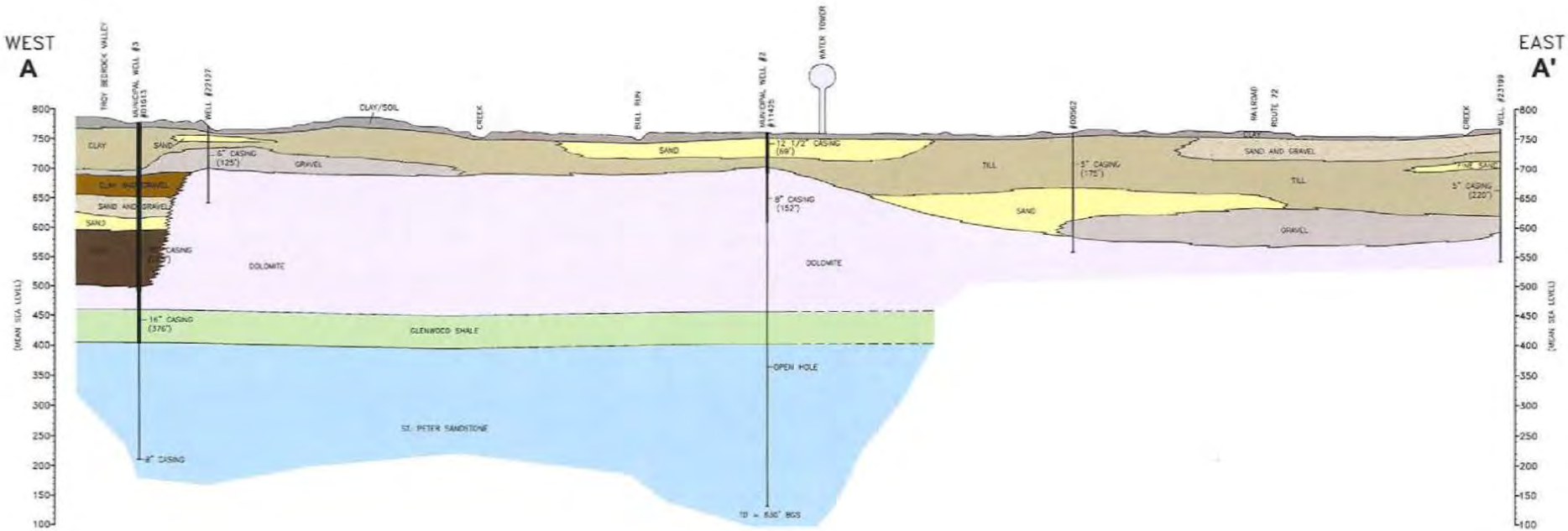
SITE LOCATION

411 MAIN STREET
KIRKLAND, ILLINOIS

SM&A
ST. JOHN-MITTELHAUSER & ASSOCIATES

FIGURE

1



LEGEND

- WATER TABLE
- TOPSOIL
- SAND
- SAND & GRAVEL
- GRAVEL
- SILT/CLAY AND TILL
- SILT
- CLAY AND GRAVEL
- CLAY
- GALENA–PLATTEVILLE DOLOMITE
- GLENWOOD SHALE
- ST. PETER SANDSTONE

HORIZONTAL SCALE IN FEET
0 300 600 1200

VERTICAL SCALE: 1"=120'

CHECK BY: SRS	
DRAWN BY: DS	
DATE: 8-8-16	
SCALE: AS SHOWN	
CAD NO.: 16013.01C	
PRJ NO.: 15-16013	

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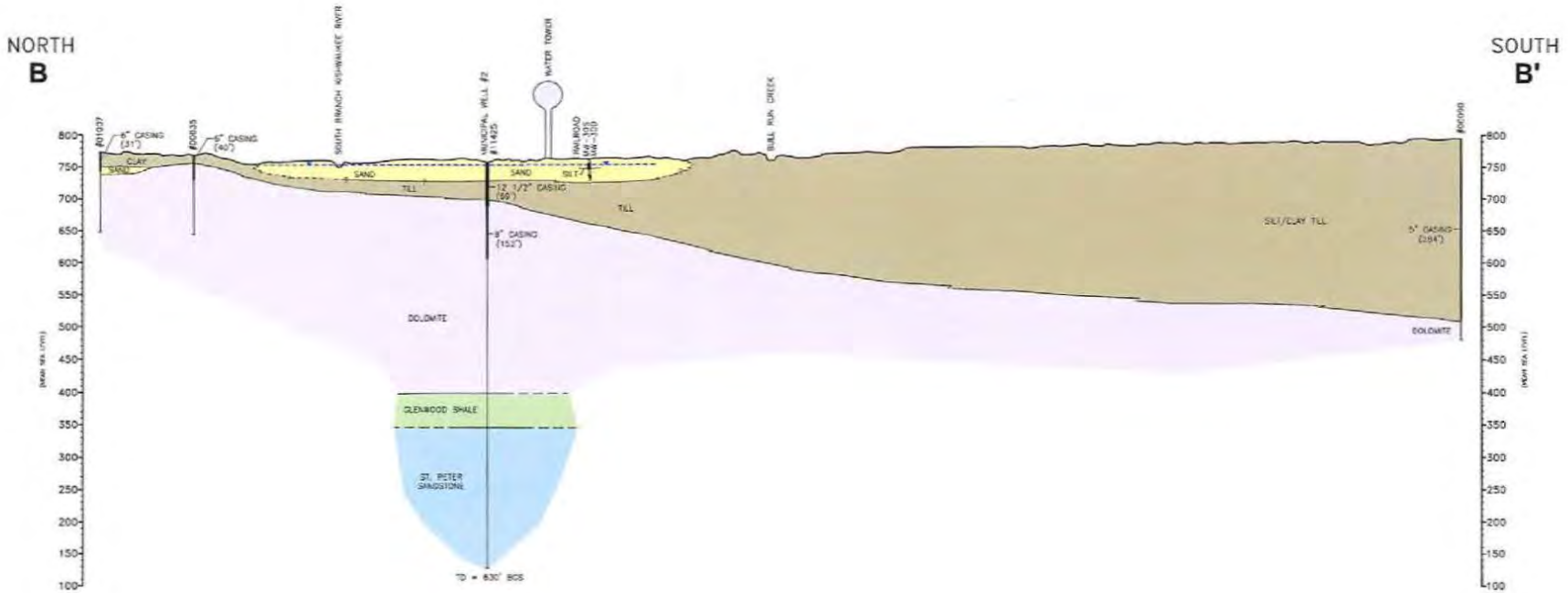
CROSS SECTION A–A'

411 MAIN STREET
KIRKLAND, ILLINOIS

FIGURE
2



LEGEND

- WATER TABLE
- SAND
- SAND & GRAVEL
- SILT/CLAY AND TILL
- SILT
- GALENA-PLATTEVILLE DOLOMITE
- GLENWOOD SHALE
- ST. PETER SANDSTONE

HORIZONTAL SCALE IN FEET
0 300 600 1200

VERTICAL SCALE: 1"=120'

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SCALE: AS SHOWN	
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PRJ NO.: 15-16013	

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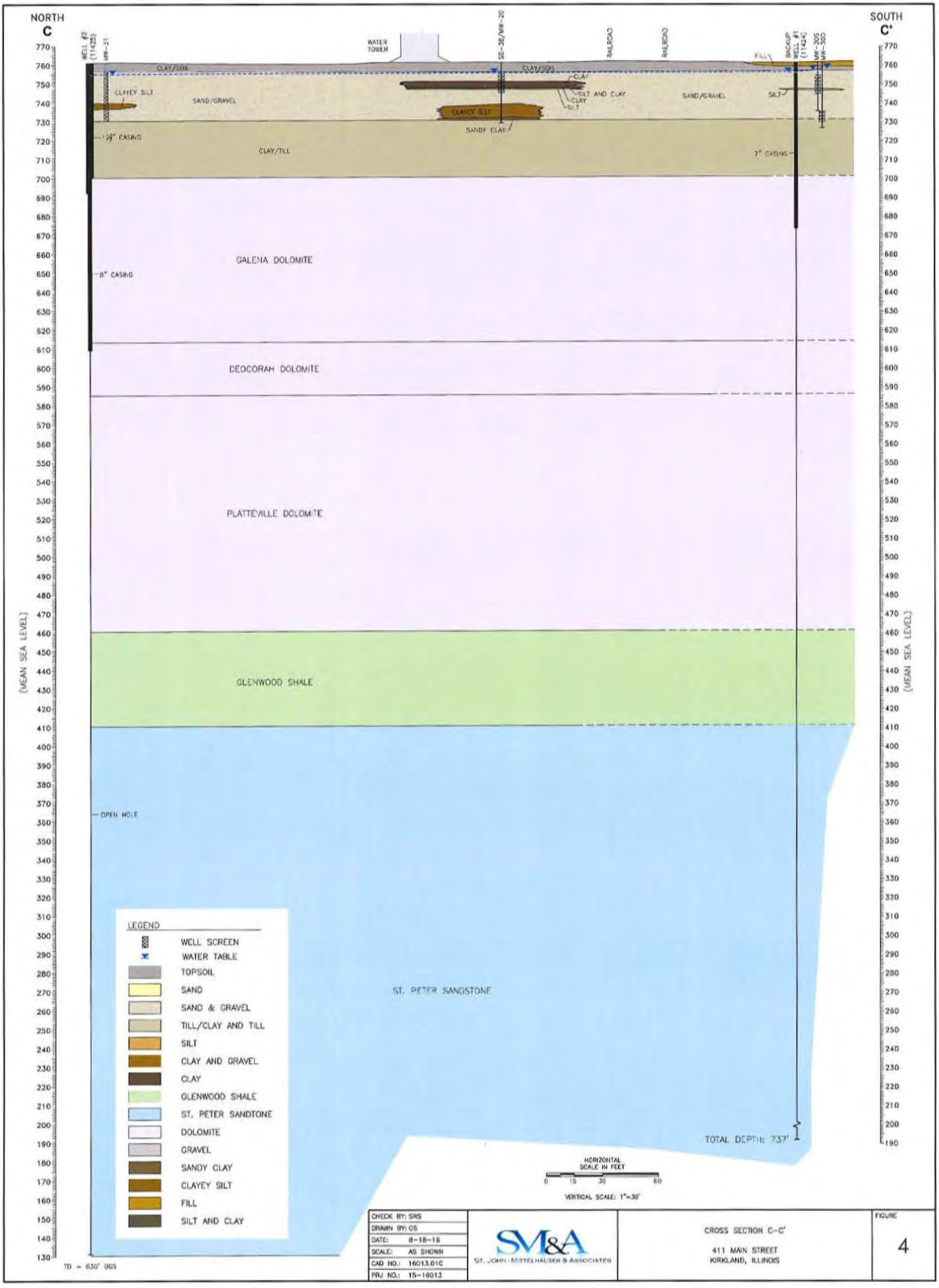
CROSS SECTION B-B'

411 MAIN STREET
KIRKLAND, ILLINOIS

FIGURE
3



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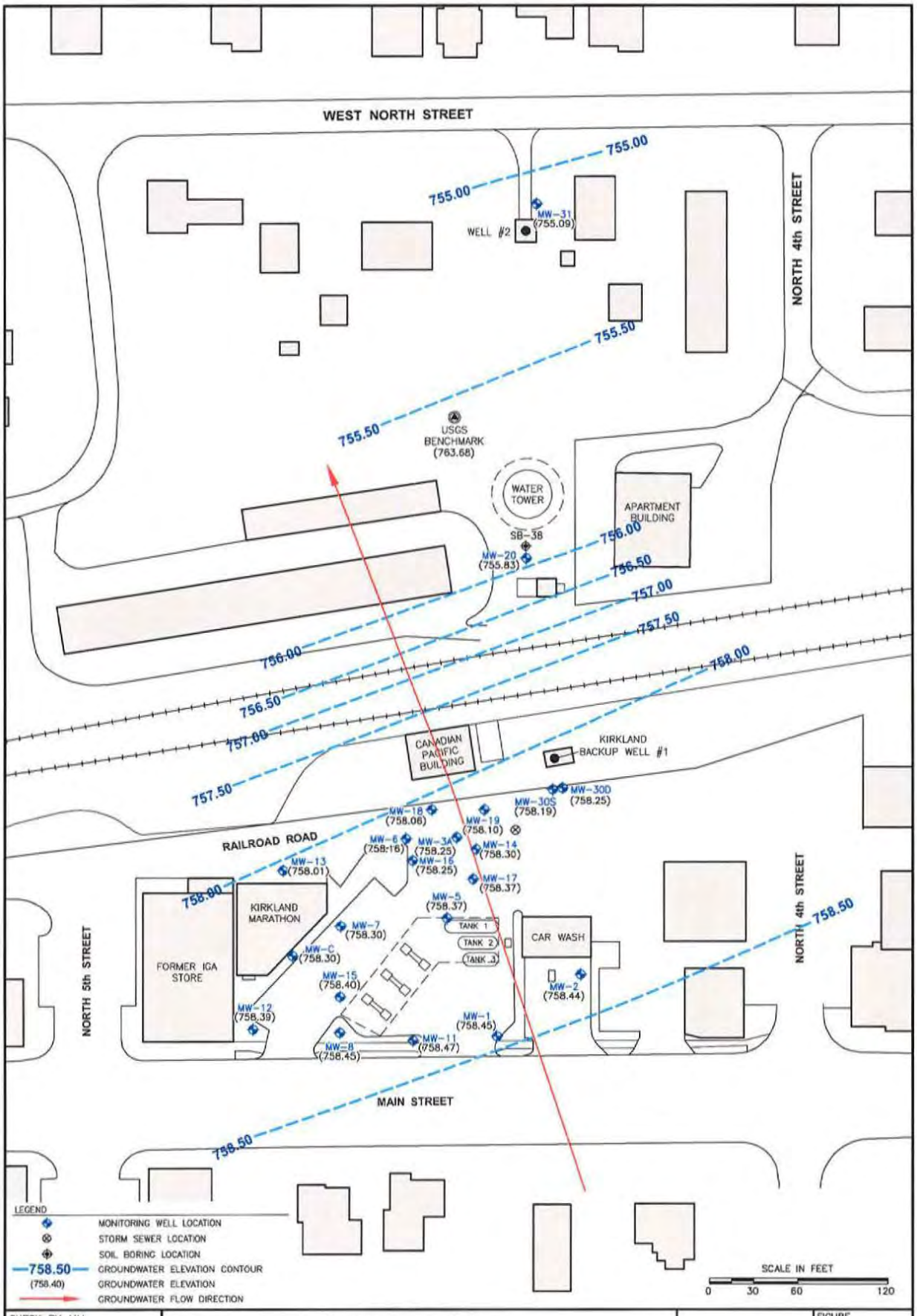
CROSS SECTION C-C'

411 MAIN STREET
KIRKLAND, ILLINOIS

FIGURE
4



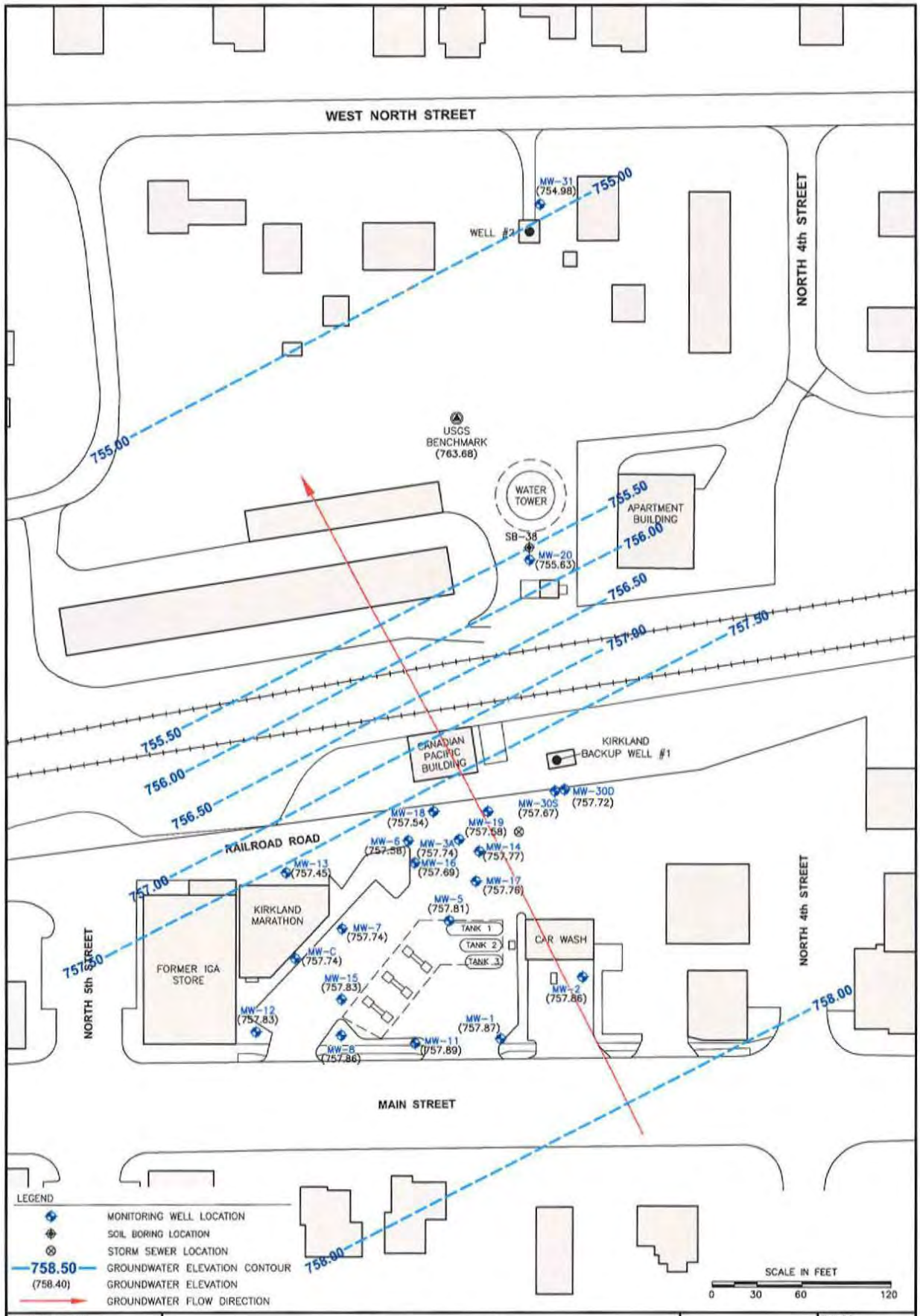
CHECK BY	MM
DRAWN BY	OS
DATE	8-19-16
SCALE	AS SHOWN
CAD NO.	16013.01F
PRJ NO.	15-16013

POTENTIOMETRIC SURFACE MAP
AUGUST 9, 2016

411 MAIN STREET
KIRKLAND, ILLINOIS

SM&A
ST. JOHN MEYER-HAUSER & ASSOCIATES

FIGURE
5



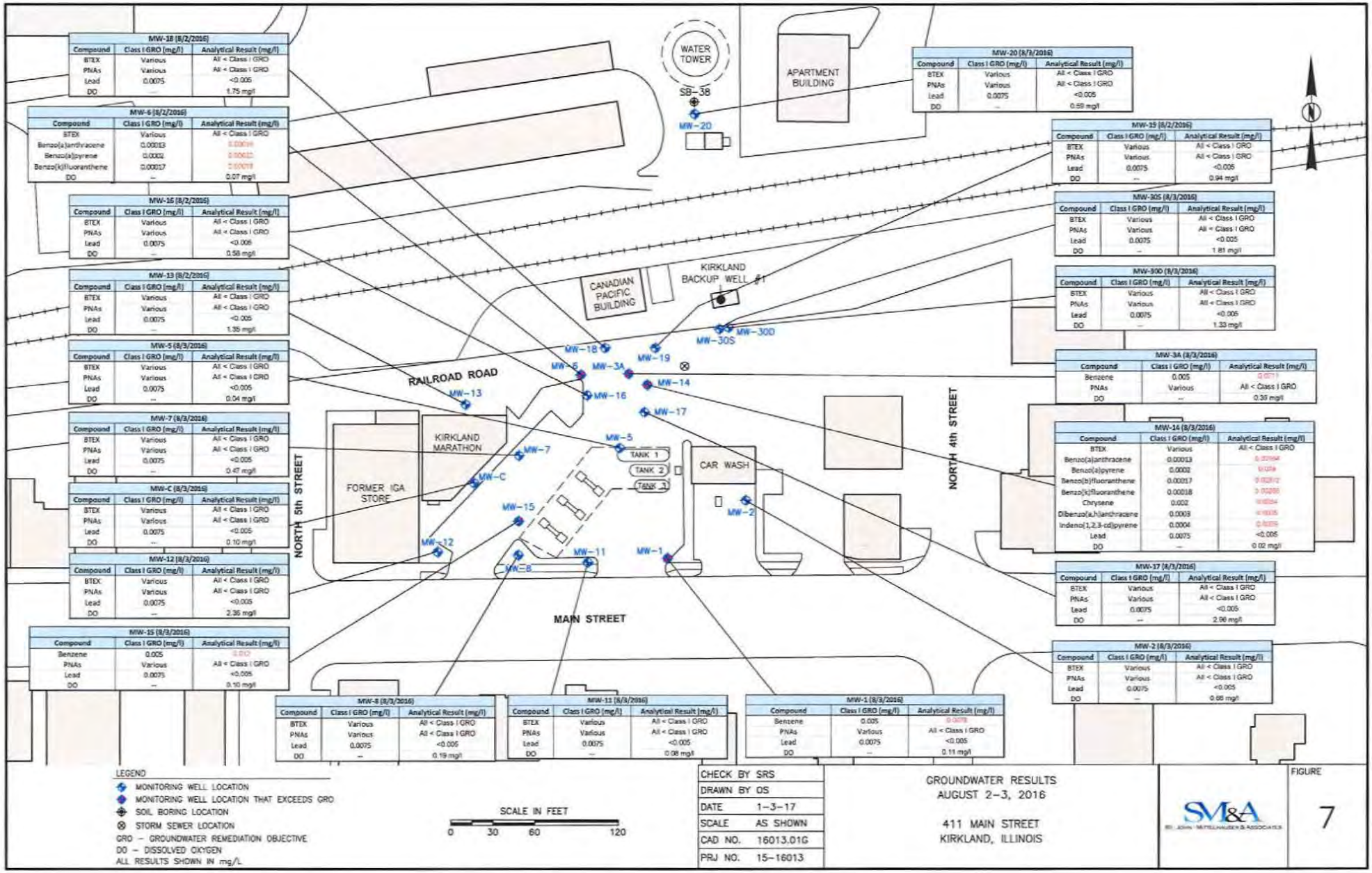
CHECK BY	MM
DRAWN BY	OS
DATE	8-19-16
SCALE	AS SHOWN
CAD NO.	16013.01F1
PRJ NO.	15-16013

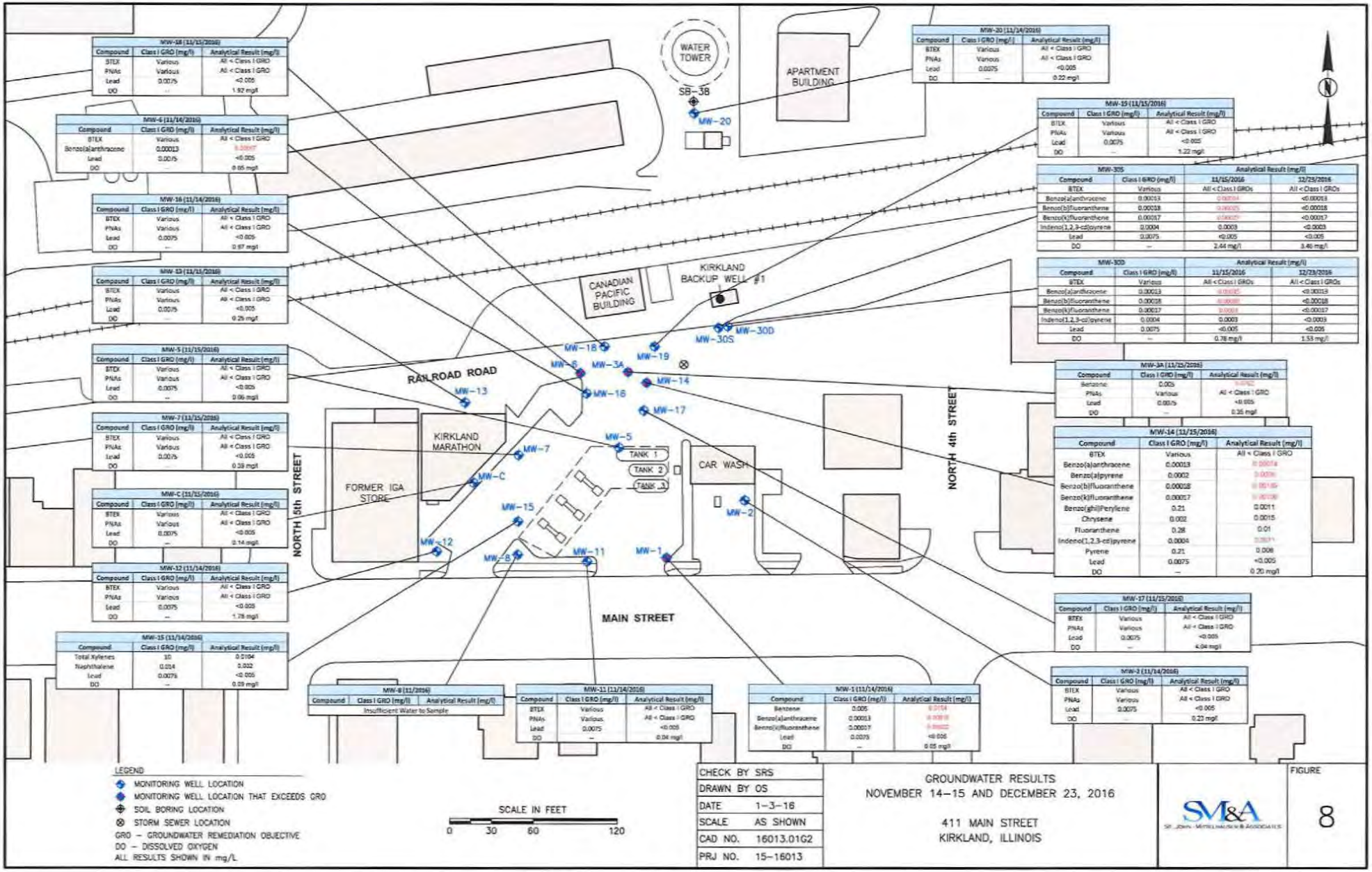
POTENTIOMETRIC SURFACE MAP
NOVEMBER 14, 2016

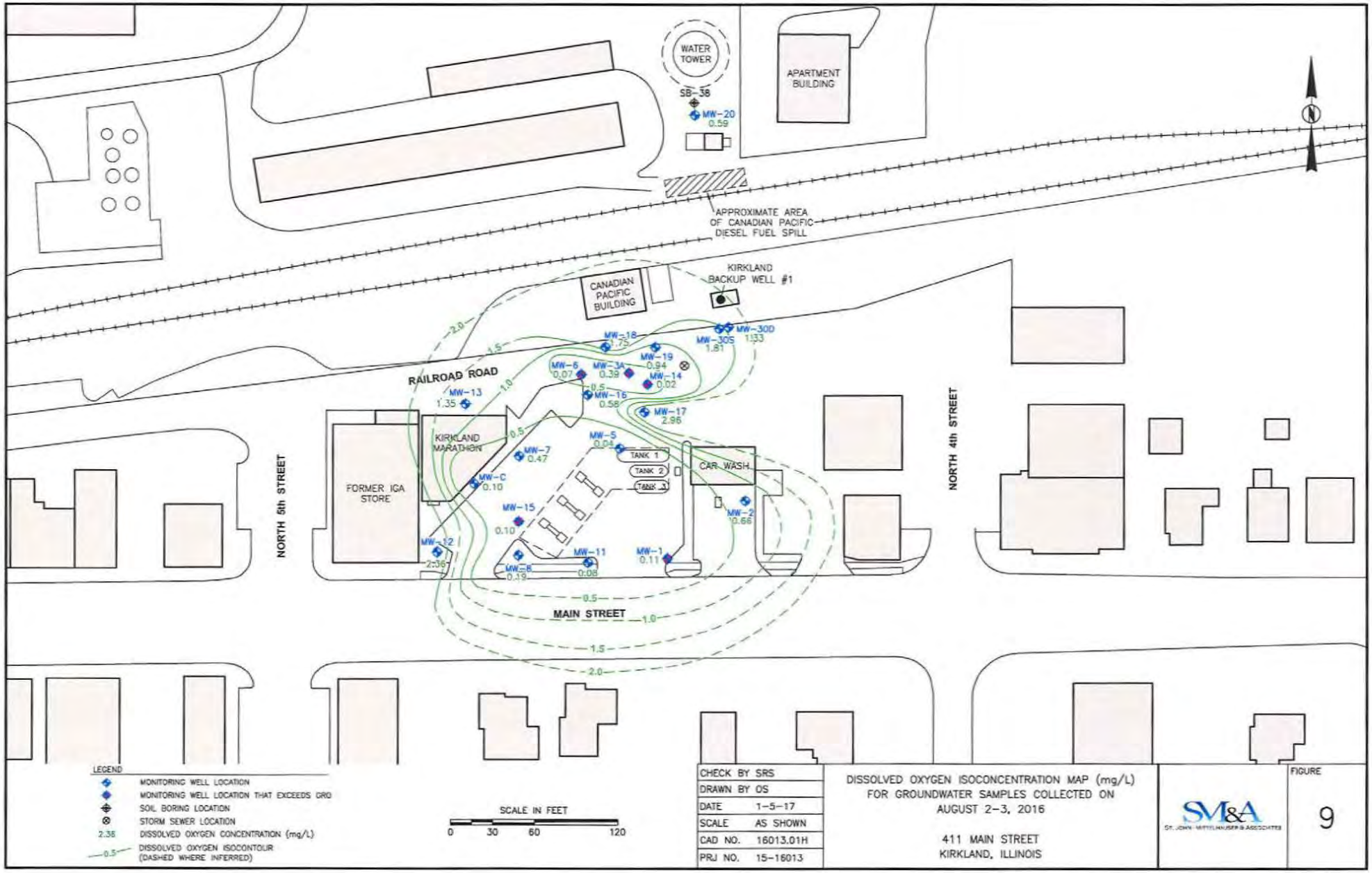
411 MAIN STREET
KIRKLAND, ILLINOIS

SM&A
ST. JOHN - MITTELHAUSER & ASSOCIATES

FIGURE
6


MW-18 (8/2/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.75 mg/l
MW-6 (8/2/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
Benzo(a)anthracene | 0.00013 | 0.00014
Benzo(a)pyrene | 0.0002 | 0.00012
Benzo(b)fluoranthene | 0.00017 | 0.00018
DO | -- | 0.07 mg/l
MW-16 (8/2/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.58 mg/l
MW-13 (8/2/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.35 mg/l
MW-5 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.04 mg/l
MW-7 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.47 mg/l
MW-C (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.10 mg/l
MW-12 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 2.36 mg/l
MW-15 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Benzene | 0.005 | 0.012
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.10 mg/l
MW-8 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.19 mg/l
MW-11 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.08 mg/l
MW-1 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Benzene | 0.005 | 0.0078
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.11 mg/l
MW-20 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.59 mg/l
MW-19 (8/2/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.94 mg/l
MW-30S (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.81 mg/l
MW-30D (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.33 mg/l
MW-3A (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Benzene | 0.005 | 0.0071
PNAs | Various | All < Class I GRO
DO | -- | 0.36 mg/l
MW-14 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
Benzo(a)anthracene | 0.00013 | 0.00064
Benzo(a)pyrene | 0.0002 | 0.0004
Benzo(b)fluoranthene | 0.00017 | 0.00017
Benzo(k)fluoranthene | 0.00018 | 0.00018
Chrysene | 0.002 | 0.00054
Dibenzo(a,h)anthracene | 0.0003 | 0.00035
Indeno(1,2,3-cd)pyrene | 0.0004 | 0.0005
Lead | 0.0075 | <0.005
DO | -- | 0.02 mg/l
MW-17 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 2.00 mg/l
MW-2 (8/3/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.05 mg/l
WATER TOWER
SB-38
MW-20
APARTMENT BUILDING
CANADIAN PACIFIC BUILDING
KIRKLAND BACKUP WELL #1
MW-30D
MW-30S
MW-18
MW-19
MW-6
MW-3A
MW-14
MW-16
MW-17
RAILROAD ROAD
MW-13
KIRKLAND MARATHON
MW-5
MW-7
TANK 1
TANK 2
TANK 3
CAR WASH
MW-C
MW-2
FORMER IGA STORE
NORTH 5th STREET
NORTH 4th STREET
MW-15
MW-12
MW-11
MW-1
MW-8
MAIN STREET
LEGEND
MONITORING WELL LOCATION
MONITORING WELL LOCATION THAT EXCEEDS GRO
SOIL BORING LOCATION
STORM SEWER LOCATION
GRO - GROUNDWATER REMEDIATION OBJECTIVE
DO - DISSOLVED OXYGEN
ALL RESULTS SHOWN IN mg/L
SCALE IN FEET
0 30 60 120
CHECK BY SRS
DRAWN BY OS
DATE 1-3-17
SCALE AS SHOWN
CAD NO. 16013.01G
PRJ NO. 15-16013
GROUNDWATER RESULTS
AUGUST 2-3, 2016
411 MAIN STREET
KIRKLAND, ILLINOIS
SM&A
FIGURE
7


WATER TOWER
SB-38
MW-20
APARTMENT BUILDING
CANADIAN PACIFIC BUILDING
KIRKLAND BACKUP WELL #1
MW-30S
MW-30D
MW-18
MW-19
MW-6
MW-3A
MW-14
MW-16
MW-17
RAILROAD ROAD
MW-13
KIRKLAND MARATHON
MW-5
MW-7
TANK 1
TANK 2
TANK 3
CAR WASH
MW-C
FORMER IGA STORE
MW-15
MW-2
MW-12
MW-8
MW-11
MW-1
NORTH 5th STREET
NORTH 4th STREET
MAIN STREET
N
MW-18 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.92 mg/l
MW-6 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
Benzo(a)anthracene | 0.00013 | 0.00017
Lead | 0.0075 | <0.005
DO | -- | 0.65 mg/l
MW-16 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.97 mg/l
MW-13 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.25 mg/l
MW-5 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.06 mg/l
MW-7 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.39 mg/l
MW-C (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.14 mg/l
MW-12 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.78 mg/l
MW-15 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Total Xylenes | 10 | 0.2194
Naphthalene | 0.014 | 0.332
Lead | 0.0075 | <0.005
DO | -- | 0.39 mg/l
MW-8 (11/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Insufficient Water to Sample
MW-11 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.04 mg/l
MW-1 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Benzene | 0.005 | 0.0154
Benzo(a)anthracene | 0.00013 | 0.00018
Benzo(a)fluoranthene | 0.00017 | 0.00022
Lead | 0.0075 | <0.005
DO | -- | 0.05 mg/l
MW-20 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.22 mg/l
MW-15 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 1.22 mg/l
MW-30S
Compound | Class I GRO (mg/l) | Analytical Result (mg/l) 11/15/2016 | 12/23/2016
BTEX | Various | All < Class I GROs | All < Class I GROs
Benzo(a)anthracene | 0.00013 | 0.00014 | <0.00013
Benzo(b)fluoranthene | 0.00018 | 0.00025 | <0.00018
Benzo(k)fluoranthene | 0.00017 | 0.00017 | <0.00017
Indeno(1,2,3-cd)pyrene | 0.0004 | 0.0003 | <0.0003
Lead | 0.0075 | <0.005 | <0.005
DO | -- | 2.44 mg/l | 3.46 mg/l
MW-30D
Compound | Class I GRO (mg/l) | Analytical Result (mg/l) 11/15/2016 | 12/23/2016
BTEX | Various | All < Class I GROs | All < Class I GROs
Benzo(a)anthracene | 0.00013 | 0.00015 | <0.00013
Benzo(b)fluoranthene | 0.00018 | 0.00021 | <0.00018
Benzo(k)fluoranthene | 0.00017 | 0.0003 | <0.00017
Indeno(1,2,3-cd)pyrene | 0.0004 | 0.0003 | <0.0003
Lead | 0.0075 | <0.005 | <0.005
DO | -- | 0.78 mg/l | 1.53 mg/l
MW-3A (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
Benzene | 0.005 | 0.0052
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.35 mg/l
MW-14 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
Benzo(a)anthracene | 0.00013 | 0.00014
Benzo(a)pyrene | 0.0002 | 0.0003
Benzo(b)fluoranthene | 0.00018 | 0.00025
Benzo(k)fluoranthene | 0.00017 | 0.00020
Benzo(ghi)Perylene | 0.21 | 0.0011
Chrysene | 0.002 | 0.0015
Fluoranthene | 0.28 | 0.01
Indeno(1,2,3-cd)pyrene | 0.0004 | 0.0003
Pyrene | 0.21 | 0.008
Lead | 0.0075 | <0.005
DO | -- | 0.20 mg/l
MW-17 (11/15/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 4.04 mg/l
MW-2 (11/14/2016)
Compound | Class I GRO (mg/l) | Analytical Result (mg/l)
BTEX | Various | All < Class I GRO
PNAs | Various | All < Class I GRO
Lead | 0.0075 | <0.005
DO | -- | 0.23 mg/l
LEGEND
MONITORING WELL LOCATION
MONITORING WELL LOCATION THAT EXCEEDS GRO
SOIL BORING LOCATION
STORM SEWER LOCATION
GRO – GROUNDWATER REMEDIATION OBJECTIVE
DO – DISSOLVED OXYGEN
ALL RESULTS SHOWN IN mg/L
SCALE IN FEET
0 30 60 120
CHECK BY SRS
DRAWN BY OS
DATE 1-3-16
SCALE AS SHOWN
CAD NO. 16013.01G2
PRJ NO. 15-16013
GROUNDWATER RESULTS
NOVEMBER 14-15 AND DECEMBER 23, 2016
411 MAIN STREET
KIRKLAND, ILLINOIS
SM&A
FIGURE
8



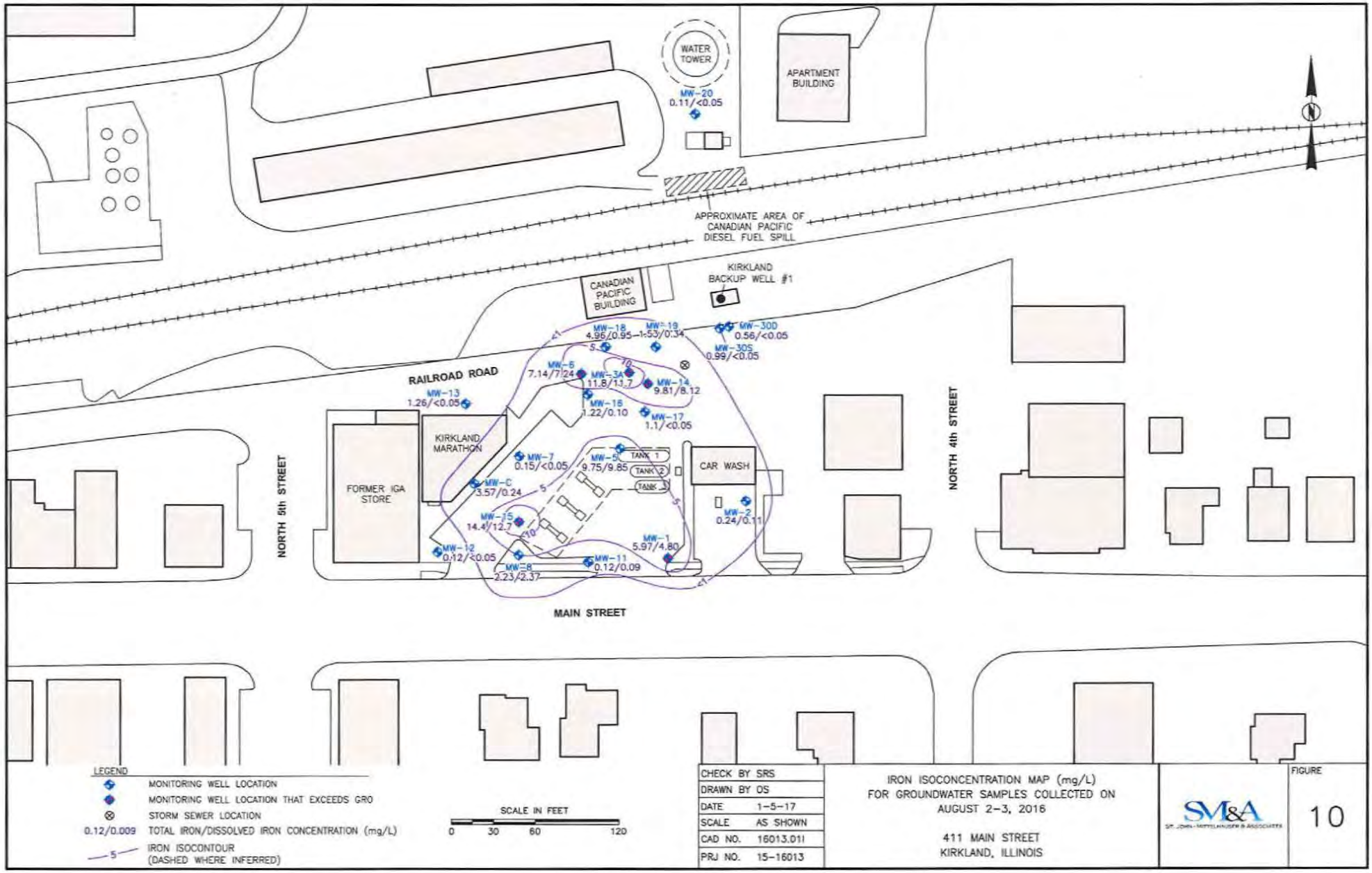
CHECK BY	SRS
DRAWN BY	OS
DATE	1-5-17
SCALE	AS SHOWN
CAD NO.	16013.01H
PRJ NO.	15-16013

DISSOLVED OXYGEN ISOCONCENTRATION MAP (mg/L)
FOR GROUNDWATER SAMPLES COLLECTED ON
AUGUST 2-3, 2016

411 MAIN STREET
KIRKLAND, ILLINOIS

SM&A
ST. JOHN, MITTELHAUSER & ASSOCIATES

FIGURE
9



CHECK BY	SRS
DRAWN BY	OS
DATE	1-5-17
SCALE	AS SHOWN
CAD NO.	16013.01I
PRJ NO.	15-16013

IRON ISOCONCENTRATION MAP (mg/L)
FOR GROUNDWATER SAMPLES COLLECTED ON
AUGUST 2-3, 2016

411 MAIN STREET
KIRKLAND, ILLINOIS

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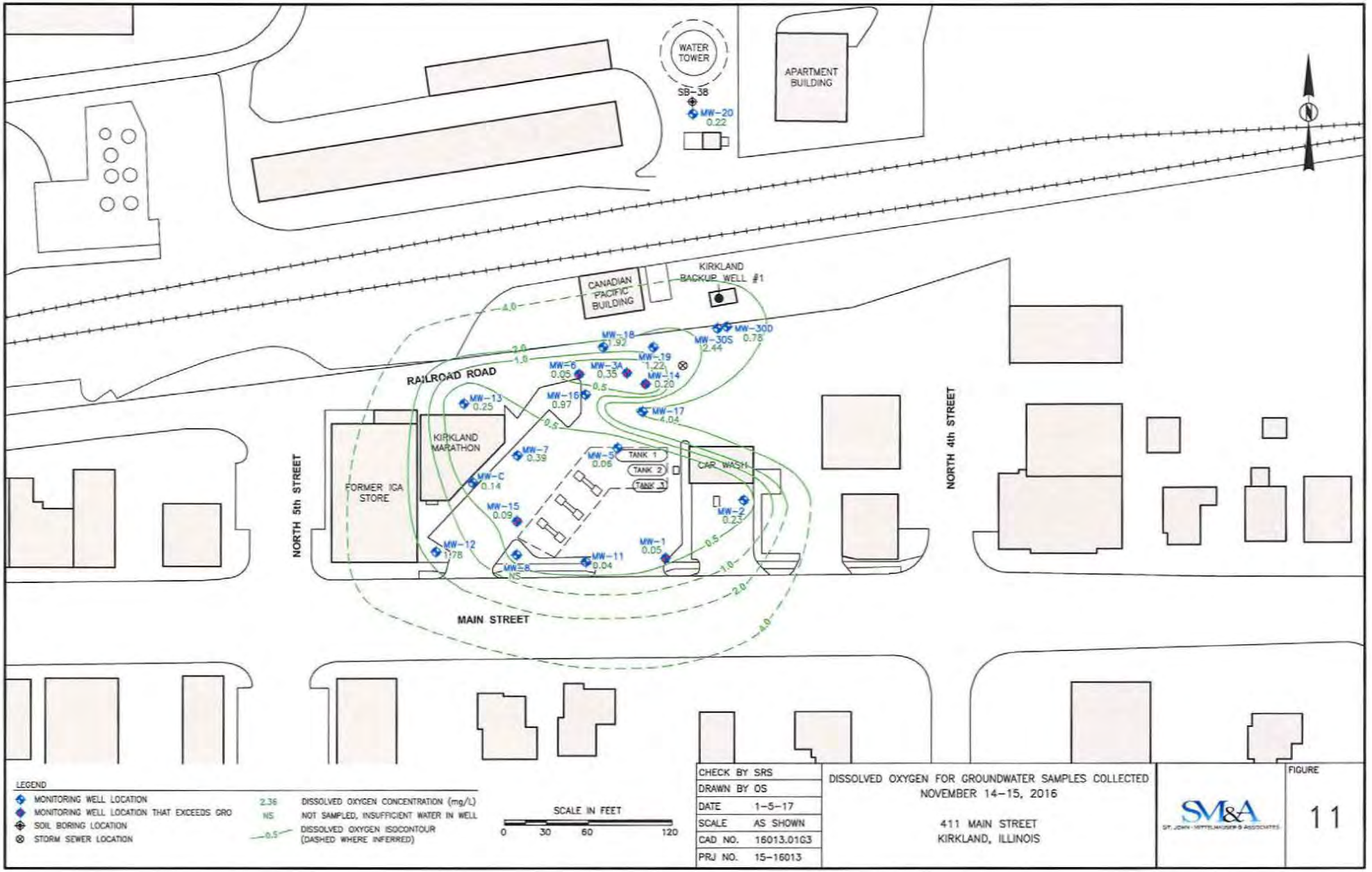
FIGURE
10



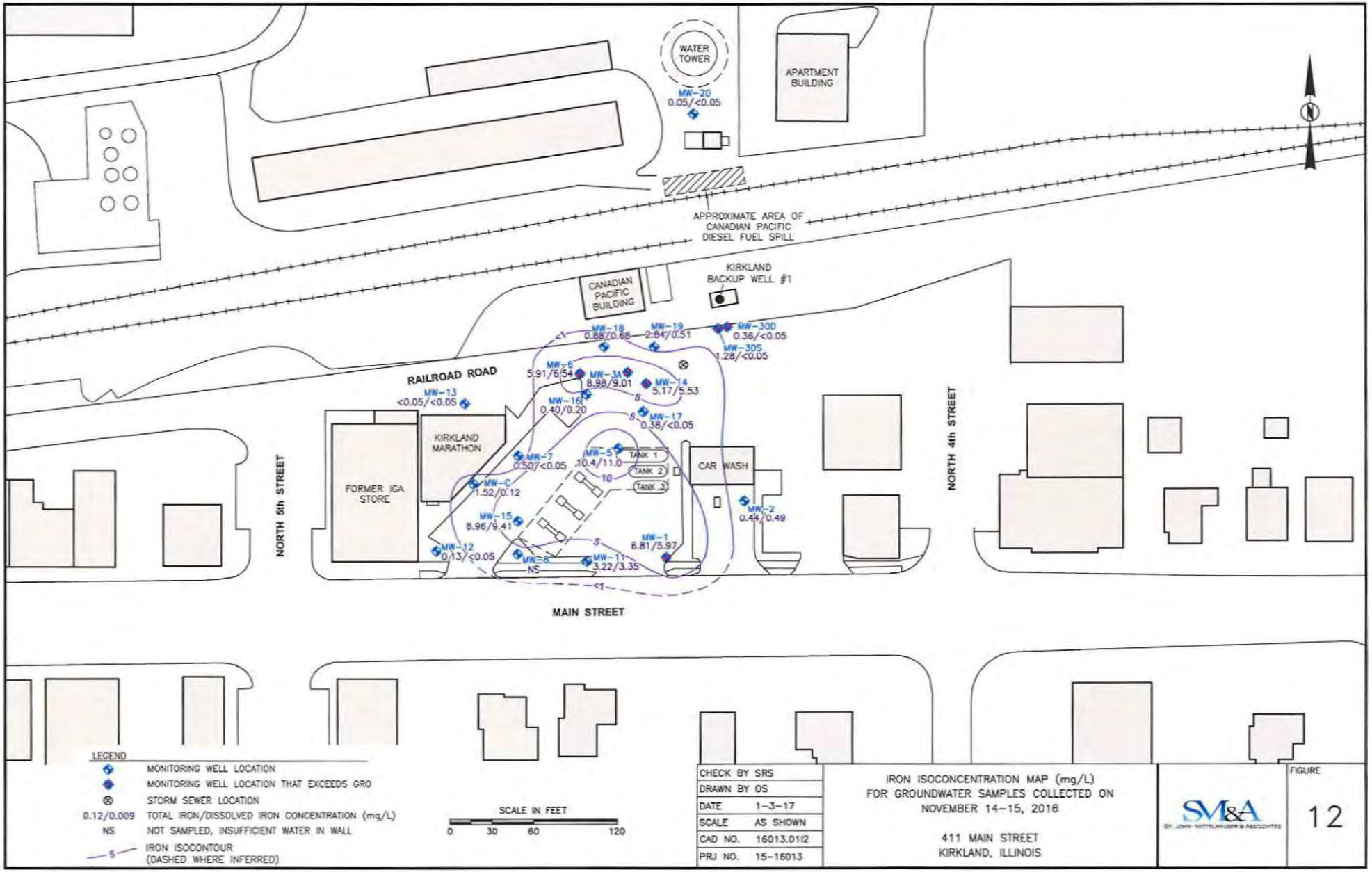
CHECK BY	SRS
DRAWN BY	OS
DATE	1-5-17
SCALE	AS SHOWN
CAD NO.	16013.01G3
PRJ NO.	15-16013

DISSOLVED OXYGEN FOR GROUNDWATER SAMPLES COLLECTED NOVEMBER 14-15, 2016

411 MAIN STREET
KIRKLAND, ILLINOIS

SM&A
ST. JOHN - HITTELMACHER & ASSOCIATES

FIGURE
11



CHECK BY	SRS
DRAWN BY	OS
DATE	1-3-17
SCALE	AS SHOWN
CAD NO.	16013.01I2
PRJ NO.	15-16013

IRON ISOCONCENTRATION MAP (mg/L)
FOR GROUNDWATER SAMPLES COLLECTED ON
NOVEMBER 14-15, 2016

411 MAIN STREET
KIRKLAND, ILLINOIS

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FIGURE
12

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- STORM SEWER LOCATION

TANK 1: 4,000/3,000-GAL. PREMIUM
TANK 2: 10,000-GAL. REGULAR
TANK 3: 6,000-GAL. DIESEL

CHECK BY: CC	
DRAWN BY: OS	
DATE: 1-3-16	
SCALE: AS SHOWN	
CAD NO.: 16013.01E	
PRJ NO.: 15-16013	

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KIRKLAND WELLS #1 AND #2
AND 400 FOOT SETBACK ZONES

411 MAIN STREET
KIRKLAND, ILLINOIS

FIGURE
13

Figure 14
Water Level Data Recorded in MW-31

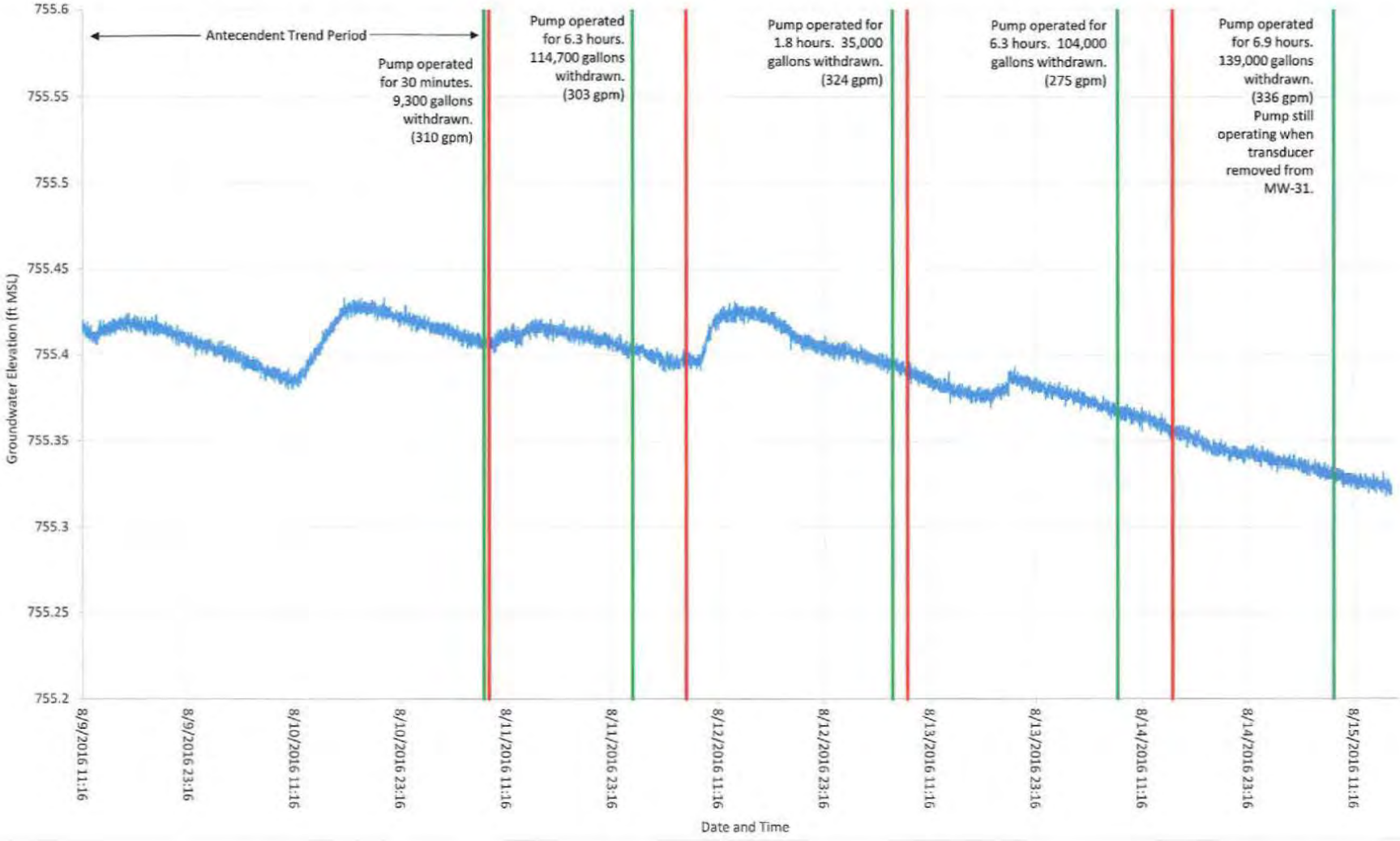
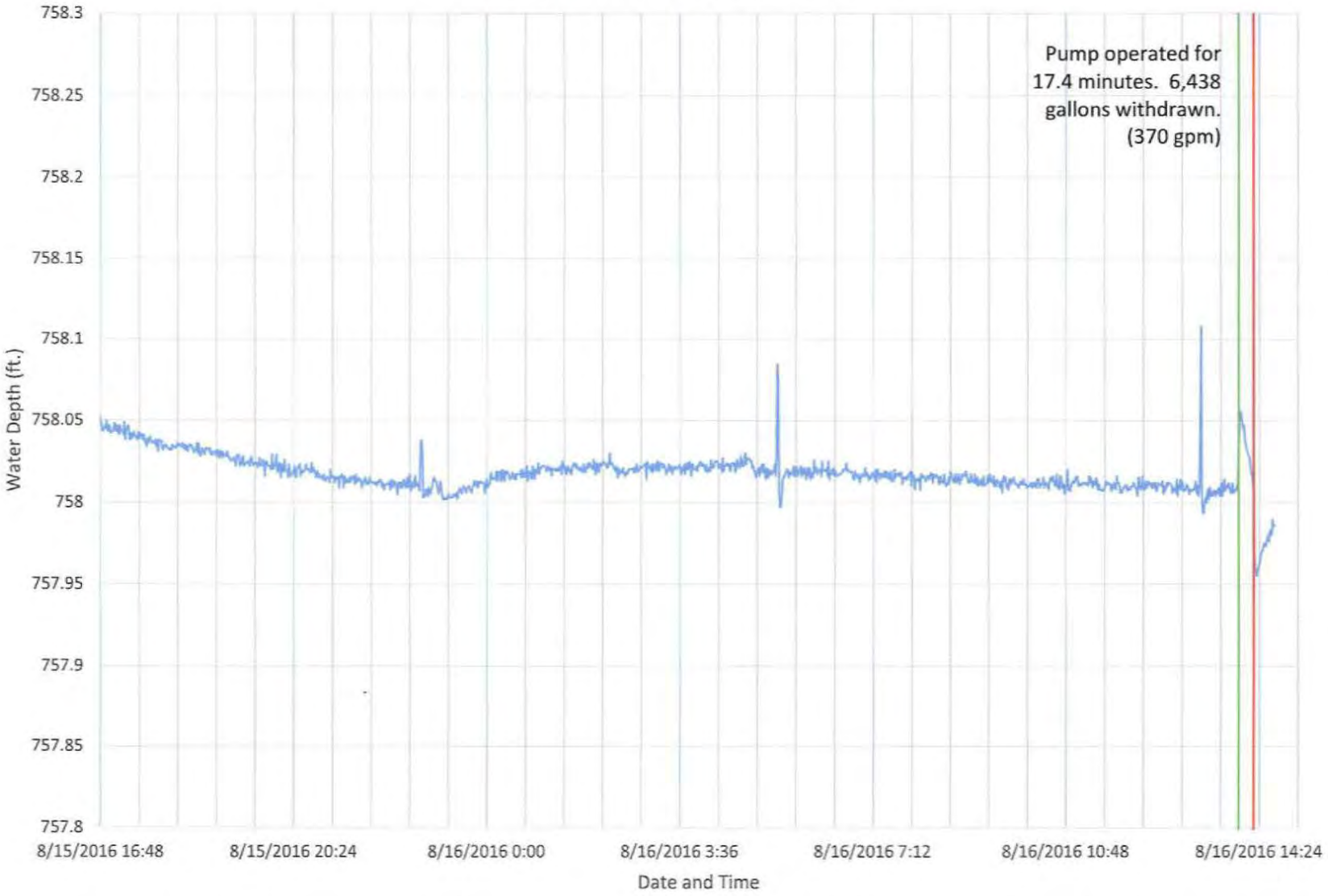


Figure 15
Water Level Data Recorded - MW-30D



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TABLES

TABLE 1
Groundwater Level Measurements

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Well ID	TOC [1] (MSL)	August 9, 2016		November 14, 2016	
		Depth to Water [2]	Static Water Elevation (MSL)	Depth to Water [2]	Static Water Elevation (MSL)
MW-1	767.28	8.83	758.45	9.41	757.87
MW-2	767.66	9.22	758.44	9.80	757.86
MW-3A	766.94	8.69	758.25	9.20	757.74
MW-5	767.44	9.07	758.37	9.63	757.81
MW-6	767.00	8.84	758.16	9.42	757.58
MW-7	768.44	10.14	758.30	10.70	757.74
MW-8	769.13	10.68	758.45	11.27	757.86
MW-11	767.93	9.46	758.47	10.04	757.89
MW-12	768.78	10.39	758.39	10.95	757.83
MW-13	768.26	10.25	758.01	10.81	757.45
MW-14	766.46	8.16	758.30	8.69	757.77
MW-15	768.11	9.71	758.40	10.28	757.83
MW-16	767.04	8.79	758.25	9.35	757.69
MW-17	766.82	8.45	758.37	9.06	757.76
MW-18	766.72	8.66	758.06	9.18	757.54
MW-19	766.20	8.10	758.10	8.62	757.58
MW-20	763.38	7.55	755.83	7.75	755.63
MW-30D	765.35	7.10	758.25	7.63	757.72
MW-30S	765.50	7.31	758.19	7.83	757.67
MW-31	766.88	11.79	755.09	11.90	754.98
MW-C	769.35	11.05	758.30	11.61	757.74

NOTES:
[1] Survey Date: May 9, 2016: USGS Marker S-130 Located 42 05 38 (N), 88 50 53 (W) 763.68 feet MSL
[2] Measured from Top of Riser
ft = feet
MSL = Mean Sea Level
TOC = Top of Casing

TABLE 2
Groundwater Analytical Results (August, November, December 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-C		MW-1		MW-2		MW-3A		MW-5	
		Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16
BTEX (mg/l)											
Benzene	0.005	<0.005	<0.005	**0.0078**	**0.0104**	<0.005	<0.005	**0.0711**	**0.0762**	<0.005	<0.005
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0057**	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
PNAs (mg/l)											
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	<0.00013	**0.00016**	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	<0.00017	**0.00022**	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.003**	**0.004**	**0.002**	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Naphthalene	0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Metals (6010C)											
Iron		3.57	1.52	5.97	6.81	0.24	0.44	11.8	8.98	9.75	10.4
Lead	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Metals (6010C)											
Iron, diss.		0.24	0.12	4.80	5.97	0.11	0.49	11.7	9.01	9.85	11.0
Lead, diss.	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Field Parameters											
pH	6.5 - 9	6.78	7.05	6.60	6.74	6.59	6.77	6.79	6.89	6.70	6.83
Temperature (°C)	--	17.43	17.79	16.96	17.64	17.50	17.36	18.44	17.16	17.59	16.33
Specific Conductivity (µS/cm)	--	2139.9	2785.2	1178.9	1230.7	2325.2	1520.4	1639.7	1760.6	1655.4	2071.7
Dissolved Oxygen (mg/l)	--	0.10	0.14	0.11	0.05	0.66	0.23	0.39	0.35	0.04	0.06
Turbidity (NTU)	--	75.80	36.26	18.32	224.91	48.64	113.04	8.87	0.00	23.46	4.15
ORP (mV)	--	60.2	199.7	-69.3	-91.4	131.2	149.8	-81.1	-117.7	-105.1	-100.5

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficent Water for Sampling
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 2
Groundwater Analytical Results (August, November, December 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-6		MW-7		MW-8		MW-11		MW-12	
		Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16
BTEX (mg/l)											
Benzene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
PNAs (mg/l)											
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	NS	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	NS	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	**0.00016**	**0.00017**	<0.00013	<0.00013	<0.00013	NS	<0.00013	<0.00013	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	NS	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	**0.00022**	<0.00018	<0.00018	<0.00018	<0.00018	NS	<0.00018	<0.00018	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	**0.00018**	<0.00017	<0.00017	<0.00017	<0.00017	NS	<0.00017	<0.00017	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	NS	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	NS	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	NS	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	NS	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	NS	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	NS	<0.0003	<0.0003	<0.0003	<0.0003
Naphthalene	0.14	<0.01	<0.01	<0.01	<0.01	<0.01	NS	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	NS	<0.002	<0.002	<0.002	<0.002
Total Metals (6010C)											
Iron		7.14	5.91	0.15	0.50	2.32	NS	0.12	3.22	0.12	0.13
Lead	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Dissolved Metals (6010C)											
Iron, diss.		7.24	6.54	<0.05	<0.05	2.37	NS	0.09	3.35	<0.05	<0.05
Lead, diss.	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005
Field Parameters											
pH	6.5 - 9	6.82	7.02	6.99	6.96	6.40	NS	6.43	6.80	6.77	7.13
Temperature (°C)	--	19.28	17.05	17.99	17.02	18.93	NS	21.38	18.60	17.86	17.76
Specific Conductivity (µS/cm)	--	1097.0	897.43	2636.7	2530.8	1142.3	NS	856.29	1033.2	2628.2	2441.6
Dissolved Oxygen (mg/l)	--	0.07	0.05	0.47	0.39	0.19	NS	0.08	0.04	2.36	1.78
Turbidity (NTU)	--	3.77	0.02	18.53	101.13	33.74	NS	61.28	43.05	20.30	25.58
ORP (mV)	--	-96.6	-191.1	42.8	243.8	-106.5	NS	69.8	-85.4	64.0	83.4

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
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BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 2
Groundwater Analytical Results (August, November, December 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-13		MW-14		MW-15		MW-16		MW-17	
		Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16
BTEX (mg/l)											
Benzene	0.005	<0.005	<0.005	<0.005	<0.005	**0.012**	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	**0.0068**	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	<0.005	<0.005	**0.0164**	**0.0104**	<0.005	<0.005	<0.005	<0.005
PNAs (mg/l)											
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	**0.00164**	**0.00074**	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	**0.024**	**0.0008**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	**0.00372**	**0.00149**	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	**0.00288**	**0.00108**	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	**0.0028**	**0.0011**	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	<0.0015	<0.0015	**0.0034**	**0.0015**	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	**0.0005**	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	<0.002	<0.002	**0.01**	**0.01**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	**0.0029**	**0.0011**	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Naphthalene	0.14	<0.01	<0.01	<0.01	<0.01	**0.058**	**0.032**	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	0.21	<0.002	<0.002	**0.007**	**0.006**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Metals (6010C)											
Iron		1.26	<0.05	9.81	5.17	14.4	8.96	1.22	0.40	1.1	0.38
Lead	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Metals (6010C)											
Iron, diss.		<0.05	<0.05	8.12	5.53	12.7	9.41	0.10	0.20	<0.05	<0.05
Lead, diss.	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Field Parameters											
pH	6.5 - 9	6.73	6.96	6.85	7.01	6.64	6.97	6.49	6.92	6.75	6.82
Temperature (°C)	--	20.89	14.43	18.76	17.02	18.93	17.77	17.20	16.82	17.54	15.62
Specific Conductivity (µS/cm)	--	4338.2	3119.8	1920.9	1757.6	1704.7	1805.1	1251.3	1389.3	1103.0	1244.9
Dissolved Oxygen (mg/l)	--	1.35	0.25	0.02	0.20	0.10	0.09	0.58	0.97	2.96	4.04
Turbidity (NTU)	--	155.19	10.01	35.17	4.80	24.71	35.09	264.09	6.06	154.30	21.39
ORP (mV)	--	167.7	233.2	-85.4	-132.2	-73.2	-45.5	107.2	85.8	123.2	208.8

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficent Water for Sampling
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 2
Groundwater Analytical Results (August, November, December 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective[1]	MW-18		MW-19		MW-20		MW-30S			MW-30D		
		Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Aug-16	Nov-16	Dec-16	Aug-16	Nov-16	Dec-16
BTEX (mg/l)													
Benzene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
PNAs (mg/l)													
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	**0.00014**	<0.00013	<0.00013	**0.00015**	<0.00013
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.0002**	<0.0002
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	**0.00025**	<0.00018	<0.00018	**0.00028**	<0.00018
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	**0.00027**	<0.00017	<0.00017	**0.0003**	<0.00017
Benzo[ghi]perylene	0.21	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	**0.0003**	<0.0003	<0.0003	**0.0003**	<0.0003
Naphthalene	0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Metals (6010C)													
Iron		4.96	0.88	1.53	2.84	0.11	0.05	0.99	1.28	<0.05	0.56	0.36	0.11
Lead	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Metals (6010C)													
Iron, diss.		0.95	0.68	0.34	0.51	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead, diss.	0.0075	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Field Parameters													
pH	6.5 - 9	7.00	7.07	6.98	7.07	7.05	6.70	6.64	6.92	6.97	6.90	6.02	7.12
Temperature (°C)	--	19.09	16.85	19.07	17.25	17.58	14.73	17.89	17.87	13.93	15.55	15.41	13.42
Specific Conductivity (µS/cm)	--	1304.3	1373.3	1729.6	1755.8	1025.4	1073.14	268.2	1766.1	1810.7	1444.4	1626.5	1522.8
Dissolved Oxygen (mg/l)	--	1.75	1.92	0.94	1.22	0.59	0.22	1.81	2.44	3.46	1.33	0.78	1.53
Turbidity (NTU)	--	104.33	4.24	86.92	143.99	136.78	2.20	113.75	502.26	5.53	55.79	110.88	8.39
ORP (mV)	--	6.0	49.9	15.6	65.2	-3.5	152.19	199.0	227.8	183.8	181.7	247.2	166.9

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficent Water for Sampling
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-C					MW-1				MW-2			
		Nov-12	Jun-14	May-15	Aug-16	Nov-16	Aug-01	May-15	Aug-16	Nov-16	Aug-01	May-15	Aug-16	Nov-16
BTEX (mg/l)														
Benzene	0.005	<	<0001	<0001	<0.005	<0.005	<0.005	**0.0072**	**0.0078**	**0.0104**	<0.005	<0001	<0.005	<0.005
Ethylbenzene	0.7	<	<0.001	<0.001	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005
Toluene	1	<	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<	<0.003	<0.003	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005
PNAs (mg/l)														
Acenaphthene	0.42	NA	<0.00005	<0.00005	<0.01	<0.01	<0.01	**0.00034**	<0.01	<0.01	<0.01	<0.00005	<0.01	<0.01
Acenaphthylene	0.21	NA	<0.00005	<0.00005	<0.01	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.01	<0.00005	<0.01	<0.01
Anthracene	2.1	NA	<0.00005	<0.00005	<0.005	<0.005	<0.005	**0.000056**	<0.005	<0.005	<0.005	<0.00005	<0.005	<0.005
Benzo(a)anthrscene	0.00013	NA	<0.00005	<0.00005	<0.00013	<0.00013	<0.00013	<0.00005	<0.00013	**0.00016**	<0.00013	<0.00005	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	NA	<0.00005	<0.00005	<0.0002	<0.0002	<0.0002	<0.00005	<0.0002	<0.0002	<0.0002	<0.00005	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	NA	<0.00005	<0.00005	<0.00018	<0.00018	<0.00018	<0.00005	<0.00018	<0.00018	<0.00018	<0.00005	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	NA	<0.00005	<0.00005	<0.00017	<0.00017	<0.00017	<0.00005	<0.00017	**0.00022**	<0.00017	<0.00005	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	NA	<0.00005	<0.00005	<0.0004	<0.0004	<0.0004	<0.00005	<0.0004	<0.0004	<0.0004	<0.00005	<0.0004	<0.0004
Chrysene	0.0015	NA	<0.00005	<0.00005	<0.0015	<0.0015	<0.0015	<0.00005	<0.0015	<0.0015	<0.0015	<0.00005	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	NA	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003
Fluoranthene	0.28	NA	<0.00005	<0.00005	<0.002	<0.002	<0.002	**0.00011**	<0.002	<0.002	<0.002	<0.00005	<0.002	<0.002
Fluorene	0.28	NA	<0.00005	<0.00005	<0.002	<0.002	<0.002	**0.00041**	<0.002	<0.002	<0.002	<0.00005	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	NA	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003
Naphthalene	0.14	NA	<0.00025	0.00094	<0.01	<0.01	<0.01	**0.0003**	<0.01	<0.01	<0.01	<0.00025	<0.01	<0.01
Phenanthrene	0.21	NA	<0.00005	<0.00005	<0.005	<0.005	<0.005	**0.00018**	<0.005	<0.005	<0.005	<0.00005	<0.005	<0.005
Pyrene	0.21	NA	<0.00005	<0.00005	<0.002	<0.002	<0.002	**0.00011**	<0.002	<0.002	<0.002	<0.00005	<0.002	<0.002
Total Metals (6010C)														
Iron		NA	NA	10	3.57	1.52	NA	6.6	5.97	6.81	NA	1.7	0.24	0.44
Lead	0.0075	NA	<	<	<0.005	<0.005	NA	<	<0.005	<0.005	NA	<	<0.005	<0.005
Dissolved Metals (6010C)														
Iron, diss.		NA	NA	NA	0.24	0.12	NA	NA	4.80	5.97	NA	NA	0.11	0.49
Lead, diss.	0.0075	NA	NA	NA	<0.005	<0.005	NA	NA	<0.005	<0.005	NA	NA	<0.005	<0.005
Field Parameters														
pH	6.5 - 9	NA	7.30	NA	6.78	7.05	NA	7.40	6.60	6.74	NA	6.80	6.59	6.77
Temperature (°C)	--	NA	NA	NA	17.43	17.79	NA	NA	16.96	17.64	NA	NA	17.50	17.36
Specific Conductivity (µS/cm)	--	NA	NA	NA	2,139.9	2,785.2	NA	NA	1,178.9	1,230.7	NA	NA	2,325.2	1,520.4
Dissolved Oxygen (mg/l)	--	NA	NA	NA	0.10	0.14	NA	NA	0.11	0.05	NA	NA	0.66	0.23
Turbidity (NTU)	--	NA	NA	NA	75.80	36.26	NA	NA	18.32	224.91	NA	NA	48.64	113.04
ORP (mV)	--	NA	NA	NA	50.2	199.7	NA	NA	-69.3	-91.4	NA	NA	131.2	149.8

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
NA = Not Analyzed
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective[1]	MW-3A											
		Aug-01	May-02	Apr-03	Dec-03	Apr-04	Jun-05	Apr-06	Jul-06	Mar-07	Mar-08	Feb-09	Nov-12
BTEX (mg/l)													
Benzene	0.005	0.0382	<0.005	**0.408**	**0.586**	**0.172**	**0.0242**	**0.0231**	**0.0204**	**0.0109**	<0.005	<0.005	**0.03**
Ethylbenzene	0.7	<0.005	<0.005	**0.0195**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<
Toluene	1	<0.005	<0.005	**0.0099**	**0.0224**	**0.012**	<0.005	**0.0238**	<0.005	<0.005	<0.005	<0.005	<
Xylene, Total	10	**0.0059**	<0.005	**0.0232**	**0.0416**	**0.0236**	<0.005	<0.005	**0.0051**	<0.005	<0.005	<0.005	<
PNAs (mg/l)													
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	0.00015	<0.00013	<0.00013	**0.00022**	**0.00037**	NA
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.0004**	NA
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	**0.00036**	NA
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	**0.00021**	**0.00046**	NA
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.004	NA
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	NA
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	NA
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.003**	NA
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	NA
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	**0.0003**	NA
Naphthalene	0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	NA
Total Metals (6010C)													
Iron		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0075	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (6010C)													
Iron, diss.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, diss.	0.0075	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters													
pH	6.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (°C)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
NA = Not Analyzed
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective[1]	MW-3A					MW-4	MW-5						
		Jun-14	Aug-14	May-15	Aug-16	Nov-16	Aug-01	Aug-01	May-02	Apr-03	Dec-03	Apr-04	Jun-05	Apr-06
BTEX (mg/l)														
Benzene	0.005	**0.031**	**0.063**	<0.001	**0.0711**	**0.0762**	<0.005	**0.235**	**0.192**	**0.0744**	**0.0299**	**0.065**	**0.0534**	**0.018**
Ethylbenzene	0.7	<0.001	<0.001	<0001	<0.005	<0.005	<0.005	**0.301**	**0.165**	**0.0324**	**0.0272**	**0.0284**	**0.129**	**0.0154**
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0135**	**0.0128**	**0.0053**	<0.005	<0.005	**0.0059**	<0.005
Xylene, Total	10	**0.0036**	**0.013**	<0.003	<0.005	<0.005	**0.0057**	**0.661**	**0.214**	**0.190**	**0.0808**	**0.148**	**0.148**	**0.0203**
PNAs (mg/l)														
Acenaphthene	0.42	**0.0014**	**0.0013**	**0.0017**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	**0.00012**	**0.0002**	**0.00022**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	**0.00024**	**0.0002**	**0.00018**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	**0.0001**	**0.000016**	<0.00005	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	**0.00016**	<0.00005	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	**0.0003**	<0.00005	<0.00005	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	**0.00023**	<0.00005	<0.00005	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	**0.000083**	<0.00005	<0.00005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	**0.00018**	**0.000025**	<0.00005	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.00005	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	**0.00065**	**0.00012**	**0.000057**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	**0.0017**	**0.0016**	**0.0021**	**0.003**	**0.004**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.003**
Indeno(1,2,3-cd)pyrene	0.00043	**0.00017**	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Naphthalene	0.14	**0.0011**	**0.0014**	**0.0032**	<0.01	<0.01	<0.01	**0.051**	**0.016**	<0.01	**0.012**	<0.01	**0.018**	**0.331**
Phenanthrene	0.21	**0.00073**	**0.0012**	**0.0013**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	0.21	**0.00052**	**0.00012**	0.000071	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Metals (6010C)														
Iron		NA	NA	7	11.8	8.98	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0075	NA	NA	<	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (6010C)														
Iron, diss.		NA	NA	NA	11.7	9.01	NA	NA	NA	NA	NA	NA	NA	NA
Lead, diss.	0.0075	NA	NA	NA	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters														
pH	6.5 - 9	NA	NA	6.90	6.79	6.89	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (°C)	--	NA	NA	NA	18.44	17.16	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	NA	NA	NA	1,639.7	1,760.6	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	NA	NA	NA	0.39	0.35	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	--	NA	NA	NA	8.87	0.00	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	--	NA	NA	NA	-81.1	-117.7	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
NA = Not Analyzed
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-5									MW-6			
		Jul-06	Mar-07	Mar-08	Feb-09	Apr-13	May-12	Jun-14	Aug-15	Nov-16	Aug-01	May-02	Apr-03	Dec-03
BTEX (mg/l)														
Benzene	0.005	**0.0292**	**0.0392**	**0.0184**	**0.0122**	**0.0744**	**0.192**	**0.0034**	<0.005	<0.005	**0.013**	<0.005	<0.005	**0.0124**
Ethylbenzene	0.7	**0.0273**	**0.0148**	**0.0639**	**0.057**	**0.324**	**0.165**	**0.0065**	**0.0057**	<0.005	<0.005	<0.005	<0.005	**0.0058**
Toluene	1	<0.005	<0.005	<0.005	<0.005	**0.0053**	**0.0128**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.021**
Xylene, Total	10	**0.0444**	**0.0274**	**0.0179**	**0.149**	**0.19**	**0.214**	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0251**
PNAs (mg/l)														
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.000005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.000005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.00011**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	**0.00032**	<0.00013	<0.00013	<0.00013	**0.0002**	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	**0.0042**
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	**0.0004**	<0.0002	<0.0002	<0.0002	**0.00054**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.0064**
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	**0.00035**	<0.00018	<0.00018	<0.00018	**0.001**	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	**0.006**
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	**0.00021**	<0.00017	<0.00017	<0.00017	**0.00091**	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	**0.0055**
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	**0.00034**	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	**0.0049**
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	**0.0003**	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	**0.006**
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.000005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	**0.001**
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.00063**	<0.002	<0.002	<0.002	<0.002	<0.002	**0.018**
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.000005	**0.002**	<0.002	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	**0.00055**	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	**0.0052**
Naphthalene	0.14	<0.01	<0.01	<0.01	**0.03**	**0.051**	**0.016**	**0.00052**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.00022**	<0.005	<0.005	<0.005	<0.005	<0.005	**0.02**
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.00092**	<0.002	<0.002	<0.002	<0.002	<0.002	**0.013**
Total Metals (6010C)														
Iron		NA	NA	NA	NA	NA	NA	NA	9.75	10.4	NA	NA	NA	NA
Lead	0.0075	NA	NA	NA	NA	NA	NA	NA	<0.005	<0.005	NA	NA	NA	NA
Dissolved Metals (6010C)														
Iron, diss.		NA	NA	NA	NA	NA	NA	NA	9.85	11.0	NA	NA	NA	NA
Lead, diss.	0.0075	NA	NA	NA	NA	NA	NA	NA	<0.005	<0.005	NA	NA	NA	NA
Field Parameters														
pH	6.5 - 9	NA	NA	NA	NA	NA	NA	NA	6.70	6.83	NA	NA	NA	NA
Temperature (°C)	--	NA	NA	NA	NA	NA	NA	NA	17.59	16.33	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	NA	NA	NA	NA	NA	NA	NA	1,655.4	2,071.7	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	NA	NA	NA	NA	NA	NA	NA	0.04	0.06	NA	NA	NA	NA
Turbidity (NTU)	--	NA	NA	NA	NA	NA	NA	NA	23.46	4.15	NA	NA	NA	NA
ORP (mV)	--	NA	NA	NA	NA	NA	NA	NA	-105.1	-100.5	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
NA = Not Analyzed
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-6											
		May-04	Jun-05	Apr-06	Jul-06	Mar-07	Mar-08	Feb-09	May-12	Jun-14	Aug-14	May-15	Jul-15
BTEX (mg/l)													
Benzene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.0001	<0001	<0001
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0078**	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003	<0.003
PNAs (mg/l)													
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.00073**	**0.00054**	**0.00006**	**0.000073**
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.00005	<0.00005	<0.00005	**0.000082**
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.00047**	<0.00005	0.00008	**0.00024**
Benzo(a)anthracene	0.00013	**0.00168**	**0.0009**	**0.0004**	0.0004	<0.00013	**0.00669**	**0.001**	<0.00013	**0.0025**	**0.00086**	**0.000058**	**0.0015**
Benzo(a)pyrene	0.0002	**0.0016**	**0.0015**	**0.0006**	0.0006	<0.002	**0.0098**	**0.0032**	<0.0002	**0.0032**	**0.00093**	**0.000079**	**0.0029**
Benzo(b)fluoranthene	0.00018	**0.0017**	**0.0032**	**0.00075**	0.00075	0.00021	**0.0122**	**0.00349**	<0.00018	**0.0056**	**0.0017**	**0.00013**	**0.0057**
Benzo(k)fluoranthene	0.00017	**0.00199**	**0.00166**	**0.00046**	0.00046	0.0002	**0.00889**	**0.00312**	<0.00017	**0.0036**	**0.00096**	<0.00005	**0.0013**
Benzo(ghi)perylene	0.21	**0.0014**	**0.0024**	**0.0006**	0.0006	<0.0004	**0.0097**	**0.0035**	<0.0004	**0.0016**	**0.00055**	**0.00012**	**0.0041**
Chrysene	0.0015	**0.0026**	**0.0023**	<0.0015	<0.0015	<0.0015	**0.0151**	**0.0028**	<0.0015	**0.00322**	**0.0015**	**0.0001**	**0.0025**
Dibenzo(a,h)anthracene	0.0003	**0.0005**	**0.0008**	<0.0003	<0.0003	<0.0003	**0.0019**	**0.0007**	<0.0003	**0.000092**	<0.00005	<0.00005	**0.00012**
Fluoranthene	0.28	**0.011**	**0.003**	**0.002**	<0.002	<0.002	**0.033**	**0.006**	<0.002	**0.0086**	**0.0045**	**0.00054**	**0.0052**
Fluorene	0.28	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	**0.00059**	**0.00083**	**0.0001**	**0.00011**
Indeno(1,2,3-cd)pyrene	0.00043	**0.0016**	**0.0024**	**0.0006**	<0.0003	<0.0003	**0.0098**	**0.0033**	<0.0003	**0.0028**	**0.00074**	**0.000093**	**0.003**
Naphthalene	0.14	<0.01	<0.01	<0.01	0.0006	<0.01	<0.01	<0.01	<0.01	<0.00025	<0.00025	<0.00025	<0.00025
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	**0.008**	<0.005	<0.005	**0.00077**	**0.0027**	**0.000074**	**0.0007**
Pyrene	0.21	**0.007**	**0.002**	<0.002	<0.002	<0.002	**0.022**	**0.003**	<0.002	**0.005**	**0.003**	**0.00038**	**0.004**
Total Metals (6010C)													
Iron		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.2	NA
Lead	0.0075	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<	NA
Dissolved Metals (6010C)													
Iron, diss.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, diss.	0.0075	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters													
pH	6.5 - 9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.70	NA
Temperature (°C)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
NA = Not Analyzed
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective[1]	MW-6		MW-7										
		Aug-16	Nov-16	Aug-01	May-02	Apr-03	Dec-03	Apr-04	Jun-05	Apr-06	Jul-06	Mar-07	Mar-08	Feb-09
BTEX (mg/l)														
Benzene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0145**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0054**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0101**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	**0.0056**	<0.005	<0.005	**0.0225**	<0.005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
PNAs (mg/l)														
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	**0.00016**	**0.00017**	**0.00015**	<0.00013	<0.00013	<0.005	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	**0.0004**	<0.0002	<0.0002	<0.00013	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	**0.00022**	<0.00018	**0.00072**	<0.00018	<0.00018	**0.00023**	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	**0.00018**	<0.00017	**0.00056**	<0.00017	<0.00017	**0.00023**	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	**0.0005**	<0.0004	<0.0004	<0.00017	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0004	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0015	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	0.0004	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Naphthalene	0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Metals (6010C)														
Iron		7.14	5.91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0075	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (6010C)														
Iron, diss.		7.24	6.54	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, diss.	0.0075	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters														
pH	6.5 - 9	6.82	7.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (°C)	--	19.28	17.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	1,097.0	897.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	0.07	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	--	3.77	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	--	-96.6	-191.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
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BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
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TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-7		MW-8										
		Aug-16	Nov-16	Aug-01	May-02	Apr-03	Dec-03	Apr-04	Jun-05	Apr-06	Jul-06	Mar-07	Mar-08	Feb-09
BTEX (mg/l)														
Benzene	0.005	<0.005	<0.005	**0.166**	**0.075**	**0.106**	**0.236**	**0.127**	**0.059**	**0.0188**	**0.0124**	**0.0064**	<0.005	<0.005
Ethylbenzene	0.7	<0.005	<0.005	**0.0429**	**0.0472**	**0.0744**	**3.17**	**0.538**	**0.619**	**0.569**	**0.452**	**0.374**	**0.197**	**0.515**
Toluene	1	<0.005	<0.005	**0.0185**	**0.0095**	**0.0164**	**0.073**	**0.0198**	**1.09**	**0.012**	**0.0088**	**0.0101**	<0.005	<0.005
Xylene, Total	10	<0.005	<0.005	**0.0354**	**0.023**	**0.057**	**8.53**	**1.41**	**0.912**	**1.07**	**0.83**	**0.438**	**0.112**	**0.178**
PNAs (mg/l)														
Acenaphthene	0.42	<0.01	<0.01	<0.01	<0.01	<0.01	**0.642**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.029**
Acenaphthylene	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.030	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	2.1	<0.005	<0.005	<0.005	<0.005	<0.005	**0.102**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.030	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	**0.00032**
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.030	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.0002**
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.030	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.030	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	**0.00023**
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.030	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.030	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.030	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Fluoranthene	0.28	<0.002	<0.002	<0.002	<0.002	<0.002	**0.042**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	0.28	<0.002	<0.002	**0.002**	<0.002	<0.002	**1.58**	**0.006**	**0.002**	<0.002	**0.004**	<0.002	<0.002	**0.032**
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.030	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Naphthalene	0.14	<0.01	<0.01	**0.018**	**0.01**	**0.042**	**31.5**	**0.42**	**0.356**	<0.01	**0.426**	**0.274**	**0.091**	**0.475**
Phenanthrene	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	**1.44**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.03**
Pyrene	0.21	<0.002	<0.002	<0.002	<0.002	<0.002	**0.15**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**0.003**
Total Metals (6010C)														
Iron		0.15	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0075	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (6010C)														
Iron, diss.		<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, diss.	0.0075	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters														
pH	6.5 - 9	6.99	6.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Temperature (°C)	--	17.99	17.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	2,636.7	2,530.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	0.47	0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	--	18.53	101.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	--	42.8	243.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
NA = Not Analyzed
BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-8					MW-9	MW-10	MW-11						
		Nov-12	Jun-14	May-15	Aug-16	Nov-16	Aug-01	Aug-01	Aug-09	Feb-10	Mar-11	Sep-12	Nov-12	May-15	Aug-16
BTEX (mg/l)															
Benzene	0.005	<	<0.001	<0.001	<0.005	NS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<	<0.001	<0.005
Ethylbenzene	0.7	<	**0.046**	**0.059**	<0.005	NS	<0.005	<0.005	**0.0671**	**0.0581**	<0.005	<0.005	<	<0.001	<0.005
Toluene	1	<	<0.005	<0.005	<0.005	NS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<	<0.005	<0.005
Xylene, Total	10	<	<0.003	**0.015**	<0.005	NS	<0.005	<0.005	**0.296**	**0.286**	<0.005	<0.005	<	<0.003	<0.005
PNAs (mg/l)															
Acenaphthene	0.42	NA	<0.00005	<0.00005	<0.01	NS	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	<0.00005	<0.01
Acenaphthylene	0.21	NA	<0.00005	<0.00005	<0.01	NS	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	<0.00005	<0.01
Anthracene	2.1	NA	<0.00005	<0.00005	<0.005	NS	<0.005	<0.005	<0.005	<0.005	NA	NA	NA	<0.00005	<0.005
Benzo(a)anthracene	0.00013	NA	<0.00005	<0.00005	<0.00013	NS	<0.00013	<0.00013	<0.00013	<0.00013	NA	NA	NA	<0.00005	<0.00013
Benzo(a)pyrene	0.0002	NA	<0.00005	<0.00005	<0.0002	NS	<0.0002	<0.0002	<0.0002	<0.0002	NA	NA	NA	<0.00005	<0.0002
Benzo(b)fluoranthene	0.00018	NA	<0.00005	<0.00005	<0.00018	NS	<0.00018	<0.00018	<0.00018	<0.00018	NA	NA	NA	<0.00005	<0.00018
Benzo(k)fluoranthene	0.00017	NA	<0.00005	<0.00005	<0.00017	NS	<0.00017	<0.00017	<0.00017	<0.00017	NA	NA	NA	<0.00005	<0.00017
Benzo(ghi)perylene	0.21	NA	<0.00005	<0.00005	<0.0004	NS	<0.0004	<0.0004	<0.0004	<0.0004	NA	NA	NA	<0.00005	<0.0004
Chrysene	0.0015	NA	<0.00005	<0.00005	<0.0015	NS	<0.0015	<0.0015	<0.0015	<0.0015	NA	NA	NA	<0.00005	<0.0015
Dibenzo(a,h)anthracene	0.0003	NA	<0.00005	<0.00005	<0.0003	NS	<0.0003	<0.0003	<0.0003	<0.0003	NA	NA	NA	<0.00005	<0.0003
Fluoranthene	0.28	NA	<0.00005	<0.00005	<0.002	NS	<0.002	<0.002	<0.002	<0.002	NA	NA	NA	<0.00005	<0.002
Fluorene	0.28	NA	<0.00005	<0.00005	<0.002	NS	<0.002	<0.002	<0.002	<0.002	NA	NA	NA	<0.00005	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	NA	<0.00005	<0.00005	<0.0003	NS	<0.0003	<0.0003	<0.0003	<0.0003	NA	NA	NA	<0.00005	<0.0003
Naphthalene	0.14	NA	<0.00025	<0.00025	<0.01	NS	<0.01	<0.01	**0.017**	**0.031**	NA	NA	NA	<0.00025	<0.01
Phenanthrene	0.21	NA	**0.00021**	**0.086**	<0.005	NS	<0.005	<0.005	<0.005	<0.005	NA	NA	NA	<0.00005	<0.005
Pyrene	0.21	NA	<0.00005	**0.000072**	<0.002	NS	<0.002	<0.002	<0.002	<0.002	NA	NA	NA	<0.00005	<0.002
Total Metals (6010C)															
Iron		NA	NA	18	2.32	NS	NA	NA	NA	NA	NA	NA	NA	0.35	0.12
Lead	0.0075	NA	NA	0.0094	<0.005	NS	NA	NA	NA	NA	NA	NA	NA	<	<0.005
Dissolved Metals (6010C)															
Iron, diss.		NA	NA	NA	2.37	NS	NA	NA	NA	NA	NA	NA	NA	NA	0.09
Lead, diss.	0.0075	NA	NA	NA	<0.005	NS	NA	NA	NA	NA	NA	NA	NA	NA	<0.005
Field Parameters															
pH	6.5 - 9	NA	NA	6.80	6.40	NS	NA	NA	NA	NA	NA	NA	NA	7.10	6.43
Temperature (°C)	--	NA	NA	NA	18.93	NS	NA	NA	NA	NA	NA	NA	NA	NA	21.38
Specific Conductivity (µS/cm)	--	NA	NA	NA	1,142.3	NS	NA	NA	NA	NA	NA	NA	NA	NA	856.29
Dissolved Oxygen (mg/l)	--	NA	NA	NA	0.19	NS	NA	NA	NA	NA	NA	NA	NA	NA	0.08
Turbidity (NTU)	--	NA	NA	NA	33.74	NS	NA	NA	NA	NA	NA	NA	NA	NA	61.28
ORP (mV)	--	NA	NA	NA	-106.5	NS	NA	NA	NA	NA	NA	NA	NA	NA	69.8

Notes:
[1] 35 IAC 620
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BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-11	MW-12					MW-12		MW-13				
		Nov-16	Aug-09	Feb-10	Mar-11	Sep-12	May-15	Aug-16	Nov-16	Aug-09	Feb-10	Mar-11	Sep-12	Nov-12
BTEX (mg/l)														
Benzene	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<
Ethylbenzene	0.7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<
Xylene, Total	10	<0.005	**0.008**	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	**0.0086**	<0.005	<0.005	<0.005	<
PNAs (mg/l)														
Acenaphthene	0.42	<0.01	<0.01	<0.01	NA	NA	<0.00005	<0.01	<0.01	<0.01	<0.01	NA	NA	NA
Acenaphthylene	0.21	<0.01	<0.01	<0.01	NA	NA	<0.00005	<0.01	<0.01	<0.01	<0.01	NA	NA	NA
Anthracene	2.1	<0.005	<0.005	<0.005	NA	NA	<0.00005	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
Benzo(a)anthracene	0.00013	<0.00013	<0.00013	<0.00013	NA	NA	<0.00005	<0.00013	<0.00013	<0.00013	<0.00013	NA	NA	NA
Benzo(a)pyrene	0.0002	<0.0002	<0.0002	<0.0002	NA	NA	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	NA	NA	NA
Benzo(b)fluoranthene	0.00018	<0.00018	<0.00018	<0.00018	NA	NA	<0.00005	<0.00018	<0.00018	<0.00018	<0.00018	NA	NA	NA
Benzo(k)fluoranthene	0.00017	<0.00017	<0.00017	<0.00017	NA	NA	<0.00005	<0.00017	<0.00017	<0.00017	<0.00017	NA	NA	NA
Benzo(ghi)perylene	0.21	<0.0004	<0.0004	<0.0004	NA	NA	<0.00005	<0.0004	<0.0004	<0.0004	<0.0004	NA	NA	NA
Chrysene	0.0015	<0.0015	<0.0015	<0.0015	NA	NA	<0.00005	<0.0015	<0.0015	<0.0015	<0.0015	NA	NA	NA
Dibenzo(a,h)anthracene	0.0003	<0.0003	<0.0003	<0.0003	NA	NA	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	NA	NA	NA
Fluoranthene	0.28	<0.002	<0.002	<0.002	NA	NA	<0.00005	<0.002	<0.002	<0.002	<0.002	NA	NA	NA
Fluorene	0.28	<0.002	<0.002	<0.002	NA	NA	<0.00005	<0.002	<0.002	<0.002	<0.002	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	<0.0003	<0.0003	NA	NA	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	NA	NA	NA
Naphthalene	0.14	<0.01	<0.01	<0.01	NA	NA	**0.00069**	<0.01	<0.01	<0.01	<0.01	NA	NA	NA
Phenanthrene	0.21	<0.005	<0.005	<0.005	NA	NA	<0.00005	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
Pyrene	0.21	<0.002	<0.002	<0.002	NA	NA	<0.00005	<0.002	<0.002	<0.002	<0.002	NA	NA	NA
Total Metals (6010C)														
Iron		3.22	NA	NA	NA	NA	<	0.12	0.13	NA	NA	NA	NA	NA
Lead	0.0075	<0.005	NA	NA	NA	NA	<	<0.005	<0.005	NA	NA	NA	NA	NA
Dissolved Metals (6010C)														
Iron, diss.		3.35	NA	NA	NA	NA	NA	<0.05	<0.05	NA	NA	NA	NA	NA
Lead, diss.	0.0075	<0.005	NA	NA	NA	NA	NA	<0.005	<0.005	NA	NA	NA	NA	NA
Field Parameters														
pH	6.5 - 9	6.80	NA	NA	NA	NA	7.80	6.77	7.13	NA	NA	NA	NA	NA
Temperature (°C)	–	18.60	NA	NA	NA	NA	NA	17.86	17.76	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	–	1,033.2	NA	NA	NA	NA	NA	2,628.2	2,441.6	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	–	0.04	NA	NA	NA	NA	NA	2.36	1.78	NA	NA	NA	NA	NA
Turbidity (NTU)	–	43.05	NA	NA	NA	NA	NA	20.30	25.58	NA	NA	NA	NA	NA
ORP (mV)	–	-85.4	NA	NA	NA	NA	NA	64.0	83.4	NA	NA	NA	NA	NA

Notes:
[1] 35 IAC 620
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BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-13				MW-14								
		Aug-14	May-15	Aug-16	Nov-16	Aug-09	Feb-10	Jan-11	Mar-11	Sep-12	Nov-12	Jun-14	Aug-14	May-15
BTEX (mg/l)														
Benzene	0.005	<0.001	<0.001	<0.005	<0.005	**0.0337**	**0.122**	**0.0595**	**0.0304**	<0.005	**0.0076**	**0.0017**	**0.0055**	<0.001
Ethylbenzene	0.7	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<	<0.001	<0.001	<0.001
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<	<0.005	<0.005	<0.005
Xylene, Total	10	<0.003	<0.003	<0.005	<0.005	**0.0087**	<0.005	<0.005	<0.005	<0.005	<	<0.003	**0.003**	<0.003
PNAs (mg/l)														
Acenaphthene	0.42	<0.00005	<0.00005	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	**0.0018**	**0.001**	**0.00022**
Acenaphthylene	0.21	<0.00005	<0.00005	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	**0.00085**	<0.00005	<0.00005
Anthracene	2.1	<0.00005	<0.00005	<0.005	<0.005	<0.005	<0.005	NA	NA	NA	NA	**0.0034**	**0.0017**	**0.00041**
Benzo(a)anthracene	0.00013	<0.00005	<0.00005	<0.00013	<0.00013	<0.00013	<0.00013	NA	NA	NA	NA	**0.028**	**0.006**	**0.00017**
Benzo(a)pyrene	0.0002	<0.00005	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	NA	NA	NA	NA	**0.041**	**0.0088**	**0.00014**
Benzo(b)fluoranthene	0.00018	<0.00005	<0.00005	<0.00018	<0.00018	<0.00018	<0.00018	NA	NA	NA	NA	**0.085**	**0.018**	**0.00026**
Benzo(k)fluoranthene	0.00017	<0.00005	<0.00005	<0.00017	<0.00017	<0.00017	<0.00017	NA	NA	NA	NA	**0.045**	**0.0096**	**0.000079**
Benzo(ghi)perylene	0.21	<0.00005	<0.00005	<0.0004	<0.0004	<0.0004	<0.0004	NA	NA	NA	NA	**0.022**	**0.0056**	**0.00014**
Chrysene	0.0015	<0.00005	<0.00005	<0.0015	<0.0015	<0.0015	<0.0015	NA	NA	NA	NA	**0.048**	**0.016**	**0.00032**
Dibenzo(a,h)anthracene	0.0003	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	NA	NA	NA	NA	**0.0011**	<0.00005	<0.00005
Fluoranthene	0.28	<0.00005	<0.00005	<0.002	<0.002	<0.002	<0.002	NA	NA	NA	NA	**0.12**	**0.0028**	**0.0058**
Fluorene	0.28	<0.00005	<0.00005	<0.002	<0.002	<0.002	<0.002	NA	NA	NA	NA	**0.0026**	**0.0079**	**0.00079**
Indeno(1,2,3-cd)pyrene	0.00043	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	NA	NA	NA	NA	**0.038**	<0.00005	**0.00011**
Naphthalene	0.14	<0.00025	<0.00025	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.0012	**0.015**	<0.00025
Phenanthrene	0.21	<0.00005	<0.00005	<0.005	<0.005	<0.005	<0.005	NA	NA	NA	NA	**0.012**	<0.00005	**0.0049**
Pyrene	0.21	<0.00005	<0.00005	<0.002	<0.002	<0.002	<0.002	NA	NA	NA	NA	**0.078**	**0.024**	**0.0033**
Total Metals (6010C)														
Iron		NA	3	1.26	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	10
Lead	0.0075	NA	0.0076	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	<
Dissolved Metals (6010C)														
Iron, diss.		NA	NA	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, diss.	0.0075	NA	NA	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters														
pH	6.5 - 9	NA	7.40	6.73	6.96	NA	NA	NA	NA	NA	NA	NA	NA	7.30
Temperature (°C)	--	NA	NA	20.89	14.43	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specific Conductivity (µS/cm)	--	NA	NA	4,338.2	3,119.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Oxygen (mg/l)	--	NA	NA	1.35	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)	--	NA	NA	155.19	10.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORP (mV)	--	NA	NA	167.7	233.2	NA	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective[1]	MW-14			MW-15			MW-16			MW-17		
		Jul-15	Aug-16	Nov-16	May-15	Aug-16	Nov-16	May-15	Aug-16	Nov-16	May-15	Aug-16	Nov-16
BTEX (mg/l)													
Benzene	0.005	**0.012**	<0.005	<0.005	<0.001	**0.012**	<0.005	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005
Ethylbenzene	0.7	<0.001	<0.005	<0.005	<0.001	**0.0068**	<0.005	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.003	<0.005	<0.005	<0.003	**0.0164**	**0.0104**	<0.003	<0.005	<0.005	<0.003	<0.005	<0.005
PNAs (mg/l)													
Acenaphthene	0.42	**0.00037**	<0.01	<0.01	**0.00064**	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.00005	<0.01	<0.01
Acenaphthylene	0.21	<0.00005	<0.01	<0.01	**0.00017**	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.00005	<0.01	<0.01
Anthracene	2.1	**0.00057**	<0.005	<0.005	**0.00008**	<0.005	<0.005	<0.00005	<0.005	<0.005	<0.00005	<0.005	<0.005
Benzo(a)anthracene	0.00013	**0.0018**	**0.00164**	**0.00074**	<0.00005	<0.00013	<0.00013	<0.00005	<0.00013	<0.00013	<0.00005	<0.00013	<0.00013
Benzo(a)pyrene	0.0002	**0.0037**	**0.024**	**0.0008**	<0.00005	<0.0002	<0.0002	<0.00005	<0.0002	<0.0002	<0.00005	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	**0.0066**	**0.00372**	**0.00149**	<0.00005	<0.00018	<0.00018	<0.00005	<0.00018	<0.00018	<0.00005	<0.00018	<0.00018
Benzo(k)fluoranthene	0.00017	**0.0022**	**0.00288**	**0.00108**	<0.00005	<0.00017	<0.00017	<0.00005	<0.00017	<0.00017	<0.00005	<0.00017	<0.00017
Benzo(ghi)perylene	0.21	**0.0041**	**0.0028**	**0.0011**	<0.00005	<0.0004	<0.0004	<0.00005	<0.0004	<0.0004	<0.00005	<0.0004	<0.0004
Chrysene	0.0015	**0.0037**	**0.0034**	**0.0015**	<0.00005	<0.0015	<0.0015	<0.00005	<0.0015	<0.0015	<0.00005	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	**0.00012**	**0.0005**	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003
Fluoranthene	0.28	**0.014**	**0.01**	**0.01**	**0.00095**	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002
Fluorene	0.28	**0.00096**	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	**0.0033**	**0.0029**	**0.0011**	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003
Naphthalene	0.14	<0.00025	<0.01	<0.01	**0.2**	**0.058**	**0.032**	<0.00025	<0.01	<0.01	<0.00025	<0.01	<0.01
Phenanthrene	0.21	**0.0027**	<0.005	<0.005	**0.00052**	<0.005	<0.005	<0.00005	<0.005	<0.005	<0.00005	<0.005	<0.005
Pyrene	0.21	**0.0081**	**0.007**	**0.006**	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002
Total Metals (6010C)													
Iron		11	9.81	5.17	12	14.4	8.96	12	1.22	0.40	31	1.1	0.38
Lead	0.0075	0.0089	<0.005	<0.005	0.011	<0.005	<0.005	<	<0.005	<0.005	0.034	<0.005	<0.005
Dissolved Metals (6010C)													
Iron, diss.		NA	8.12	5.53	NA	12.7	9.41	NA	0.10	0.20	NA	<0.05	<0.05
Lead, diss.	0.0075	NA	<0.005	<0.005	NA	<0.005	<0.005	NA	<0.005	<0.005	NA	<0.005	<0.005
Field Parameters													
pH	6.5 - 9	6.95	6.85	7.01	7.30	6.84	6.97	7.80	6.49	6.92	7.20	6.75	6.82
Temperature (°C)	--	NA	18.76	17.02	NA	18.93	17.77	NA	17.20	16.82	NA	17.54	15.62
Specific Conductivity (µS/cm)	--	NA	1,920.9	1,757.6	NA	1,704.7	1,805.1	NA	1,251.3	1,389.3	NA	1,103.0	1,244.9
Dissolved Oxygen (mg/l)	--	NA	0.02	0.20	NA	0.10	0.09	NA	0.58	0.97	NA	2.96	4.04
Turbidity (NTU)	--	NA	35.17	4.80	NA	24.71	35.09	NA	264.09	6.06	NA	154.30	21.39
ORP (mV)	--	NA	-85.4	-132.2	NA	-73.2	-45.5	NA	107.2	85.8	NA	123.2	208.8

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
NS = Not Sampled, Insufficient Water
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BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-18			MW-19			MW-20			MW-30S			
		May-15	Aug-16	Nov-16	May-15	Aug-16	Nov-16	May-15	Aug-16	Nov-16	May-15	Jul-15	Aug-16	Nov-16
BTEX (mg/l)														
Benzene	0.005	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005	<0.001	<	<0.005	<0.005
Ethylbenzene	0.7	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005	<0.001	<	<0.005	<0.005
Toluene	1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<	<0.005	<0.005
Xylene, Total	10	<0.003	<0.005	<0.005	<0.003	<0.005	<0.005	<0.003	<0.005	<0.005	<0.003	<	<0.005	<0.005
PNAs (mg/l)														
Acenaphthene	0.42	<0.00005	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.00005	<	<0.01	<0.01
Acenaphthylene	0.21	<0.00005	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.00005	<0.01	<0.01	<0.00005	<	<0.01	<0.01
Anthracene	2.1	<0.00005	<0.005	<0.005	<0.00005	<0.005	<0.005	<0.00005	<0.005	<0.005	<0.00005	<	<0.005	<0.005
Benzo(a)anthracene	0.00013	<0.00005	<0.00013	<0.00013	<0.00005	<0.00013	<0.00013	<0.00005	<0.00013	<0.00013	<0.00005	<	<0.00013	**0.00014**
Benzo(a)pyrene	0.0002	<0.00005	<0.0002	<0.0002	<0.00005	<0.0002	<0.0002	<0.00005	<0.0002	<0.0002	<0.00005	<	<0.0002	<0.0002
Benzo(b)fluoranthene	0.00018	<0.00005	<0.00018	<0.00018	<0.00005	<0.00018	<0.00018	<0.00005	<0.00018	<0.00018	<0.00005	<	<0.00018	**0.00025**
Benzo(k)fluoranthene	0.00017	<0.00005	<0.00017	<0.00017	<0.00005	<0.00017	<0.00017	<0.00005	<0.00017	<0.00017	<0.00005	<	<0.00017	**0.00027**
Benzo(ghi)perylene	0.21	<0.00005	<0.0004	<0.0004	<0.00005	<0.0004	<0.0004	<0.00005	<0.0004	<0.0004	<0.00005	<	<0.0004	<0.0004
Chrysene	0.0015	<0.00005	<0.0015	<0.0015	<0.00005	<0.0015	<0.0015	<0.00005	<0.0015	<0.0015	<0.00005	<	<0.0015	<0.0015
Dibenzo(a,h)anthracene	0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<	<0.0003	<0.0003
Fluoranthene	0.28	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<	<0.002	<0.002
Fluorene	0.28	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	0.00043	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<	<0.0003	**0.0003**
Naphthalene	0.14	<0.00025	<0.01	<0.01	<0.00025	<0.01	<0.01	<0.00025	<0.01	<0.01	<0.00025	<	<0.01	<0.01
Phenanthrene	0.21	<0.00005	<0.005	<0.005	<0.00005	<0.005	<0.005	<0.00005	<0.005	<0.005	<0.00005	<	<0.005	<0.005
Pyrene	0.21	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<0.002	<0.002	<0.00005	<	<0.002	<0.002
Total Metals (6010C)														
Iron		2.8	4.96	0.88	0.13	1.53	2.84	5.8	0.11	0.05	4.8	14	0.99	1.28
Lead	0.0075	<	<0.005	<0.005	<	<0.005	<0.005	0.012	<0.005	<0.005	0.0058	0.0082	<0.005	<0.005
Dissolved Metals (6010C)														
Iron, diss.		NA	0.95	0.68	NA	0.34	0.51	NA	<0.05	<0.05	NA	NA	<0.05	<0.05
Lead, diss.	0.0075	NA	<0.005	<0.005	NA	<0.005	<0.005	NA	<0.005	<0.005	NA	NA	<0.005	<0.005
Field Parameters														
pH	6.5 - 9	6.90	7.00	7.07	6.90	6.98	7.07	7.14	7.05	6.70	7.00	6.98	6.64	6.92
Temperature (°C)	--	NA	19.09	16.85	NA	19.07	17.25	NA	17.58	14.73	NA	NA	17.89	17.87
Specific Conductivity (µS/cm)	--	NA	1304.3	1,373.3	NA	1,729.6	1,755.8	NA	1,025.4	1,073.14	NA	NA	258.15	1,766.1
Dissolved Oxygen (mg/l)	--	NA	1.75	1.92	NA	0.94	1.22	NA	0.59	0.22	NA	NA	1.81	2.44
Turbidity (NTU)	--	NA	104.33	4.24	NA	86.92	143.99	NA	136.78	2.20	NA	NA	113.75	502.26
ORP (mV)	--	NA	6.0	49.9	NA	15.6	65.2	NA	-3.5	152.19	NA	NA	199.0	227.8

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
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BOLD Identified above laboratory detection limits
BOLD Exceeds Class I GRO
Results reported in milligrams per liter (mg/l) or parts per million.

TABLE 3
Historic Groundwater Analytical Results (2001 - 2016)

0370305005 - DeKalb County / Kirkland, Illinois
Kirkland Quick Stop / Blake Leasing

Contaminant of Concern	Class I Groundwater Remediation Objective [1]	MW-30S	MW-30D					Village Main Well	Village Backup Well
		Dec-16	May-15	Jul-15	Aug-16	Nov-16	Dec-16	May-15	May-15
BTEX (mg/l)									
Benzene	0.005	<0.005	<0.001	<	<0.005	<0.005	<0.005	<0.001	<0.001
Ethylbenzene	0.7	<0.005	<0.001	<	<0.005	<0.005	<0.005	<0.001	<0.001
Toluene	1	<0.005	<0.005	<	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene, Total	10	<0.005	<0.003	<	<0.005	<0.005	<0.005	<0.003	<0.003
PNAs (mg/l)									
Acenaphthene	0.42	<0.01	<0.00005	<	<0.01	<0.01	<0.01	<0.00005	<0.00005
Acenaphthylene	0.21	<0.01	<0.00005	<	<0.01	<0.01	<0.01	<0.00005	<0.00005
Anthracene	2.1	<0.005	**0.000063**	<	<0.005	<0.005	<0.005	<0.00005	<0.00005
Benzo(a)anthracene	0.00013	<0.00013	**0.0003**	<	<0.00013	**0.00015**	<0.00013	<0.00005	<0.00005
Benzo(a)pyrene	0.0002	<0.0002	**0.00049**	<	<0.0002	**0.0002**	<0.0002	<0.00005	<0.00005
Benzo(b)fluoranthene	0.00018	<0.00018	**0.0011**	<	<0.00018	**0.00028**	<0.00018	<0.00005	<0.00005
Benzo(k)fluoranthene	0.00017	<0.00017	**0.00032**	<	<0.00017	**0.0003**	<0.00017	<0.00005	<0.00005
Benzo(ghi)perylene	0.21	<0.0004	**0.00072**	<	<0.0004	<0.0004	<0.0004	<0.00005	<0.00005
Chrysene	0.0015	<0.0015	**0.00084**	<	<0.0015	<0.0015	<0.0015	<0.00005	<0.00005
Dibenzo(a,h)anthracene	0.0003	<0.0003	**0.00012**	<	<0.0003	<0.0003	<0.0003	<0.00005	<0.00005
Fluoranthene	0.28	<0.002	**0.0012**	0.000076	<0.002	<0.002	<0.002	<0.00005	<0.00005
Fluorene	0.28	<0.002	<0.00005	<	<0.002	<0.002	<0.002	<0.00005	<0.00005
Indeno(1,2,3-cd)pyrene	0.00043	<0.0003	**0.00057**	<	<0.0003	**0.0003**	<0.0003	<0.00005	<0.00005
Naphthalene	0.14	<0.01	<0.00025	<	<0.01	<0.01	<0.01	<0.00025	<0.00025
Phenanthrene	0.21	<0.005	**0.000526**	<	<0.005	<0.005	<0.005	<0.00005	<0.00005
Pyrene	0.21	<0.002	**0.00096**	0.000072	<0.002	<0.002	<0.002	<0.00005	<0.00005
Total Metals (6010C)									
Iron		<0.05	1.1	1.8	0.56	0.36	0.11	0.6	0.45
Lead	0.0075	<0.005	0.011	<	<0.005	<0.005	<0.005	<	<
Dissolved Metals (6010C)									
Iron, diss.		<0.05	NA	NA	<0.05	<0.05	<0.05	NA	NA
Lead, diss.	0.0075	<0.005	NA	NA	<0.005	<0.005	<0.005	NA	NA
Field Parameters									
pH	6.5 - 9	6.97	7.70	7.04	6.90	6.02	7.12	7.14	7.13
Temperature (°C)	--	13.93	NA	NA	15.55	15.41	13.42	NA	NA
Specific Conductivity (µS/cm)	--	1,810.7	NA	NA	1,444.4	1,626.5	1,522.8	NA	NA
Dissolved Oxygen (mg/l)	--	3.46	NA	NA	1.33	0.78	1.53	NA	NA
Turbidity (NTU)	--	5.53	NA	NA	55.79	110.88	8.39	NA	NA
ORP (mV)	--	183.8	NA	NA	181.7	247.2	166.9	NA	NA

Notes:
[1] 35 IAC 620
"<" = Historic analytical table indicated constituent not detected above laboratory reporting limits.
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SM&A
ST. JOHN · MITTELHAUSER & ASSOCIATES

ATTACHMENT A

MUNICIPAL & POTABLE WELL LOGS

ILLINOIS STATE GEOLOGICAL SURVEY

Well ID 00090

Water Well	Top	Bottom
drift	0	284
limestone	284	311
Total Depth		**311**

Casing: 5" from 0' to 284'

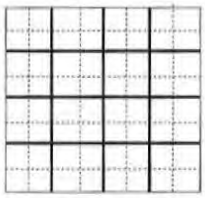
Size hole below casing: 5"

Water from limestone at 284' to 311'.
Static level 32' below casing top which is 0' above GL
Pumping level 32' when pumping at 30 gpm for 0 hours

Driller's Log filed

Owner Address: ,
Location source: Platbook verified

Permit Date: **Permit #:**



COMPANY owner
FARM Roberts, Mr.
DATE DRILLED January 1, 1955 **NO.**
ELEVATION 795GL **COUNTY NO.** 00090
LOCATION S2 NW
LATITUDE 42.074957 **LONGITUDE** -88.856029
COUNTY DeKalb **API** 120370009000 **35 - 42N - 3E**

ILLINOIS STATE GEOLOGICAL SURVEY

Well ID 00562

Water Well	Top	Bottom
top soil	0	2
clay	2	12
hard pan	12	90
clay	90	95
quick sand	95	143
gravel	143	175
yellow lime rock	175	198
Total Depth		**198**

Casing: 5" GALV. STEEL CASING from 0' to 175'

Size hole below casing: 5"

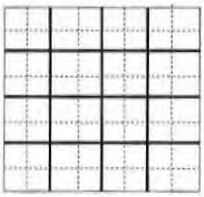
Water from yellow lime at 175' to 198'.
Static level 6' below casing top which is 0' above GL
Pumping level 16' when pumping at 10 gpm for 2 hours

Remarks: 1st farm on left East of Kirkland Rt 72

Driller's Log filed

Owner Address: ,
Location source: Platbook verified

Permit Date: **Permit #:**



COMPANY owner
FARM Ault, Fred
DATE DRILLED January 1, 1961 **NO.** 1
ELEVATION 778TM **COUNTY NO.** 00562
LOCATION 75'S line, 420'E line of SW SW SW
LATITUDE 42.095255 **LONGITUDE** -88.840864
COUNTY DeKalb **API** 120370056200 **24 - 42N - 3E**

ILLINOIS STATE GEOLOGICAL SURVEY

Well ID 00835

Water Well	Top	Bottom
clay	0	16
limestone	16	125
Total Depth		**125**

Casing: 6" 19# BLK STEEL from 0' to 40'

Size hole below casing: 6"

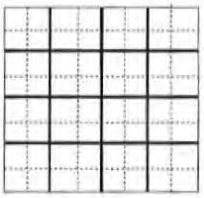
Water from rock at 0' to 125'.
Pumping level 16' when pumping at 17 gpm for 2 hours

Driller's Log filed

Owner Address: Kirkland, IL
Location source: Platbook verified

Permit Date: January 1, 1968 **Permit #:** 4548

COMPANY Rosenquist K W
FARM Lawrence & Decker
DATE DRILLED April 22, 1968 **NO.**
ELEVATION 0 **COUNTY NO.** 00835
LOCATION SW NE SE
LATITUDE 42.099526 **LONGITUDE** -88.845448
COUNTY DeKalb **API** 120370083500 **23 - 42N - 3E**



ILLINOIS STATE GEOLOGICAL SURVEY

Well ID 21227

Water Well	Top	Bottom
clay	0	5
sand	5	10
clay	10	24
sand & clay	24	38
gravel, stones & sand	38	74
soft limestone	74	83
white & yellow then red limestone	83	125
Total Depth		**125**

Casing: 6" from 0' to 0'

Size hole below casing: 6"

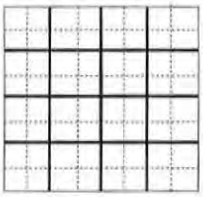
Water from rock at 0' to 0'.
Static level 10' below casing top which is 1' above GL

Driller's Log filed

Owner Address: 6336 Calumet Ave. Munster, IN
Location source: Platbook verified

Permit Date: February 13, 1974 **Permit #:** 27609

COMPANY Stone H I & Son
FARM Calumet Council B.S.A.
DATE DRILLED March 20, 1974 **NO.** 1
ELEVATION 750TM **COUNTY NO.** 21227
LOCATION 2380'N line, 1100'E line of SW SE SE
LATITUDE 42.090035 **LONGITUDE** -88.867642
COUNTY DeKalb **API** 120372122700 **22 - 42N - 3E**



ILLINOIS STATE GEOLOGICAL SURVEY

Well ID 23199

Private Water Well	Top	Bottom
clay	0	10
sand & gravel	10	30
sand, clay & gravel	30	40
clay & stones	40	60
fine sand	60	70
clay	70	80
sandy clay	80	130
fine sand	130	145
sand & gravel	145	170
limestone	170	220
Total Depth		**220**

Casing: 5" IL APPROVED STEEL from -1' to 220'

Grout: BENTONITE from 0 to 0.

Size hole below casing: 5"

Water from rock at 0' to 0'.

Pumping level 15' when pumping at 15 gpm for 0 hours

Permanent pump installed at 40'
on July 7, 1999, with a capacity of 10 gpm

Owner Address: 31957 Ault Road Kingston, IL

Address of well: same as above

Location source: Location from permit

Permit Date: June 16, 1999 **Permit #:**

COMPANY Stone, Guy D.

FARM Busse, Daryl & Connie

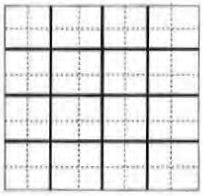
DATE DRILLED June 21, 1999 **NO.**

ELEVATION 0 **COUNTY NO.** 23199

LOCATION NE NE NE

LATITUDE 42.094289 **LONGITUDE** -88.823394

COUNTY DeKalb **API** 120372319900 **25 - 42N - 3E**



ILLINOIS STATE GEOLOGICAL SURVEY

Well ID 01007

Water Well	Top	Bottom
clay	0	25
sand	25	31
limestone	31	125
Total Depth		**125**

Casing: 6" BLK. STEEL 19.45# from 0' to 31'

Size hole below casing: 6"

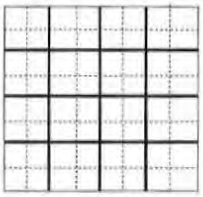
Water from limestone at 31' to 125'.
Static level 6' below casing top which is 1' above GL
Pumping level 13' when pumping at 15 gpm for 2 hours

Driller's Log filed

Owner Address: Box 97 Kirkland, IL
Location source: Location from permit

Permit Date: June 27, 1972 **Permit #:** 18481

COMPANY Rosenquist, Gerald Wilbur
FARM Begun, John
DATE DRILLED July 6, 1972 **NO.**
ELEVATION 767TM **COUNTY NO.** 01007
LOCATION NW NE SE
LATITUDE 42.101333 **LONGITUDE** -88.845464
COUNTY DeKalb **API** 120370100700 **23 - 42N - 3E**



ILLINOIS STATE GEOLOGICAL SURVEY

Municipal Well #1
#11424

Municipal Water Supply	Top	Bottom
no record	0	737
Total Depth		737

Casing: 7" CASING from 0' to 88'

Static level 6' below casing top which is 0' above GL
Pumping level 8' when pumping at 200 gpm for 1 hour

Permit Date: **Permit #:**

COMPANY
FARM Kirkland, Village of
DATE DRILLED January 1, 1896 **NO.**
ELEVATION 775 **COUNTY NO.** 23132
LOCATION 650'S 1850'W NE/c
LATITUDE 42.093177 **LONGITUDE** -88.848557
COUNTY DeKalb **API** 120372313200 **26 - 42N - 3E**

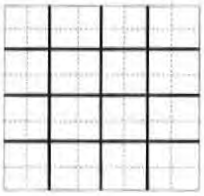
ILLINOIS STATE GEOLOGICAL SURVEY

Municipal Well #2
 # 11425

Municipal Water Supply	Top	Bottom
soil, silty, dark brown;silt,ylsh orange	0	5
gvl(1/2"), sand,calc,clayey,ylsh orn/gry	5	30
till,calc,sy,sty,ylsh orn / gry orange	30	50
till,calc,sty,gry orange to olive green	50	60
dol,ylsh orn / lgt ylsh gry, f / coarse	60	130
dolomite, cherty, ylsh orn, fine /coarse	130	147
dol,slgtly sy, yl gry,f/crs,few dk spks	147	165
dol, sy, ylsh gry, f / crs, dk speckled	165	175
dol,gry yl,f / crs,ptly dk spkld,f / crs	175	180
dol,gray yl /ylsh gray, fine to medium	180	205
dol,ylsh gry / pale ylsh brn,f / medium	205	215
dol,ylsh orn,f/med;dol,gry,f,slgtly fosf	215	225
dol,lgt ylsh brn / gray, fine to medium	225	245
dol,ylsh gry/gry,f/med,scttrd orn&dk spk	245	260
dol,ptly argil,gry/ylsh gry,f,dark spks	260	270
dol,ylsh gry/orn,f/med,scttrd dk&orn spk	270	290
dol,ptly argil,ylsh orn, fine to medium	290	295
dol,sy,ylsh gry to yellowish orange,fine	295	300
sh,dolc,grn/gry grn,fr;ss,gry,crs,incoh	300	305
dol,sy,argil,yl/grn-gry,vy f,ss,f/crs	305	310
sandstone,gray,fine & coarse,incoherent	310	315
dol,sy,argil,yl/grn-gry,very fine	315	340
ss,partly dol,gry, vy f / crs,incoherent	340	350
ss,gray,fine / crs, incoh,silty, at base	350	420

Permit Date: **Permit #:**

COMPANY owner
FARM Kirkland, Village Of
DATE DRILLED October 1, 1950 **NO.** 1
ELEVATION 775TM **COUNTY NO.** 00792
LOCATION 2219'S line, 1818'E line of SE
LATITUDE 42.086613 **LONGITUDE** -88.848295
COUNTY DeKalb **API** 120370079200 **26 - 42N - 3E**



ILLINOIS STATE GEOLOGICAL SURVEY

sandstone,silty,light gray,f / crs,incoh	420	430
sandstone,light gry,fine to coarse,incoh	430	495
ss,lgt ylsh gry,fine / medium,incoherent	495	550
ss,sty,lgt ylsh gray, fine to crs,incoh	550	590
ss,light yellow,fine / medium,incoherent	590	600
ss,lgt gry, pnksh tint, fine to coarse	600	620
cht,yl,pnk,ss,yl-gry,f/crs;ss,silic,yl	620	630
Knox	350	
St Peter	350	
Total Depth		630

Casing: 13" I.D. from 0' to 69'
8" I.D. from -2' to 152'

Static level 15' below casing top which is 0' above GL
Pumping level 24' when pumping at 200 gpm for 0 hours

Driller's Log filed
Strip Log filed
Survey Sample Study filed
Sample set # 20714 (0' - 630') Received: January 1, 1950

Owner Address:
Location source: Platbook verified

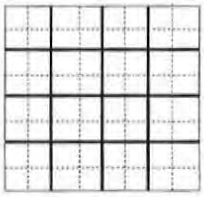
ILLINOIS STATE GEOLOGICAL SURVEY

Municipal Well #3
 # 01613

Municipal Water Supply	Top	Bottom
brown clay	0	10
yellow clay	10	15
brown clay	15	40
sandy & clay	40	50
sandy clay	50	70
fine gravel	70	80
clay	80	90
clay & fine gravel	90	120
fine gravel	120	125
clay	125	140
sand & fine gravel (caving)	140	160
fine gravel	160	180
clay & fine gravel	180	190
clay	190	205
clay & sand	205	281
soft brown limestone	281	283
shale	283	284
hard limestone	284	287
tan limestone	287	370
sandstone	370	376
tan sandstone	376	430
brown sandstone	430	440
tan sandstone	440	530
brown lime & sand	530	554

Permit Date: **Permit #:**

COMPANY Meadow Equipment
FARM Kirkland
DATE DRILLED March 25, 2005 **NO.** 3
ELEVATION 0 **COUNTY NO.** 23580
LOCATION SW SE NW
LATITUDE 42.088375 **LONGITUDE** -88.874446
COUNTY DeKalb **API** 120372358000 **27 - 42N - 3E**



ILLINOIS STATE GEOLOGICAL SURVEY

red shale	554	560
Total Depth		**560**

Casing: 20" A53 STEEL from 0' to 288'
16" A53 STEEL from 288' to 376'

Grout: PRESSURIZED from 0 to 288.

Grout: NEAT CEMENT from 0 to 376.

Water from sandstone at 376' to 560'.
Static level 69' below casing top which is 2' above GL

Remarks: PICS 03790300 #3, Est Yield 600 gpm

Owner Address: ,
Address of well: W of Malta Rd, N of Rt 72
Kirkland, IL
Add'l loc. info: Subdivision: Hickory Ridge

Location source: Location from the driller

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
clay	0	5
sand	5	10
clay	10	24
sand & clay	24	38
gravel, stones & sand	38	74
soft limestone	74	83
white & yellow then red limestone	83	125
Total Depth		**125**

Casing: 6" from 0' to 0'

Size hole below casing: 6"

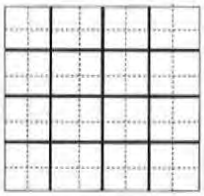
Water from rock at 0' to 0'.
Static level 10' below casing top which is 1' above GL

Driller's Log filed

Owner Address: 6336 Calumet Ave. Munster, IN
Location source: Platbook verified

Permit Date: February 13, 1974 **Permit #:** 27609

COMPANY Stone H I & Son
FARM Calumet Council B.S.A.
DATE DRILLED March 20, 1974 **NO.** 1
ELEVATION 750TM **COUNTY NO.** 21227
LOCATION 2380'N line, 1100'E line of SW SE SE
LATITUDE 42.090035 **LONGITUDE** -88.867642
COUNTY DeKalb **API** 120372122700 **22 - 42N - 3E**



SM&A
ST. JOHN - MITTELHAUSER & ASSOCIATES

ATTACHMENT B

WELL & BORING LOGS

PDC TECHNICAL SERVICES, INC.
LOG OF BORING

Sheet 1 of 1

Project KIRKLAND QUICK STOP — Job No. 91C-139

Project Location KIRKLAND, ILLINOIS — Boring Type HSA

Boring Designation MW-1 — Elev. ____ — Total Depth 18.0'

Date Started 9-5-91 — Date Completed 9-5-91 — Logged By M. MELTON

Drilling Contractor TESTING ENGINEERING, INC.

Driller PAT HAMMOND & STEVE WADE — Rig No. 17 — Backfilled (Y/N) N

Surface Conditions ASPHALT PAVEMENT — INSTALLED WELL MW-1

SAMPLE NUMBER	SAMPLE TYPE	RECOVERED (INCHES)	1ST 6"	2ND 6"	3RD 6"	"N" VALUE	QP (TSF)	DEPTH (FEET)	SAMPLE TYPE	LOG	DESCRIPTION OF MATERIAL	REMARKS
											ASPHALT	
											SANDY GRAVEL [FILL]	
1	SS	18	3	3	3	6	1.0	2			SILTY CLAY (CL): Dark brown, soft, moist	TIP read 0.0 PPM
								4			grades brown @ 3.7'	
2	SS	20	2	4	3	7	0.8	6			grades mottled greenish-greyish brown @ 5.7'	TIP read 34.5 PPM
3	SS	19	7	13	16	29	-	8			SANDY GRAVEL (GM); Dark greenish grey, medium dense, wet, w/ silt	TIP read 1745.0 PPM
4	SS	16	12	18	16	34	-	10			grades saturated @ 11.2'	TIP read 2348.0 PPM Collected sample MW-1
5	SS	16	17	18	24	42	-	12				
								14			SAND (SW); Brown, loose, saturated	TIP read 2.4 PPM
								16				
								18			End of boring @ 18.0'	

PDC TECHNICAL SERVICES, INC.
LOG OF BORING

Sheet 1 of 1

Project KIRKLAND QUICK STOP — Job No. 91C-139

Project Location KIRKLAND, ILLINOIS — Boring Type HSA

Boring Designation MW-2 — Elev. ____ — Total Depth 18.0'

Date Started 9-4-91 — Date Completed 9-4-91 — Logged By M. MELTON

Drilling Contractor TESTING ENGINEERING, INC.

Driller PAT HAMMOND & STEVE WADE — Rig No. 17 — Backfilled (Y/N) N

Surface Conditions ASPHALT PAVEMENT — INSTALLED WELL MW-2

SAMPLE NUMBER	SAMPLE TYPE	RECOVERED (INCHES)	1ST 6"	2ND 6"	3RD 6"	"N" VALUE	QP (TSF)	DEPTH (FEET)	SAMPLE TYPE	LOG	DESCRIPTION OF MATERIAL	REMARKS
											ASPHALT	
											SANDY GRAVEL [Fill]	
1	SS	12	3	3	3	6	1.1	2			SILTY CLAY (CL); Dark brown, soft, moist	TIP read 0.0 PPM
								4				
2	SS	16	3	3	4	7	1.5	6			grade w/sand @ 6.0'	TIP read 0.0 PPM
											1" sand seam @ 6.8'	
3	SS	21	16	19	21	40	-	8			SANDY GRAVEL (GM); Brown, dense, moist	TIP read 0.0 PPM
											grades wet @ 9.4'	
4	SS	18	21	25	26	N/A	-	10				TIP read 0.0 PPM
											grades saturated @ 11.5'	
5	SS	19	19	28	21	49	-	12				TIP read 0.0 PPM
								14			SAND (SW); Brown, loose, saturated	
6	SS	14	10	16	10	26	-					TIP read 0.0 PPM
								16			grades oxide stains @ 16.5'	
								18			End of boring @ 18.0'	

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-3A

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 11/14/94

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 11/14/94

Driller: J. Reimer — Geologist: A. HAAK/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

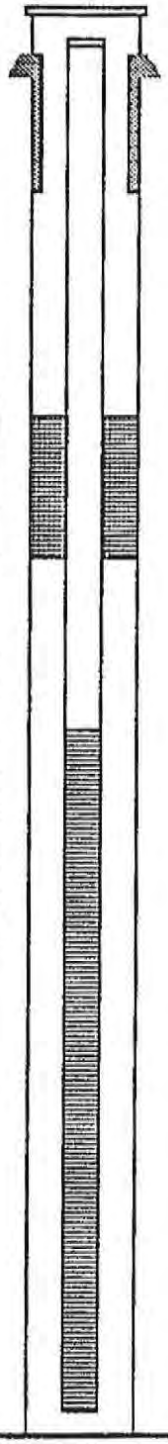
	Sstainless Steel SpecifyType	PVC Specify Type	Other SpecifyType
Riser coupling joint			
Riser pipe above w.t.		Sched 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3' 2"
Screen length	10'
Screen slot size	.01
Protective casing length	
Depth to water	7.95
Elevation of water	89.63
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.82
Other	

Completed by: A. Haak



Elevations - .01 ft.

97.92 Top of Protective Casing

97.58 Top of Riser Pipe

97.92 Ground Surface

97.42 Top of Annular Sealant

.16 Casing Stickup

97.26 Top of Seal

2' Total Seal Interval

95.26 Top of Sand

94.26 Top of Screen

10 Total Screen Interval

84.26 Bottom of Screen

83.93 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-4

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 11/14/94

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 11/14/94

Driller: J. REIMER — Geologist: A. HAAK/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

	Sstainless Steel SpecifyType	PVC Specify Type	Other SpecifyType
Riser coupling joint			
Riser pipe above w.t.		Sched 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

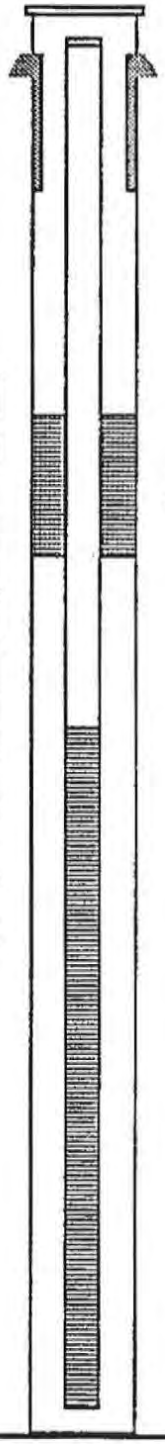
Measurements

to .01 ft (where applicable)

Riser pipe length	3' 2"
Screen length	10
Screen slot size	.01
Protective casing length	
Depth to water	8.68
Elevation of water	89.84
Free Product thickness	N/A
Gallons removed (develop)	
Gallons removed (purge)	2.07
Other	

Completed by: A. Haak

Elevations - .01 ft.



98.88 Top of Protective Casing

98.52 Top of Riser Pipe

98.88 Ground Surface

98.36 Top of Annular Sealant

.16 Casing Stickup

98.22 Top of Seal

2' Total Seal Interval

96.22 Top of Sand

95.22 Top of Screen

10 Total Screen Interval

85.22 Bottom of Screen

84.88 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-5

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 11/14/94

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 11/14/94

Driller: J. REIMER — Geologist: A. HAAK/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

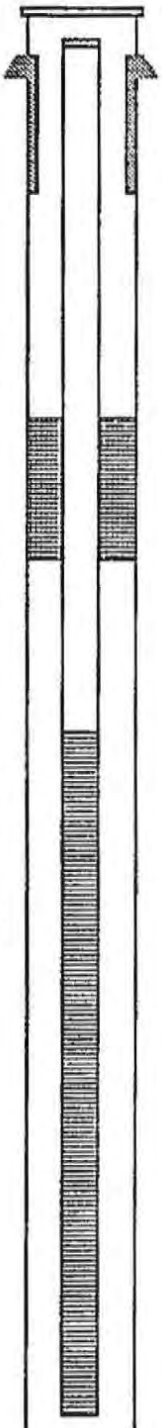
	Sstainless Steel SpecifyType	PVC Specify Type	Other SpecifyType
Riser coupling joint			
Riser pipe above w.t.		Sched 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3' 2"
Screen length	10'
Screen slot size	.01
Protective casing length	
Depth to water	9.21
Elevation of water	89.73
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.21
Other	

Completed by: A. Haak



Elevations - .01 ft.

99.26 Top of Protective Casing

98.94 Top of Riser Pipe

99.26 Ground Surface

98.78 Top of Annular Sealant

.16 Casing Stickup

98.60 Top of Seal

2 Total Seal Interval

96.60 Top of Sand

95.60 Top of Screen

10 Total Screen Interval

88.60 Bottom of Screen

86.27 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-6

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 11/14/94

Drilling Contractor: FISCHE ENTERPRISES — Date Completed: 11/14/94

Driller: J. REIMER — Geologist: A. HAAK/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

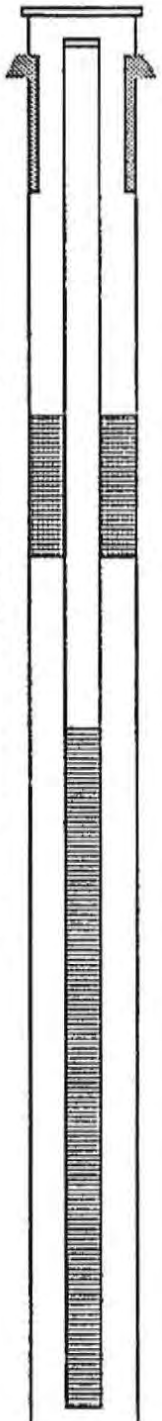
	Sstainless Steel SpecifyType	PVC Specify Type	Other SpecifyType
Riser coupling joint			
Riser pipe above w.t.		Sched. 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3' 2"
Screen length	10'
Screen slot size	.01
Protective casing length	
Depth to water	8.62
Elevation of water	89.48
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.52
Other	

Completed by: A. Haak



Elevations - .01 ft.

98.44 Top of Protective Casing

98.10 Top of Riser Pipe

98.44 Ground Surface

97.94 Top of Annular Sealant

.16' Casing Stickup

97.78 Top of Seal

2 Total Seal Interval

95.78 Top of Sand

94.78 Top of Screen

10 Total Screen Interval

84.78 Bottom of Screen

84.45 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-7

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 11/15/94

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 11/15/94

Driller: J. REIMER — Geologist: A. HAAK/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

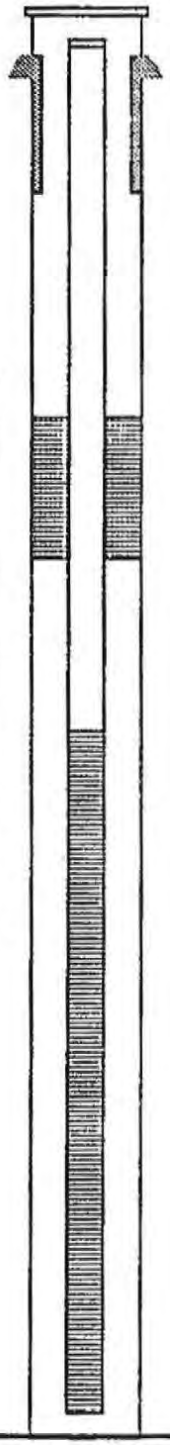
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sched. 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3' 2"
Screen length	10'
Screen slot size	.01
Protective casing length	
Depth to water	9.07
Elevation of water	89.58
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.27
Other	

Completed by: A. Haak



Elevations - .01 ft.

99.03 Top of Protective Casing

98.65 Top of Riser Pipe

99.03 Ground Surface

98.49 Top of Annular Sealant

.16' Casing Stickup

98.37 Top of Seal

2 Total Seal Interval

96.37 Top of Sand

95.37 Top of Screen

10 Total Screen Interval

85.37 Bottom of Screen

85.04 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-8

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 11/15/94

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 11/15/94

Driller: J. REIMER — Geologist: A. HAAK/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

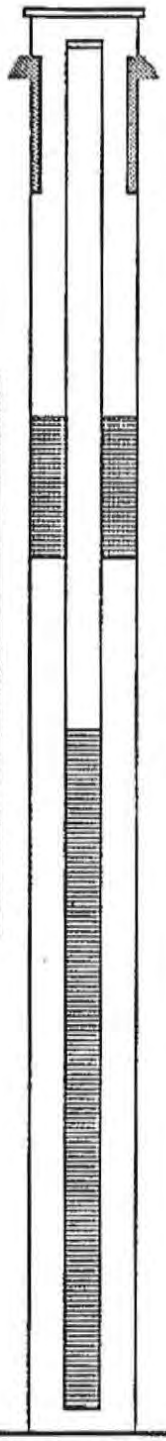
	Sstainless Steel SpecifyType	PVC Specify Type	Other SpecifyType
Riser coupling joint			
Riser pipe above w.t.		Sched 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3' 2"
Screen length	10'
Screen slot size	.01
Protective casing length	
Depth to water	9.27
Elevation of water	89.63
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.17
Other	

Completed by: A. Haak



Elevations - .01 ft.

99.23 Top of Protective Casing

98.90 Top of Riser Pipe

99.23 Ground Surface

98.74 Top of Annular Sealant

.16' Casing Stickup

98.57 Top of Seal

2 Total Seal Interval

96.57 Top of Sand

95.57 Top of Screen

10 Total Screen Interval

85.57 Bottom of Screen

85.24 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-9

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 1/5/95

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 1/5/95

Driller: S. SAUNDERS — Geologist: E. STEWART/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Potland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

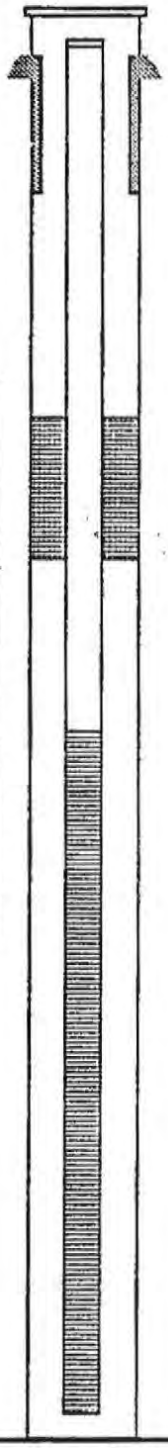
	Sstainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sched 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3'
Screen length	10.00
Screen slot size	.01
Protective casing length	
Depth to water	8.76
Elevation of water	89.66
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.33 gallons
Other	

Completed by: A. Haak



Elevations - .01 ft.

--- Top of Protective Casing

98.42 Top of Riser Pipe

98.68 Ground Surface

97.57 Top of Annular Sealant

.85 Casing Stickup

96.91 Top of Seal

1' Total Seal Interval

95.91 Top of Sand

94.91 Top of Screen

10 Total Screen Interval

84.91 Bottom of Screen

85.16 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency — LUST Well Completion Report

Incident No.: 89-1717 — Well No.: MW-10

Site Name: KIRKLAND QUICK STOP — Date Drilling Start: 1/5/95

Drilling Contractor: FISCHE ENTERPRISES INC. — Date Completed: 1/5/95

Driller: S. SAUNDERS — Geologist: E. STEWART/DAHL

Drilling Method: HOLLOW STEM AUGER — Drilling Fluids (type) NO FLUIDS USED

Annular Space Details

Type of Surface Seal: Portland cement

Type of Annual Sealant: Portland cement

Type of Bentonite Seal (Granular, Pellet): 1/4" pellets

Type of Sand Pack: #5 Silica

Well Construction Materals

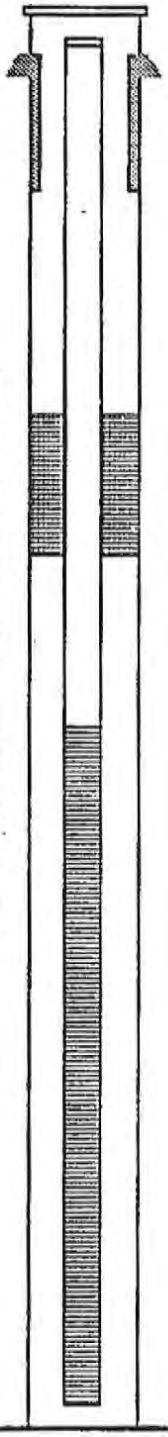
	Sstainless Steel SpecifyType	PVC Specify Type	Other SpecifyType
Riser coupling joint			
Riser pipe above w.t.		Sched 40	
Riser pipe below w.t.			
Screen	304		
Coupling joint screen to riser	Threaded	Threaded	
Protective casing			Manhole Cover

Measurements

to .01 ft (where applicable)

Riser pipe length	3'
Screen length	10'
Screen slot size	.01
Protective casing length	---
Depth to water	8.10
Elevation of water	89.68
Free Product thickness	
Gallons removed (develop)	
Gallons removed (purge)	2.67 gallons
Other	

Completed by: A. Haak



Elevations - .01 ft.

--- Top of Protective Casing

97.78 Top of Riser Pipe

98.10 Ground Surface

96.88 Top of Annular Sealant

.90 Casing Stickup

96.22 Top of Seal

1' Total Seal Interval

95.22 Top of Sand

94.22 Top of Screen

10 Total Screen Interval

84.22 Bottom of Screen

84.47 Bottom of Borehole

For Groundwater Monitoring Wells installed due to a release of petroleum subject to 35 Ill. Adm. Code Section 731, Subpart F.

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: Trans Environmental
Driller: Cabeno Environmental Field Services
Drilling Method: Hollow Stem Auger-Geoprobe

Well No.: MW-11
Date Drilled Start: 26-Aug-09
Date Completed: 26-Aug-09
Geologist: Matt Warneke
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite Chips
Type of Bentonite Seal (Granular, Pellet): Bartoid Bentonite (Hole Plug) - Chips
Type of Sand Pack: Silica Sand - #5

Well Construction Materials

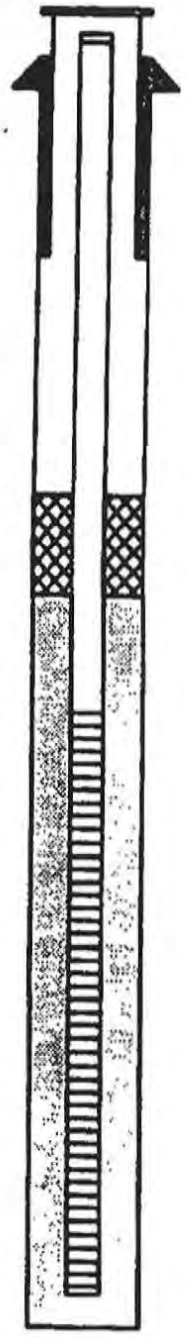
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		X	
Riser pipe above w.t.		✓	
Riser Pipe below w.t.		✓	
Screen		✓	
Coupling joint screen to riser		X	
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	4.00
Screen Length	10.00
Screen Slot Size	
Protective casing length	8"
Depth to water	11.00
Elevation of water	
Free Product thickness	
Gallons removed (develop)	5
Gallons removed (purge)	
Other	

Completed by: Matt Warneke



Elevations - .01 ft.

_____ Top of Protective Casing
_____ Top of Riser Pipe
_____ Ground Surface
_____ Top of Annular sealant
_____ Casing Stickup

_____ Top of Seal
_____ Total Seal Interval
_____ Top of Sand

4' Top of Screen

_____ Total Screen Interval

14' Bottom of Screen
15' Bottom of Borehole

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: Trans Environmental
Driller: Cabeno Environmental Field Services
Drilling Method: Hollow Stem Auger-Geoprobe

Well No.: MW-12
Date Drilled Start: 26-Aug-09
Date Completed: 26-Aug-09
Geologist: Matt Warneke
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite Chips
Type of Bentonite Seal (Granular, Pellet): _____
Bartoid Bentonite (Hole Plug) - Chips
Type of Sand Pack: Silica Sand - #5

Well Construction Materials

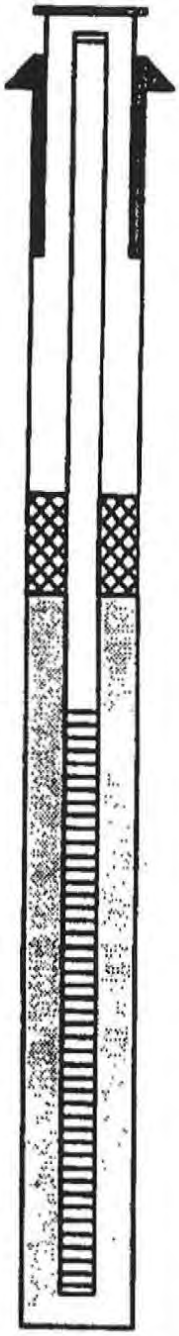
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		✓	
Riser Pipe below w.t.		✓	
Screen		✓	
Coupling joint screen to riser		X	
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	3.50
Screen Length	10.00
Screen Slot Size	
Protective casing length	8"
Depth to water	11.00
Elevation of water	
Free Product thickness	
Gallons removed (develop)	3
Gallons removed (purge)	
Other	

Completed by: Matt Warneke



Elevations - .01 ft.

_____ Top of Protective Casing
_____ Top of Riser Pipe
_____ Ground Surface
_____ Top of Annular sealant
_____ Casing Stickup

_____ Top of Seal
_____ Total Seal Interval
_____ Top of Sand
3.5' Top of Screen
10' Total Screen Interval
13.5' Bottom of Screen
14' Bottom of Borehole

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: Trans Environmental
Driller: Cabeno Environmental Field Services
Drilling Method: Hollow Stem Auger-Geoprobe

Well No.: MW-13
Date Drilled Start: 26-Aug-09
Date Completed: 26-Aug-09
Geologist: Matt Warneke
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite Chips
Type of Bentonite Seal (Granular, Pellet): _____
Bartoid Bentonite (Hole Plug) - Chips
Type of Sand Pack: Silica Sand - #5

Well Construction Materials

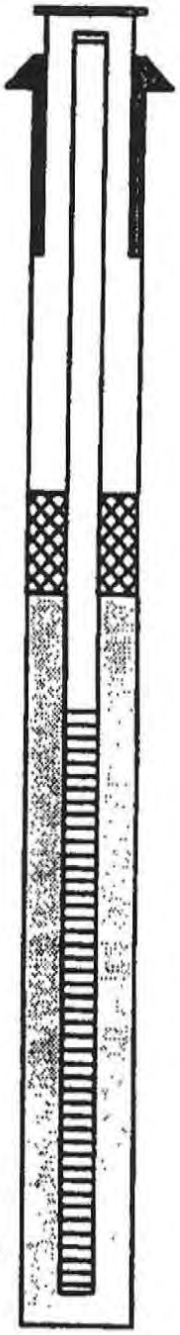
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		X	
Riser pipe above w.t.		✓	
Riser Pipe below w.t.		✓	
Screen		✓	
Coupling joint screen to riser		X	
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	4.00
Screen Length	10.00
Screen Slot Size	
Protective casing length	8"
Depth to water	11.00
Elevation of water	
Free Product thickness	
Gallons removed (develop)	5
Gallons removed (purge)	
Other	

Completed by: Matt Warneke



Elevations - .01 ft.

_____ Top of Protective Casing
_____ Top of Riser Pipe
_____ Ground Surface
_____ Top of Annular sealant
_____ Casing Stickup

_____ Top of Seal
_____ Total Seal Interval
_____ Top of Sand
4' Top of Screen
10' Total Screen Interval
14' Bottom of Screen
15' Bottom of Borehole

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

IL 532-2274
LPC 500 Dec-96

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: Trans Environmental
Driller: Cabeno Environmental Field Services
Drilling Method: Hollow Stem Auger-Geoprobe

Well No.: MW-14
Date Drilled Start: 26-Aug-09
Date Completed: 26-Aug-09
Geologist: Matt Warneke
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite Chips
Type of Bentonite Seal (Granular, Pellet): _____
Bartoid Bentonite (Hole Plug) - Chips
Type of Sand Pack: Silica Sand - #5

Well Construction Materials

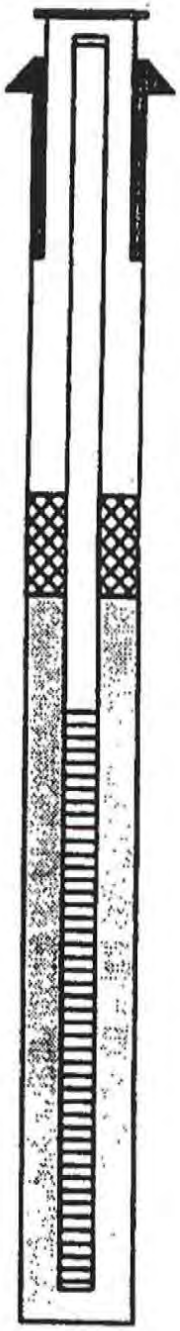
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		X	
Riser pipe above w.t.		✓	
Riser Pipe below w.t.		✓	
Screen		✓	
Coupling joint screen to riser		X	
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	3.00
Screen Length	10.00
Screen Slot Size	
Protective casing length	8"
Depth to water	9.00
Elevation of water	
Free Product thickness	
Gallons removed (develop)	5
Gallons removed (purge)	
Other	

Completed by: Matt Warneke



Elevations - .01 ft.

_____ Top of Protective Casing
_____ Top of Riser Pipe
_____ Ground Surface
_____ Top of Annular sealant
_____ Casing Stickup

_____ Top of Seal
_____ Total Seal Interval
_____ Top of Sand

3' Top of Screen

10' Total Screen Interval

13' Bottom of Screen
14' Bottom of Borehole

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

IL 532-2274
LPC 500 Dec-96

STAGE 2

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Bart
Drilling Method: 4 1/4" ID HSA

Well No.: SB-21/MW-15
Date Drilled Start: 04/20/15
Date Completed: 04/20/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet

Type of Sand Pack: #5 quartz filter sand

Well Construction Materials

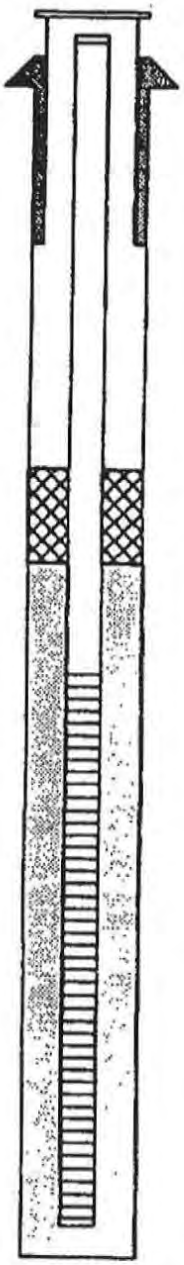
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements

to .01 ft (where applicable)

Riser Pipe Length	7.60
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	8.82
Elevation of water	760.33
Free Product thickness	0.00
Gallons removed (develop)	12.00
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

769.55 Top of Protective Casing
769.15 Top of Riser Pipe
769.55 Ground Surface
768.55 Top of Annular sealant
-0.40 Casing Stickup

-1.00 Top of Seal
5.00 Total Seal Interval
-6.00 Top of Sand

-8.00 Top of Screen

10.00 Total Screen Interval

-18.00 Bottom of Screen
-20.00 Bottom of Borehole

STAGE 2

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Bart
Drilling Method: 4 1/4" ID HSA

Well No.: SB-23/MW-16
Date Drilled Start: 04/22/15
Date Completed: 04/22/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet
Type of Sand Pack: #5 quartz filter sand

Well Construction Materials

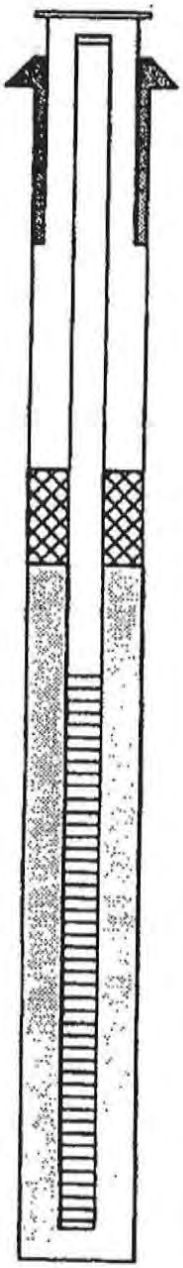
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements

to .01 ft (where applicable)

Riser Pipe Length	5.61
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	7.90
Elevation of water	760.28
Free Product thickness	0.00
Gallons removed (develop)	8.00
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

768.57 Top of Protective Casing
768.18 Top of Riser Pipe
768.57 Ground Surface
767.57 Top of Annular sealant
-0.40 Casing Stickup

-1.00 Top of Seal
3.00 Total Seal Interval
-4.00 Top of Sand

-6.00 Top of Screen

10.00 Total Screen Interval

-16.00 Bottom of Screen
-20.00 Bottom of Borehole

STAGE 2

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Bart
Drilling Method: 4 1/4" ID HSA

Well No.: SB-24/MW-17
Date Drilled Start: 04/22/15
Date Completed: 04/22/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet

Type of Sand Pack: #5 quartz filter sand

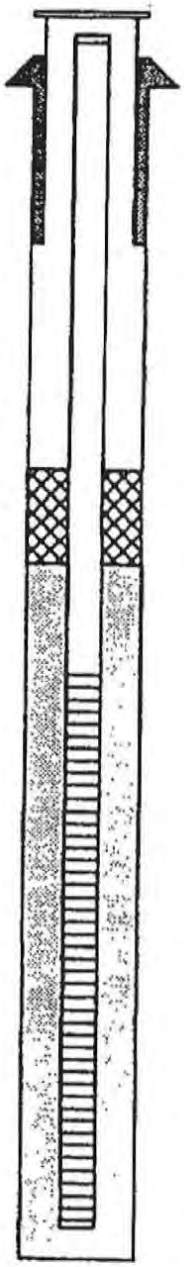
Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements to .01 ft (where applicable)

Riser Pipe Length	5.99
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	7.58
Elevation of water	760.33
Free Product thickness	0.00
Gallons removed (develop)	8.00
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

768.92 Top of Protective Casing
767.91 Top of Riser Pipe
768.92 Ground Surface
767.92 Top of Annular sealant
-1.01 Casing Stickup

-1.00 Top of Seal
4.00 Total Seal Interval
-5.00 Top of Sand

-7.00 Top of Screen

10.00 Total Screen Interval

-17.00 Bottom of Screen
-20.00 Bottom of Borehole

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

Illinois Environmental Protection Agency

STAGE 3

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Bart
Drilling Method: 4 1/4" ID HSA

Well No.: SB-32MW-18
Date Drilled Start: 04/20/15
Date Completed: 04/20/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet

Type of Sand Pack: #5 quartz filter sand

Well Construction Materials

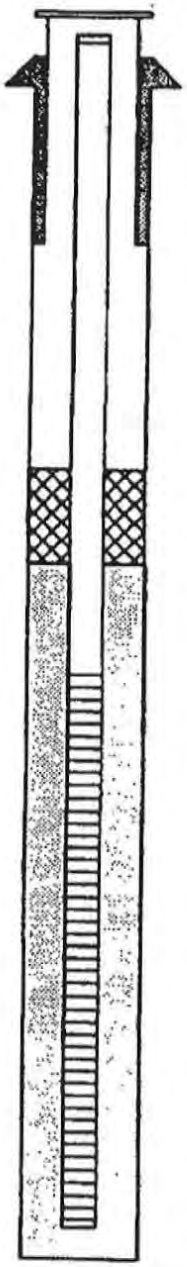
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements

to .01 ft (where applicable)

Riser Pipe Length	6.60
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	7.71
Elevation of water	760.13
Free Product thickness	0.00
Gallons removed (develop)	8.00
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

768.24 Top of Protective Casing
767.84 Top of Riser Pipe
768.24 Ground Surface
767.24 Top of Annular sealant
-0.40 Casing Stickup

-1.00 Top of Seal
4.00 Total Seal Interval
-5.00 Top of Sand

-7.00 Top of Screen

10.00 Total Screen Interval

-17.00 Bottom of Screen
-18.00 Bottom of Borehole

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

STAGE 3

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Dan
Drilling Method: 4 1/4" ID HSA

Well No.: SB-34/MW-19
Date Drilled Start: 04/23/15
Date Completed: 04/23/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet

Type of Sand Pack: #5 quartz filter sand

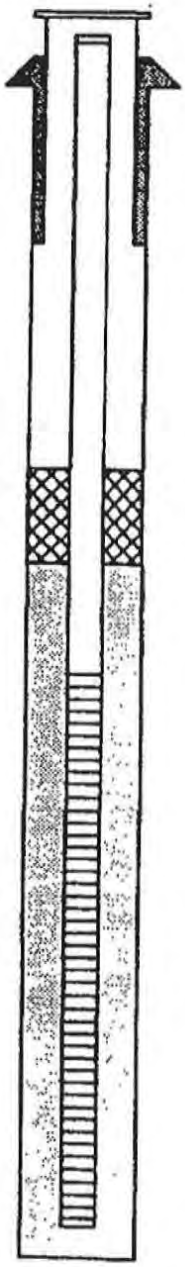
Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements to .01 ft (where applicable)

Riser Pipe Length	6.54
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	7.17
Elevation of water	760.16
Free Product thickness	0.00
Gallons removed (develop)	8.00
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

767.79 Top of Protective Casing
767.33 Top of Riser Pipe
767.79 Ground Surface
766.79 Top of Annular sealant
-0.46 Casing Stickup

-1.00 Top of Seal
3.00 Total Seal Interval
-4.00 Top of Sand

-6.00 Top of Screen

10.00 Total Screen Interval

-16.00 Bottom of Screen
-19.00 Bottom of Borehole

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

STAGE 3

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Dan
Drilling Method: 4 1/4" ID HSA

Well No.: SB-38/MW-20
Date Drilled Start: 04/23/15
Date Completed: 04/23/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet

Type of Sand Pack: #5 quartz filter sand

Well Construction Materials

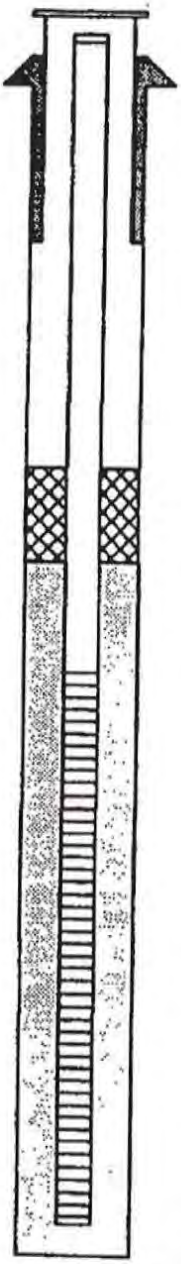
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements

to .01 ft (where applicable)

Riser Pipe Length	5.73
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	6.80
Elevation of water	757.83
Free Product thickness	0.00
Gallons removed (develop)	5.00
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

764.90 Top of Protective Casing
764.63 Top of Riser Pipe
764.90 Ground Surface
763.90 Top of Annular sealant
-0.27 Casing Stickup

-1.00 Top of Seal
3.00 Total Seal Interval
-4.00 Top of Sand

-6.00 Top of Screen

10.00 Total Screen Interval

-16.00 Bottom of Screen
-20.00 Bottom of Borehole

STAGE 3

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Bart
Drilling Method: 4 1/4" ID HSA

Well No.: SB-30D/MW-30D
Date Drilled Start: 04/21/15
Date Completed: 04/21/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite, grout
Type of Bentonite Seal (Granular, Pellet): Pellet
Type of Sand Pack: #5 quartz filter sand

Well Construction Materials

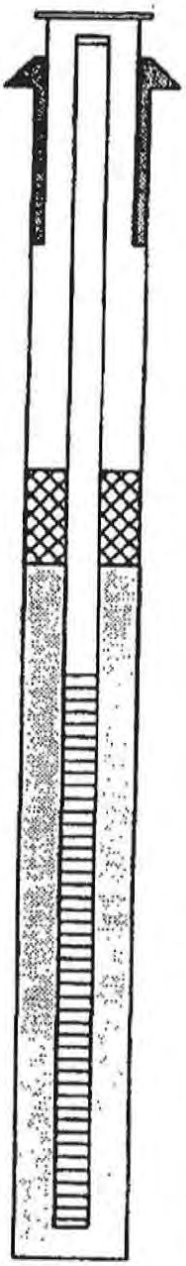
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements

to .01 ft (where applicable)

Riser Pipe Length	25.55
Screen Length	5.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	6.20
Elevation of water	760.30
Free Product thickness	0.00
Gallons removed (develop)	47.50
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

766.95 Top of Protective Casing
766.50 Top of Riser Pipe
766.95 Ground Surface
765.95 Top of Annular sealant
-0.45 Casing Stickup

-1.00 Top of Seal
23.70 Total Seal Interval
-24.70 Top of Sand

-26.00 Top of Screen

5.00 Total Screen Interval

-31.00 Bottom of Screen
-35.00 Bottom of Borehole

STAGE 3

Illinois Environmental Protection Agency

LUST Well Completion Report

Incident No.: 891717
Site Name: Kirkland Quick Stop
Drilling Contractor: C & S Drilling
Driller: Mark and Bart
Drilling Method: 4 1/4" ID HSA

Well No.: SB-30S/MW-30S
Date Drilled Start: 04/20/15
Date Completed: 04/20/15
Geologist: Tom Mangan/Al Stone
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite
Type of Bentonite Seal (Granular, Pellet): Pellet

Type of Sand Pack: #5 quartz filter sand

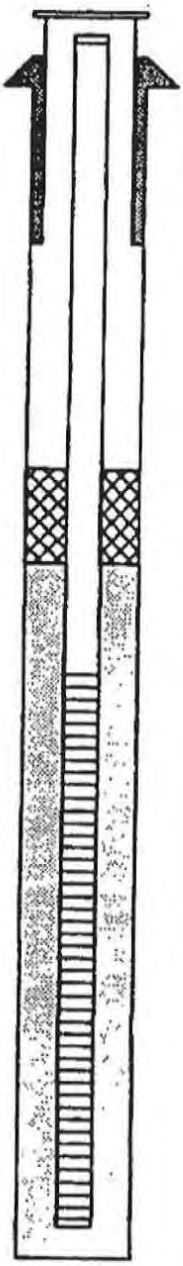
Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint		threaded	
Riser pipe above w.t.		2" sc. 40	
Riser Pipe below w.t.		2" sc. 40	
Screen		#10 slot	
Coupling joint screen to riser		threaded	
Protective casing	steel		

Measurements to .01 ft (where applicable)

Riser Pipe Length	6.64
Screen Length	10.00
Screen Slot Size	0.00
Protective casing length	0.80
Depth to water	6.35
Elevation of water	760.29
Free Product thickness	0.00
Gallons removed (develop)	47.50
Gallons removed (purge)	5.00
Other	

Completed by: Alan Stone



Elevations - .01 ft.

767.00 Top of Protective Casing
766.64 Top of Riser Pipe
767.00 Ground Surface
766.00 Top of Annular sealant
-0.45 Casing Stickup

-1.00 Top of Seal
3.90 Total Seal Interval
-4.90 Top of Sand

-7.00 Top of Screen

10.00 Total Screen Interval

-17.00 Bottom of Screen
-26.00 Bottom of Borehole

The Agency is authorized to require this information under 415 ILCS 5/4 and 21. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000.00 for each day failure continues, a fine up to $50,000.00 and imprisonment up to five years. This form has been approved by the Forms Management Center.

ST. JOHN - MITTELHAUSER & ASSOCIATES

BORING NO.: MW-31	**WELL NO.:** MW-31	**PROJECT NO.:** 15-16013	**PROJECT NAME:** Kirkland
SITE ID. NO.:	**FEDERAL ID. NO.:**		**SITE LOCATION:** Kirkland, IL
COORDINATES:		**LATITUDE:** °	**LONGITUDE:** °
DRILLING CO.: C.S Drilling	**QUAD.:** Kirkland **SEC.:** 26 **T:** T42 N **R:** R3 E		**G.S. ELEVATION:** 763.90 MSL
DRILLER: M. Natali	**DRILLING EQUIP.:** Diedrich D-120		**BOREHOLE DIA.:** 6.75"
START DATE: 8/8/16 **START TIME (hours):**0900	**FINISH DATE:** 8/8/16 **FINISH TIME (hours):** 1045		**LOGGED BY:** M. Lyter **CHECKED BY:** C. Clark
STICKUP: 2.98 ft AGS	**TOP of CASING ELEVATION:** 766.88 ft MSL		**SCREEN INTERVAL:** 2.0'-26.8'
RISER DIA./MTL./LGTH.: 2"/PVC/4.98'		**SCREEN MTL./SLOT:** PVC/0.010"	

DEPTH (ft)	DESCRIPTION	GRAPHIC	ELEVATION	WELL	SAMPLES NUMBER	SAMPLES RECOVERY (ft)	SAMPLES METHOD	SAMPLES MOISTURE	SAMPLES BLOW CNT (6")	PID (ppm) SCAN	PID (ppm) HEADSPACE	REMARKS
-4												
-2												
0			763.90									
	TOPSOIL (0.0'-1.6') Black, moist, stiff, organics, medium to high plasticity		762.3		A	3.9/4	HSA	M	--	0.2	--	
2	**SILTY CLAY (1.6'-6.5') CL** Tan, moist, stiff, high plasticity Grades hard at 2.4'				B		HSA	M	--	0.1	--	
4					C	3/4	HSA	M	--	0.1	--	
6	Grades with fine grained sand at 6.1'		757.4									
	SANDY CLAY (6.5'-7.4') SC Brown, moist, stiff, low plasticity		756.5		D		HSA	M	--	0.2	--	
8	**SAND (7.4'-10.3') SW** Brown, moist, fine grained, dense, with fine and coarse gravel, some medium grained sand, trace coarse grained sand Saturated at 9.2'				E	3.4/4	HSA	M	--	0.4	--	
10			753.6									
	SAND (10.3'-11.0') SP Brown, saturated, fine grained, medium dense		752.9		F		HSA	M/S	--	--	--	
12	**SAND (11.0'-19.8') SW** Brown, saturated, fine to coarse grained, some fine and coarse gravel Sand seam; Fine grained from 12.8'-13.3' Sand seam; Coarse grained 13.3'-13.5' With fine gravel at 13.7'				G	3/4	HSA	S	--	--	--	
14					H		HSA	S	--	--	--	
16												

ST. JOHN - MITTELHAUSER & ASSOCIATES

BORING NO.: MW-31	WELL NO.: MW-31	PROJECT NO.: 15-16013	PROJECT NAME: Kirkland

DEPTH (ft)	DESCRIPTION	GRAPHIC	ELEVATION	WELL	SAMPLES NUMBER	RECOVERY (ft)	METHOD	MOISTURE	BLOW CNT (6")	PID (ppm) SCAN	PID (ppm) HEADSPACE	REMARKS
18	Sand seam; Fine grained from 16.6'-16.9'				I	1.7/2	HSA	S	--	--	--	
					J	2.8/4	HSA	S	--	--	--	
20	**CLAYEY SILT (19.8'-21.4') ML** Tan, saturated, some fine grained sand, medium plasticity		744.1									
	Gravel seam; Fine and coarse gravel from 21.0'-21.1'		742.5		K		HSA	S	--	--	--	
22	**SAND (21.4'-24.4') SP** Tan, saturated, fine grained, dense				L	2.8/4	HSA	S	--	--	--	
24	Grades to trace clay at 23.9'		739.5									
	SANDY GRAVEL (24.4'-26.0') GC Dark gray to black, saturated, fine to medium grained sand, fine and coarse gravel				M		HSA	S	--	--	--	
26	Silty clay seam; Dark gray, very hard, trace fine gravel from 24.8'-25.3'		737.9									
	Grades gray at 25.3'		737.2									
	SAND (26.0'-26.7') SP Gray, saturated, fine grained, dense		736.6		N	2/2	HSA	S/M	--	--	--	
28	**SAND (26.7'-27.3') SW** Gray, saturated, fine to coarse grained sand, dense		735.9									
	SILTY CLAY (27.3'-28.0') CL Gray, moist, very hard, high plasticity, trace fine gravel											
30	**End of Boring at 28.0'**											
32												
34												
36												
38												
40												

PDC TECHNICAL SERVICES, INC.
LOG OF BORING

Sheet 1 of 1

Project KIRKLAND QUICK STOP — Job No. 91C-139

Project Location KIRKLAND, ILLINOIS — Boring Type HSA

Boring Designation A-1 — Elev. _____ — Total Depth 17.0'

Date Started 9-3-91 — Date Completed 9-3-91 — Logged By M. MELTON

Drilling Contractor TESTING ENGINEERING, INC.

Driller PAT HAMMOND & STEVE WADE — Rig No. 17 — Backfilled (Y/N) Y

Surface Conditions ASPHALT PAVEMENT

SAMPLE NUMBER	SAMPLE TYPE	RECOVERED (INCHES)	1ST 6"	2ND 6"	3RD 6"	"N" VALUE	TIP (TSF)	DEPTH (FEET)	SAMPLE TYPE	LOG	DESCRIPTION OF MATERIAL	REMARKS
											ASPHALT	
								2			SANDY GRAVEL [Fill] Dark brown, loose, moist, w/brick and cement fragments	TIP read 3.9 PPM
1	SS	19	3	3	2	5						
								4				TIP read 19.7 PPM
							1.2				SILTY CLAY (CL) Brown, soft, moist	
2	SS	22	3	3	3	6	1.3	6				TIP read 4.3 PPM
3	SS	14	2	5	3	8	0.9	8			grades @ 8.7', greenish-grey, wet, trace sand	TIP read 573.0 PPM
											GRAVELLY SAND (GM) Dark brown, loose, wet, trace silt	TIP read 1043.0 PPM
4	SS	15	5	6	7	13	-	10				
								12			grades saturated @ 11.25'	TIP read 3824.0 PPM Collected sample A-1
5	SS	12	6	7	5	12	-					
								14				TIP read 2045.0 PPM
6	SS	18	7	6	4	10	-					TIP read 127.0 PPM
								16			grades light brown @ 16.0'	TIP read 9.3 PPM
											End of boring @ 17.0'	
								18				

PDC TECHNICAL SERVICES, INC.
LOG OF BORING

Sheet 1 of 1

Project KIRKLAND QUICK STOP — Job No. 91C-139
Project Location KIRKLAND, ILLINOIS — Boring Type HSA
Boring Designation A-2 — Elev. ____ — Total Depth 14.5'
Date Started 9-4-91 — Date Completed 9-4-91 — Logged By M. MELTON
Drilling Contractor TESTING ENGINEERING, INC.
Driller PAT HAMMOND & STEVE WADE — Rig No. 17 — Backfilled (Y/N) Y
Surface Conditions ASPHALT PAVEMENT

SAMPLE NUMBER	SAMPLE TYPE	RECOVERED (INCHES)	1ST 6"	2ND 6"	3RD 6"	"N" VALUE	TSF (TSF)	DEPTH (FEET)	SAMPLE TYPE	LOG	DESCRIPTION OF MATERIAL	REMARKS
											ASPHALT	
											SANDY GRAVEL [FILL]	
1	SS	15	3	3	3	6	1.1	2			SILTY CLAY (CL); Dark brown, soft, moist	TIP read 78.0 PPM
								4			grades mottled greenish brown @ 4.0'	
2	SS	12	4	5	6	11	1.25	6			grades trace sand & gravel, wet @ 6.8'	TIP read 83.5 PPM
3	SS	13	42	51	53	N/A	-	8			SANDY GRAVEL (GM); Light brownish grey, loose, damp, trace silt	TIP read 168.0 PPM
4	SS	17	19	21	19	40	-	10			Sand (SW); Light brownish grey, wet, loose, w/gravel grades saturated @ 10.7'	TIP read 125.0 PPM Collected Sample A-2
5	SS	19	13	16	15	31	-	12				TIP read 38.4 PPM
								14			grades brown @ 13.8'	TIP read 1.4 PPM
											End of boring @ 14.5'	
								16				
								18				

LUST Incident #: 891717
DAHL Project #: 1494 1347
Site Name: KIRKLAND QUICK
Address: KIRKLAND, IL

Boring #: TB-3; MW-3A
Boring Location: REPLACE MW-3

Page: 1 of 1
Date: 11/14/94
Start 12:00 p.m. Finish 12:40 pm

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content P.L. % 0 20 40 60 LL % Scale:	Penetrometer(TSF)	OVA/PID/FID	Remarks
1	SS	3"	1 2	Dark brown silty clay w/some organics. (CL)			15	Slight petrol. odor.
2	SS	6"	3 4	Grades to gray.			60	
3	SS	F	5 6	Gray sandy silt. (ML)			70	Moist, strong odor.
4	SS	F	7 8	@7.5' gray silty sand w/large gravel (GM)			90	Water @ ~9'. Lab sample collected, strong odor.
5	SS	12"	9 10	Gravel amount & size decreasing, very loose.			85	Sheen on spoon, odor.
6	SS	12"	11 12	Brown, well sorted sands. (SW)			30	Slight odor, wet.
7	SS	20"	13 14				1	
			15	EOB @ 15'. (Lots of blow-up in hole)				

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data
Depth While Drilling ▼ 9'
Depth After Drilling ▽ 7.95

Auger Depth 14' Rig Type B-57 Mobile Drill
Rotary Depth 15'
Driller J. Reimer Geologist A. Haak
Note: Boring backfilled unless otherwise noted.

Illinois Environmental Protection Agency

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 891717
DAHL Project #: 1494 1347
Site Name: KIRKLAND QUICK
Address: KIRKLAND, IL

Boring #: TB-1; MW-4
Boring Location: SE CORNER OF CAR WASH

Page: 1 of 1
Date: 11/14/94
Start 8:15 a.m. Finish 9:10 a.m.

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content P.L. % 0 20 40 60 LL.% Scale:	Penetrometer(TSF)	OVA/PID/FID	Remarks
1	SS	12"	1	Silty clay, dark brown. (CL)			0	
			2					
2	SS	F	3	Grades to medium brown.			0	
			4					
3	SS	F	5	Brown, sandy silt. (ML)			0	
			6					
4	SS	6"	7	Brown silt w/sand & large gravel, very loose (GM)			0	
			8					Wet @ 8'.
5	SS	14"	9				0	Wet. Lab sample collected.
			10					
6	SS	12"	11				0.5	Gravel decrease in size. Wet.
			12					
7	SS	F	13					
			14					
			15	EOB @ 15'.				

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data
▼ Depth While Drilling 8'
▽ Depth After Drilling 8.69

Auger Depth 14' Rig Type B-57 Mobile Drill
Rotary Depth 15'
Driller J. Reimer Geologist A. Haak
Note: Boring backfilled unless otherwise noted.

Illinois Environmental Protection Agency

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 891717 DAHL Project #: 1494 1347 Site Name: KIRKLAND QUICK Address: KIRKLAND, IL	Boring #: TB-2; MW-5 Boring Location: EAST SIDE OF STATION BUILDING	Page: 1 of 1 Date: 11/14/94 Start 10:10 a.m. Finish 10:20 am

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content (P.L. % – L.L.%; Scale: 0, 20, 40, 60)	Penetrometer (TSF)	OVA/PID/FID	Remarks
			1	New fill material consistency of pea gravel.				
			2					
			3	No samples collected.				
			4					
			5					
			6					
			7					
			8					
			9				30	Wet @ ~9-10'. Petroleum odor.
			10					
			11					
			12					
			13	Brown sand w/silt & fine gravel, very loose (GM)				
			14				110	Lab sample from ~14'. Wet.
			15	EOB @ 15'.				

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data			
Depth While Drilling: 4'	Auger Depth: 14	Rig Type: B-57 Mobile Drill	Illinois Environmental Protection Agency
Depth After Drilling: 9.21	Rotary Depth: 15		
	Driller: J. Reimer	Geologist: A. Haak	
	Note: Boring backfilled unless otherwise noted.		

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 891717 DAHL Project #: 1494 1347 Site Name: KIRLAND QUICK Address: KIRKLAND, IL	Boring #: TB-4; MW-6 Boring Location: NORTH SIDE OF STATION.	Page: 1 of 1 Date: 11/14/94 Start 1:20 p.m. Finish 2:05 p.m.

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content (P.L. % – L.L. %; Scale: 0, 20, 40, 60)	Penetro-meter (TSF)	OVA/PID/FID	Remarks
				Fill - Hit old RR tie, bricks.			1	Smells like creosote
1	SS	6"	1					
			2					
2	SS	F	3	Dark brown silty clay, some organics. (CL)			0	
			4					
3	SS	NR	5	Grades to medium brown.				
			6					
4	SS	18"	7	Brown silt & sand w/large gravel, very loose (GM)			0.5	Moist.
			8					
5	SS	12"	9	Grades to gray.			2	Water @ 9'. also sample
			10					Wet
6	SS	F	11	Grades to light brown.			5	Slight petrol. odor, wet.
			12					
7	SS	F	13	Brown, med. grained sand & gravel. (GP)			1	Wet.
			14					
			15	EOB @ 15'.				

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data Depth While Drilling 9' Depth After Drilling 8.63	Auger Depth 14' Rotary Depth 15' Driller J. Reimer	Rig Type B-57 Mobile Drill Geologist A. Haak	Illinois Environmental Protection Agency

Note: Boring backfilled unless otherwise noted.

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 891717
DAHL Project #: 1494 1347
Site Name: KIRKLAND QUICK
Address: KIRKLAND, IL

Boring #: TB-5: MW-7
Boring Location: WEST SIDE OF BUILDING

Page: 1 of 1
Date: 11/15/94
Start 8:15 a.m. Finish 9:20 a.m.

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content P.L. % 0 20 40 60 LL% Scale:	Penetrometer(TSF)	OVA/PID/FID	Remarks
1	SS	F	1	Silty clay w/some organics, trace small gravel, dark brown. (CL)			0	
2	SS	12"	3				0	
3	SS	18"	5	Grades to medium brown.			0	
4	SS	20"	7	Brown sandy silt. (ML)			0.5	
5	SS	F	9	Brown sandy silt w/gravel. (GM)			1	Water @ ~9.5'. Lab sample collected.
6	SS	16"	11	Brown, well sorted sand, medium grained. (SW)			0	Saturated.
7	SS		13	Brown, silty sand w/gravel. (GM)			0	Saturated.
			15	EOB @ 15'.				

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data
Depth While Drilling ▼ 9.5'
Depth After Drilling ▽ 9.57

Auger Depth 14' Rig Type B-57 Mobile Drill
Rotary Depth 15'
Driller J. Reimer Geologist A. Haak
Note: Boring backfilled unless otherwise noted.

Illinois Environmental Protection Agency

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P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 891717
DAHL Project #: 1494.1347
Site Name: KIRKLAND QUICK
Address: KIRLAND, IL

Boring #: TB-6; MW-8
Boring Location: SOUTHWEST CORNER OF STATION.

Page: 1 of 1
Date: 11/15/94
Start 9:55 a.m. Finish 11:05 am

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content P.L. % 0 20 40 60 LL% Scale:	Penetrometer(TSF)	OVA/PID/FID	Remarks
1	SS	20"	1-2	Dark brown w/organics, silty clay. (CL)			1	
2	SS	18"	3-4	Grades to med. brown w/Fe mottles.			2	
3	SS	F	5-6	Dark brown sandy silt w/Fe stains, petrol. staining. (ML)			5	Petroleum odor.
							50	Petroleum odor.
4	SS	F	7-8	Gray sand & silt w/gravel. (GM)				
5	SS	F	9-10	Gray, well sorted med. grained sand. (SW)			190	Water @ 9'. Lab sample collected. Petroleum odor.
6	SS	F	11-12	Gray sand & silt w/gravel, petrol. staining. (GM)			170	Wet, odor.
7	SS	F	13-14	Brown, well sorted med. grained sand, grades to coarse grained.			150	Saturated, strong petroleum odor.
							60	
8	SS		15-16	Sand & silt w/gravel. (GM)			70	Slight petroleum odor.
			17	EOB @ 17'.				
			18-19					

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data
Depth While Drilling ▼ 9'
Depth After Drilling ▽ 9.27

Auger Depth 14' Rig Type B-57 Mobile Drill
Rotary Depth 17'
Driller J. Reimer Geologist A. Haak
Note: Boring backfilled unless otherwise noted.

Illinois Environmental Protection Agency

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 89-1717
DAHL Project #: 1494 1347
Site Name: KIRKLAND QUICK
Address: 411 W. MAIN STREET

Boring #: TB-7: MW-9
Boring Location: IN PARKING LANE ON SOUTH SIDE OF HWY. 73 WEST OF QUICK STOP

Page: 1 of 1
Date: 1/5/95
Start 9:00 a.m. Finish

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content P.L. % 0 20 40 60 L.L. % Scale:	Penetrometer(TSF)	OVA/PID/FID	Remarks
			1	Asphalt & concrete.				
			2	Brown/black clayey silt.				Slightly moist.
			3					
1	SS	1/4	4	Gravel & sand fill.			8	Plastic.
			5					
2	SS	1/2	6	Sand & small limestone chips			7	Dry
			7					
3	SS	3/4	8	Coarse sand & pebbles			6	Wet. Lab sample collected.
			9					
			10	Mixed grain sand.				
			11					
4	SS	3/4	12				11	Wet.
			13					
5	SS	3/4	14				8	
			15	EOB @ 15'. MW-9 set @ 15'.				
			16					
			17					
			18					
			19					

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data
Depth While Drilling ▼ 7 1/2'
Depth After Drilling ▽ 8.75'

Auger Depth 15' Rig Type B-57 Mobile Drill
Rotary Depth
Driller Fische Ent. Geologist E. Stewart
Note: Boring backfilled unless otherwise noted.

Illinois Environmental Protection Agency

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

LUST Incident #: 89-1717
DAHL Project #: 1494 1347
Site Name: KIRKLAND QUICK
Address: 411 W. MAIN STREET

Boring #: TB-8: MW-10
Boring Location: IN PARKING LANE SOUTH SIDE OF HWY. 72, SOUTH OF SOUTH CORNER OF QUICK STOP

Page: 1 of 1
Date: 1/5/95
Start 10:45 a.m. Finish 12:00 p.m

Sample #	Sample Type	Sample Recovery	Depth (feet)	Detailed Soil and Rock Description	Natural Moisture Content P.L. % 0 20 40 60 L.L.% Scale:	Penetrometer(TSF)	OVA/PID/FID	Remarks
			1	Asphalt & concrete.				
			2	Brown/black silty, clay, plastic.				Slightly moist.
			3	1' Gray sandy clay, non-plastic, compressed. 6" Gray clay mixed w/sand &				Dry.
1	SS	1/2	4	gravel. 6" Gravel & sand.			1	Dry
2	SS	1/2	5	Gravel & find sand.			1	Dry
			6					
3	SS	3/4	7	Mixed grain sand.			4	Wet @ 7'. Lab sample collected.
			8					
			9	Mixed grain sand & gravel.			3	Wet.
			10					
4	SS	3/4	11					
			12					
5	SS	3/4	13				1	
			14					
6	SS	3/4	15	EOB @ 15'. MW-10 set @ 10'.			1	
			16					
			17					
			18					
			19					

Note: Stratification lines are approximate; in-situ transition between soil types may be gradual.

Groundwater Data
Depth While Drilling ▼ 8'
Depth After Drilling ▽ 8.10'

Auger Depth 14' Rig Type B-57 Mobile Drill
Rotary Depth
Driller Steve/Fische Drilling Geologist E. Stewart
Note: Boring backfilled unless otherwise noted.

Illinois Environmental Protection Agency

P = Partial Recovery F = Full Recovery

DAHL & ASSOCIATES, INC. / BETTENDORF, IOWA

IL 532 2275
LPC 501 Oct-93

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-21/MW-15
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Dril Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	20
	MW Diameter:	2"	Total Depth:	20
	Field Staff:	Tom Mangan and Al Stone	Date:	4/20/2015
	Sampler Length:	4' macrocore	GW Level:	approx. 9.5' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
1.0	FILL	0	4.5'	ASPHALT (0 - 3") FILL. Light tan silty sand and gravel base (3" - 14") FILL. Brown clay, black sand, mixed with coal and silty sand. Moist. No odor.			63%	0.9 (0' - 4')		
2.0										
3.0										
4.0										
5.0	CL	4.5	5.9	CLAY, with silt, some fine to coarse sand, trace gravel. Brown, medium consistency, medium plasticity, moist. No odor. May be fill or reworked.		4' - 6' to lab	63%	0.8 (4' - 8')		
6.0										
	SW	5.9	10	SAND, fine to medium grained, with coarse sand, some gravel. Light brown, loose, slightly moist. Mild odor starting at 8'. May be fill or reworked material.						
7.0										
8.0										
9.0				Becoming wet at 9.5'.			63%	166.0 (8' - 12')		
10.0										
	SW	10	16.5	SAND, fine to medium grained, with coarse sand, some gravel. Gray, loose, slightly moist. Very strong petroleum odor.		10' - 11' to lab				
11.0										
12.0				Gray fine sand between 12.75' and 13.5'.						
13.0							65%	179.0 (12' - 16')		
14.0				Color changes to light brown with reddish lenses, slight odor at 13.5'.						
15.0										
16.0										
17.0	SP	16.5	18	SAND, fine grained. Brown, loose, wet. No odor.			63%	9.5 (16' - 20')		
18.0										
	SW	18	18.5	SAND, fine to medium grained, with coarse sand, some gravel. Brown, loose, sl. moist. No odor. Brown clay plug between 18.4' - 18.5'. No sample recovery from 18.5' to 20'. Fell out of sampler.						
19.0										
20.0										

NOTES: End of drilling at 16'. End of sampling at 20'. Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

8	-	18	ft bgs	2" ID #10-slot PVC screen
0.25	-	8	ft bgs	2" ID sch. 40 PVC casing
6	-	18	ft bgs	filter sand
1	-	6	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-21/MW-15
Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
Location:	411 W Main St.	Dril Name	Mark and Bart
	Kirkland, IL	Sampling Depth:	20
MW Diameter:	2"	Total Depth:	20
Field Staff:	Tom Mangan and Al Stone	Date:	4/20/2015
Sampler Length:	4' macrocore	GW Level:	approx. 9.5' bgs

GEO-THINK, LLC

611 Stevens Street
Geneva, Il. 60134

GROUND ELEVATION (ft. NGVD):

BELOW BELOW GRND SURFACE	STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
1.0	FILL	0	4.5'	ASPHALT (0 - 3") FILL. Light tan silty sand and gravel base (3" - 14") FILL. Brown clay, black sand, mixed with coal and silty sand. Moist. No odor.			63%	0.9 (0' - 4')		
2.0										
3.0										
4.0										
5.0	CL	4.5	5.9	CLAY, with silt, some fine to coarse sand, trace gravel. Brown, medium consistency, medium plasticity, moist. No odor. May be fill or reworked.		4' - 6' to lab	63%	0.8 (4' - 8')		
6.0										
7.0	SW	5.9	10	SAND, fine to medium grained, with coarse sand, some gravel. Light brown, loose, slightly moist. Mild odor starting at 8'. May be fill or reworked material.						
8.0										
9.0				Becoming wet at 9.5'.			63%	166.0 (8' - 12')		
10.0										
11.0	SW	10	16.5	SAND, fine to medium grained, with coarse sand, some gravel. Gray, loose, slightly moist. Very strong petroleum odor.		10' - 11' to lab				
12.0										
13.0				Gray fine sand between 12.75' and 13.5'.			65%	179.0 (12' - 16')		
14.0				Color changes to light brown with reddish lenses, slight odor at 13.5'.						
15.0										
16.0										
17.0	SP	16.5	18	SAND, fine grained. Brown, loose, wet. No odor.			63%	9.5 (16' - 20')		
18.0										
19.0	SW	18	18.5	SAND, fine to medium grained, with coarse sand, some gravel. Brown, loose, sl. moist. No odor. Brown clay plug between 18.4' - 18.5'.						
20.0				No sample recovery from 18.5' to 20'. Fell out of sampler.						

NOTES: End of drilling at 16'. End of sampling at 20'.
Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

8	-	18	ft bgs	2" ID #10-slot PVC screen
0.25	-	8	ft bgs	2" ID sch. 40 PVC casing
6	-	18	ft bgs	filter sand
1	-	6	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-23/MW-16
Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
Location:	411 W Main St.	Dril Name	Mark and Bart
	Kirkland, IL	Sampling Depth:	20
MW Diameter:	2"	Total Depth:	20
Field Staff:	Tom Mangan and Al Stone	Date:	4/22/2015
Sampler Length:	4' macrocore	GW Level:	approx. 8' bgs

GEO-THINK, LLC
611 Stevens Street
Geneva, Il. 60134

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
	FILL	0	4.5'	ASPHALT (0 - 3")						
1.0				FILL. Light tan silty sand and gravel base (3" - 15")						
				FILL. Brown clay, black sand, mixed with coal (15" - 26")			54%	0.0 (2' - 3')		
2.0										
3.0				Empty sample tune from 26" - 48".						
4.0										
	CL	4	8	CLAY, with silt and little fine to coarse sand. Brown with many small distinct reddish brown and brownish gray mottles, some small black (pyrolusite) nodules. Medium consistency, medium plasticity, very moist. No odor.		4' - 6' to lab	58%	0.0 (4' - 7')		
5.0										
6.0						6' - 8' to lab				
7.0										
8.0										
	SM	8	10	SILTY SAND, fine to medium grained, with trace coarse sand and little gravel. Brown, medium dense, wet. No odor.			73%	0.0 (8' - 10')		
9.0										
10.0										
	SP/ SM	10	12	SAND, fine to medium grained, with silt, trace coarse sand and little gravel. Brown, medium dense, wet. No odor.				0.7 (10' - 12')		
11.0										
12.0										
	SP	12	14.5	SAND, fine to medium grained, with some silt, trace coarse sand and little gravel. Brownish gray, medium, dense, wet. Very slight odor. Becoming brown at 14'.			67%	0.2 (12' - 14')		
13.0										
14.0								0.0 (14' - 16')		
	SM	14.5	16	SILTY SAND, fine grained, with trace gravel, coarse sand, and little medium sand. Brown, medium dense, wet. No odor.						
15.0										
16.0										
	SP	16	18	SAND, medium grained, with trace gravel, trace fine sand, and trace coarse sand. Brown, medium dense, no odor. Becoming more gravelly with depth, then no gravel between 19' - 20'.			50%	0.0 (16' - 20')		
17.0										
18.0										
19.0										
20.0										

NOTES: End of drilling at 16'. End of sampling at 20'. Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

6	-	16	ft bgs	2" ID #10-slot PVC screen
0.25	-	6	ft bgs	2" ID sch. 40 PVC casing
4	-	16	ft bgs	filter sand
1	-	4	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-24/MW-17
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St. Kirkland, IL	Dril Name	Mark and Bart
			Sampling Depth:	20
	MW Diameter:	2"	Total Depth:	20
	Field Staff:	Tom Mangan and Al Stone	Date:	4/22/2015
	Sampler Length:	4' macrocore	GW Level:	approx. 8' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
	FILL	0	2	ASPHALT (0 - 3") FILL. Light tan silty sand and gravel base (3" - 14") FILL. Brown clay, black sand, mixed with coal (14" - 24")			90%	0.4 (0' - 4')		
1.0										
2.0										
	CL	2	6	CLAY, with silt. Dark brown, soft, medium plasticity, very moist. No odor.						
3.0										
4.0				Becoming brown with reddish-brown and grayish-brown mottles at 3.5'.						
				Tan, medium consistency to stiff atarting at 5'.		4' - 6' to lab	65%	0.0 (4' - 6')		
5.0				Little gravel starting at 5'.						
6.0										
	SP	6	8	SAND, fine to medium grained, with little coarse sand, some gravel, and trace silt. Tan, medium dense, moist. No odor.				0.2 (6' - 8')		
7.0										
8.0										
	SP	8	10	SAND, medium grained, with some fine and coarse sand, some gravel, and trace silt. Brown, medium dense, wet. No odor.			85%	1.2 (8' - 10')		
9.0										
10.0				More fine sand starting at 9.3'.						
	SP	10	15.5	SAND, medium grained, with little to some gravel, and some fine and coarse sand. Gray, medium dense to dense, wet. Mild odor.		10' - 12' to lab		7.9 (10' - 12')		
11.0										
12.0										
							88%	3.0 (12' - 14')		
13.0										
14.0				Black from 14' - 15'.				3.6 (14' - 15')		
15.0				Brown from 15' - 15.5'.				1.1 (15' - 16')		
	CL	15.5	20	CLAY, with silt and fine to medium sand, and trace gravel. Light brown, medium consistency, medium plasticity, wet. No odor.			94%	2.1 (16' - 20')		
16.0										
17.0										
18.0										
19.0				Thin (1") layer of gravelly clay at 19'.						
20.0										

NOTES: End of drilling at 17'. End of sampling at 20'.
Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

7	-	17	ft bgs	2" ID #10-slot PVC screen
0.25	-	7	ft bgs	2" ID sch. 40 PVC casing
5	-	17	ft bgs	filter sand
1	-	5	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-32/MW-18
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Drll Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	18
	MW Diameter:	2"	Total Depth:	18
	Field Staff:	Tom Mangan and Al Stone	Date:	4/20/2015
	Sampler Length:	4' macrocore	GW Level:	approx. 8' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
	FILL	0	4	ASPHALT (0 - 3") FILL. Black sand with coal (3" - 6") FILL. Black/greenish gray clay. Mild odor. (6"-1.5') FILL. Black and brown sand. Moist. (1.5' - 4')		1' - 3' to lab	75%	3.5 (1' - 3') 0.7 (3' - 4')		
1.0										
2.0										
3.0										
4.0										
5.0	OL	4	4.5	TOPSOIL. Clay w/ silt. Moist. No odor.			83%	0.6 (4.5' - 7')		
	CL	4.5	7.5	CLAY, with silt and trace fine sand. Brown,						
6.0				medium consistency, medium plasticity,						
				very moist to wet.		6' - 8' to lab				
7.0				Yellow-brown and gray mottles, black (pyrolusite) nodules starting at 5'. Gravel at 7'.						
8.0	SP	7.5	11.5	SAND, medium grained, with some fine and coarse sand, some gravel, trace silt. Light brown to reddish						
9.0				brown, dense, wet. No odor.			92%	0.8 (8' - 10')		
10.0										
				Becoming grayish brown with mild odor at 10'.				0.9 (10' - 12')		
11.0										
12.0	SM	11.5	12	SILTY SAND, fine grained. Dense, wet. No odor.						
	SP	12	14	; SAND, fine to medium grained. Light brown,						
13.0				medium dense, wet. No odor.			77%	0.6 (12' - 16')		
14.0										
	CL	14	14.75	SANDY CLAY, fine grained, with silt. Brown,						
15.0				medium consistency, medium plasticity, wet.						
	SP	14.75	15.5	SAND, medium to coarse grained. Brown,						
16.0	CL	15.5	18	SANDY CLAY, fine grained, with silt. Brown, wet.						
				medium consistency, medium plasticity, wet.						
17.0							58%	0.4 (16' - 18')		
				4" seam of brown fine to medium sand at 16'9"						
18.0										
				1" softer and silter seam at 17'6"						
19.0										
20.0										

NOTES: End of drilling at 16'. End of sampling at 18'. Telephone No. (630) 208-5050
Drilled w/ 4 1/4" ID Hollow Stem Auger. 18' - 20' interval fell out of sampler in hole.

Monitoring Well Construction

7	-	17	ft bgs	2" ID #10-slot PVC screen
0.25	-	7	ft bgs	2" ID sch. 40 PVC casing
5	-	17	ft bgs	filter sand
1	-	5	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-34/MW-19
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Dril Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	19'
	MW Diameter:	2"	Total Depth:	19'
	Field Staff:	Tom Mangan and Al Stone	Date:	4/23/2015
	Sampler Length:	4' macrocore	GW Level:	approx. 8' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
	FILL	0	4.5	ASPHALT (0" - 3") FILL. Light tan silty sand and gravel base (3" - 5"). FILL. Clay, wiuth silt, sand, and gravel. Brown, moist. Layers of black slag and cinders observed.			90%	1.6 (0' - 4')		
1.0										
2.0										
3.0										
4.0				Layer (6") of yellow-brown medium sand with little gravel at 3' - 3.5'.						
5.0	CL	4.5	6.5	SILTY SANDY CLAY, fine grained, with trace medium sand. Brown, medium consistency, medium plasticity, moist. No odor. Thin (1/4") seams of brown sand @ 5.5' and 5.7'.		5' - 7' to lab	69%	0.6 (4' - 6')		
6.0								0.1 (6' - 7')		
7.0	SP	6.5	12	SAND, fine to medium grained, with little gravel and trace silt. Reddish-brown, loose, moist. No odor. becoming wet @ 8'. Thin (3') seam of fine sand @ 8.5'. Color is brownish-gray @ 9.5' - 10'. Thin (1') seam of reddish-brown fine sand @ 10'. Color changes to brownish-gray at 10'. Thin (1") seam of silty fine sand @ 10.5'.			92%	0.5 (8' - 10')		
8.0										
9.0										
10.0								0.6 (10' - 12')		
11.0										
12.0										
13.0	SP	12	13	SAND, medium grained. Brown, medium dense, wet. No odor.			92%	0.7 (12' - 14')		
14.0	SP	13	14	SAND, fine grained, with trace to little silt. Reddish-brown, med. Dense, wet. No odor. Becoming brown and medium/coarse at 14'.						
15.0	SP	14	15	SAND, med/coarse grained, w/ little gravel. Brown to gray, medium dense, wet. No odor. Silty at 14.5'.				0.5 (14' - 16')		
16.0	CL	15	15.8	SILTY SANDY CLAY, fine grained. Brown, wet.						
	SP	15.8	16.5	SAND, fine/med grained. Brown, wet. No odor.						
17.0	SP	16.5	19	SAND, medium to coarse grained, with gravel. Brown, medium dense, wet. No odor. Becoming siltier @ 17.25'.		16' - 18' to lab	71%	2.0 (16' - 18')		
18.0										
19.0				More gravel and cobbles @ 18.5'.				0.7 (18' - 19')		
20.0				No recovery from 19' - 20'.						

NOTES: End of drilling at 16'. End of sampling at 19' (bottom 1' fell out of sampler). Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

6	-	16	ft bgs	2" ID #10-slot PVC screen
0.25	-	6	ft bgs	2" ID sch. 40 PVC casing
4	-	16	ft bgs	filter sand
1	-	4	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-38/MW-20
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St. Kirkland, IL	Dril Name	Mark and Bart
			Sampling Depth:	18'
	MW Diameter:	2"	Total Depth:	18'
	Field Staff:	Tom Mangan and Al Stone	Date:	4/23/2015
	Sampler Length:	4' macrocore	GW Level:	approx. 8' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
	FILL	0	6.5	FILL. Clay, with silt, trace to little fine to coarse sand, trace gravel. Brown with reddish-brown and grayish-brown mottles, medium consistency to stiff, medium plasticity, moist to very moist. No odor. Thin (1") seams of slag and coal throughout.			94%	0.3 (0' - 2') 0.0 (2' - 4')		
1.0										
2.0										
3.0										
4.0										
5.0				Note: Bottom 3' of 0' - 4' sample appeared to have fallen out of sampler while in hole.			25%	0.0 (5' - 6')		
6.0										
7.0	SM	6.5	9	SILTY SAND, fine to medium grained, with coarse sand and trace gravel. Brown, loose (soupy), wet. No odor.						
8.0										
9.0						8' - 10' to lab	52%	0.3 (8' - 10')		
	SP	9	9.5	SAND, fine /med. grained. Brown, wet, loose.						
10.0	SP	9.5	12.5	SAND, medium to coarse grained, with some gravel. Brown, wet, loose. No odor.						
11.0										
12.0										
13.0	CL	12.5	16	SILTY SANDY CLAY, fine grained, with trace to little gravel, and trace coarse sand. Brown, stiff, medium plasticity, wet. No odor. Thin (4") seam of fine to medium grained sand at 14'. Wet, no odor.			77%	0.3 (12' - 14') 0.1 (14' - 16')		
14.0										
15.0										
16.0										
	ML	16	16.5	SILT, w/little f/m sand. Brown, no plast., stiff, wet.						
17.0	CL	16.5	17.5	SILTY SANDY CLAY, fine grained, with trace gravel and tr med/c sand. Brown, stiff, med plast., moist.		17' - 18' to lab	56%	0.0 (16' - 17') 0.1 (17' - 18')		
18.0	ML	17.5	18	SILT. Brown, medium consistency to stiff, no plasticity, wet. No odor.						
19.0										
20.0										

NOTES: End of drilling at 16'. End of sampling at 18' (bottom 2' fell out of sampler). Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

6	-	16	ft bgs	2" ID #10-slot PVC screen
0.25	-	6	ft bgs	2" ID sch. 40 PVC casing
4	-	16	ft bgs	filter sand
1	-	4	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-30D/MW-30D
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Dril Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	35
	MW Diameter:	2"	Total Depth:	35
	Field Staff:	Tom Mangan and Al Stone	Date:	4/21/2015
	Sampler Length:	4' macrocore, 2' split barrel	GW Level:	approx. 7' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA. PID (ppm)	Penetrm Reading	Moisture Content
1.0	FILL	1	4	ASPHALT (0" - 3") FILL (black sand, gravel, clay, and coal) (3" - 3') No odor.			44%			
2.0								0.0 (0' - 4')		
3.0				Bottom 2' of sample missing. Believed to be fill.						
4.0										
	FILL	4	5.5	FILL, brown clay with silt and sand. Moist. No odor.				0.5 (4' - 6')		
5.0							81%			
6.0	SP	5.5	8	SAND, medium to coarse grained, with some gravel. Light brown, medium dense, moist to very moist. No odor. Thin silty sand seams at 6' and 7'.		6' - 8' to lab				
7.0								0.5 (6' - 8')		
8.0										
		8	26	Blind drilled. See log for SB30S.						
9.0										
10.0										
11.0										
12.0										
13.0										
14.0										
15.0										
16.0										
17.0										
18.0										
19.0										
20.0										

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-30D/MW-30D
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Dril Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	35
	MW Diameter:	2"	Total Depth:	35
	Field Staff:	Tom Mangan and Al Stone	Date:	4/21/2015
	Sampler Length:	4' macrocore, 2' split barrel	GW Level:	approx. 7' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
21.0										
22.0										
23.0										
24.0										
25.0										
26.0										
27.0	SP	26	28	SAND, fine grained, with some medium sand and little to some fine gravel. Brown, medium dense, wet. No odor.			33%	0.5 (26' - 28')		
28.0										
29.0	SP	28	30	SAND, medium grained, with fine to coarse gravel, little fine and coarse sand. Brown, dense, wet. No odor. 2" seam of brown sandy silt at 29.8', wet.			63%	0.8 (28' - 30')		
30.0										
31.0	CL	30	35	SANDY CLAY (till) (fine grained sand), with silt, little medium to coarse sand, some fine to coarse gravel and cobbles. Gray, very hard, moist (actually saturated), medium plasticity. No odor.			38%	0.7 (30' - 32')		
32.0										
33.0							0%	--		
34.0							83%	--		
35.0										

NOTES: End of drilling at 33'. End of sampling at 35'. Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

26	-	31	ft bgs	2" ID #10-slot PVC screen
0.25	-	26	ft bgs	2" ID sch. 40 PVC casing
31	-	35	ft bgs	natural collapse
24.7	-	31	ft bgs	filter sand
22.4	-	24.7	ft bgs	bentonite
5	-	22.4	ft bgs	cement/bentonite grout
1	-	5	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-30S/MW-30S
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Dril Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	26'
	MW Diameter:	2"	Total Depth:	26'
	Field Staff:	Tom Mangan and Al Stone	Date:	4/20/2015
	Sampler Length:	4' macrocore, 2' split barrel	GW Level:	approx. 7' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
				ASPHALT (0" - 3")						
1.0	FILL	1	3	FILL (black sand, gravel, clay, and coal) (3" - 3') No odor.			71%			
2.0										
3.0								0.2 (3' - 4')		
4.0	CL	3	4	CLAY, with silt, trace fine sand. Brown, medium consistency, medium plasticity, very moist. No odor.						
5.0	CL	4	6	Same, but thin seams of fine sand and trace gravel starting at 4'. Few brownish-gray and many reddish brown mottles, some black (pyrolusite) nodules, wet starting at 4'. No odor.		4'-6' to lab	92%	0.0 (4' - 6')		
6.0										
	SM	6	6.5	SILTY SAND, fine grained, with trace gravel, wet.						
7.0	SW	6.5	8	SAND, fine to coarse grained, with little silt. Brown, medium dense, very moist. No odor.				0.1 (6' - 8')		
8.0										
	SP	8	14	SAND, medium grained, with fine and coarse sand, little gravel, trace silt. Brown, medium dense, wet. No odor.						
9.0							71%	0.1 (8' - 12')		
10.0										
11.0				6" layer of light brown sand at 7' (SP).		10'-11' to lab				
12.0										
13.0							58%	0.1 (12' - 16')		
14.0										
	ML	14	15	SILT, with trace fine sand. Brown, stiff, no plasticity, wet. No odor.						
15.0										
	SM	15	16	SILTY SAND, fine grained, with little clay and some gravel. Brown, loose, wet. No odor.						
16.0										
	SP	16	20	SAND, fine to medium grained, with trace silt. Brown, medium dense, wet. No odor.						
17.0							50%	0.0 (16' - 20')		
18.0										
19.0										
20.0										

GEO-THINK, LLC 611 Stevens Street Geneva, Il. 60134	Proj. No.	Kirkland Quick Stop	Soil Boring No.	SB-30S/MW-30S
	Site Name:	Kirkland Quick Stop	Driller:	C&S Drilling
	Location:	411 W Main St.	Dril Name	Mark and Bart
		Kirkland, IL	Sampling Depth:	26'
	MW Diameter:	2"	Total Depth:	26'
	Field Staff:	Tom Mangan and Al Stone	Date:	4/20/2015
	Sampler Length:	4' macrocore, 2' split barrel	GW Level:	approx. 7' bgs

BELOW BELOW GRND SURFACE	GROUND ELEVATION (ft. NGVD): STRAT			SAMPLE DESCRIPTION	MW DIA	SMP ID No.	Rec. (%)	SAMPLE DATA PID (ppm)	Penetrm Reading	Moisture Content
	SP	20	25.5	SAND, medium grained, with trace to little fine and coarse sand, trace silt. Brown, loose to medium dense, wet. No odor.			88%	0.3 (20' - 24')		
21.0										
22.0				1" seam of gravelly sand at 22'.						
23.0										
24.0										
25.0							50%	0.0 (24' - 26')		
26.0	SW	25.5	26	SAND, fine to coarse grained, w/ gravel and cobbles. Brown, w/ lenses of brown silty/sandy clay.						

NOTES: End of drilling at 33'. End of sampling at 35'. Drilled w/ 4 1/4" ID Hollow Stem Auger.

Telephone No. (630) 208-5050

Monitoring Well Construction

7	-	17	ft bgs	2" ID #10-slot PVC screen
0.25	-	7	ft bgs	2" ID sch. 40 PVC casing
17	-	26	ft bgs	natural collapse
4.9	-	17	ft bgs	filter sand
1	-	4.9	ft bgs	bentonite
0	-	1	ft bgs	flush mount pro casing, concreted in place

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BORING NO.: MW-31	**WELL NO.:** MW-31	**PROJECT NO.:** 15-16013	**PROJECT NAME:** Kirkland
SITE ID. NO.:	**FEDERAL ID. NO.:**		**SITE LOCATION:** Kirkland, IL
COORDINATES:		**LATITUDE:** °	**LONGITUDE:** °
DRILLING CO.: C.S Drilling	**QUAD.:** Kirkland **SEC.:** 26 **T:** T42 N **R:** R3 E		**G.S. ELEVATION:** 763.90 MSL
DRILLER: M. Natali	**DRILLING EQUIP.:** Diedrich D-120		**BOREHOLE DIA.:** 6.75"
START DATE: 8/8/16 **START TIME (hours):**0900	**FINISH DATE:** 8/8/16 **FINISH TIME (hours):** 1045		**LOGGED BY:** M. Lyter **CHECKED BY:** C. Clark
STICKUP: 2.98 ft AGS	**TOP of CASING ELEVATION:** 766.88 ft MSL		**SCREEN INTERVAL:** 2.0'-26.8'
RISER DIA./MTL./LGTH.: 2"/PVC/4.98'		**SCREEN MTL./SLOT:** PVC/0.010"	

DEPTH (ft)	DESCRIPTION	GRAPHIC	ELEVATION	WELL	SAMPLES NUMBER	SAMPLES RECOVERY (ft)	SAMPLES METHOD	SAMPLES MOISTURE	SAMPLES BLOW CNT (6")	PID (ppm) SCAN	PID (ppm) HEADSPACE	REMARKS
-4												
-2												
0			763.90									
	TOPSOIL (0.0'-1.6') Black, moist, stiff, organics, medium to high plasticity		762.3		A	3.9/4	HSA	M	--	0.2	--	
2	**SILTY CLAY (1.6'-6.5') CL** Tan, moist, stiff, high plasticity Grades hard at 2.4'				B		HSA	M	--	0.1	--	
4					C	3/4	HSA	M	--	0.1	--	
6	Grades with fine grained sand at 6.1'		757.4									
	SANDY CLAY (6.5'-7.4') SC Brown, moist, stiff, low plasticity		756.5		D		HSA	M	--	0.2	--	
8	**SAND (7.4'-10.3') SW** Brown, moist, fine grained, dense, with fine and coarse gravel, some medium grained sand, trace coarse grained sand Saturated at 9.2'				E	3.4/4	HSA	M	--	0.4	--	
10			753.6									
	SAND (10.3'-11.0') SP Brown, saturated, fine grained, medium dense		752.9		F		HSA	M/S	--	--	--	
12	**SAND (11.0'-19.8') SW** Brown, saturated, fine to coarse grained, some fine and coarse gravel Sand seam; Fine grained from 12.8'-13.3' Sand seam; Coarse grained 13.3'-13.5' With fine gravel at 13.7'				G	3/4	HSA	S	--	--	--	
14					H		HSA	S	--	--	--	
16												

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BORING NO.: MW-31	WELL NO.: MW-31	PROJECT NO.: 15-16013	PROJECT NAME: Kirkland

DEPTH (ft)	DESCRIPTION	GRAPHIC	ELEVATION	WELL	SAMPLES NUMBER	RECOVERY (ft)	METHOD	MOISTURE	BLOW CNT (6")	PID (ppm) SCAN	PID (ppm) HEADSPACE	REMARKS
18	Sand seam; Fine grained from 16.6'-16.9'				I	1.7/2	HSA	S	--	--	--	
					J	2.8/4	HSA	S	--	--	--	
20	**CLAYEY SILT (19.8'-21.4') ML** Tan, saturated, some fine grained sand, medium plasticity		744.1									
	Gravel seam; Fine and coarse gravel from 21.0'-21.1'		742.5		K		HSA	S	--	--	--	
22	**SAND (21.4'-24.4') SP** Tan, saturated, fine grained, dense				L	2.8/4	HSA	S	--	--	--	
24	Grades to trace clay at 23.9'		739.5									
	SANDY GRAVEL (24.4'-26.0') GC Dark gray to black, saturated, fine to medium grained sand, fine and coarse gravel				M		HSA	S	--	--	--	
26	Silty clay seam; Dark gray, very hard, trace fine gravel from 24.8'-25.3' Grades gray at 25.3'		737.9									
	SAND (26.0'-26.7') SP Gray, saturated, fine grained, dense		737.2		N	2/2	HSA	S/M	--	--	--	
	SAND (26.7'-27.3') SW Gray, saturated, fine to coarse grained sand, dense		736.6									
28	**SILTY CLAY (27.3'-28.0') CL** Gray, moist, very hard, high plasticity, trace fine gravel		735.9									
	End of Boring at 28.0'											
30												
32												
34												
36												
38												
40												

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BORING NO.: SB-20B	**PROJECT NO.:** 15-16013		**PROJECT NAME:** Kirkland
SITE ID. NO.:	**FEDERAL ID. NO.:**		**SITE LOCATION:** Kirkland, IL
COORDINATES:		**LATITUDE:** °	**LONGITUDE:** °
DRILLING CO.: C.S Drilling	**QUAD.:** Kirkland **SEC.:** 26 **T.:** T42 N **R.:** R3 E		**G.S. ELEVATION:** 763.72 MSL
DRILLER: M. Natali	**DRILLING EQUIP.:** Diedrich D-120		**BOREHOLE DIA.:** 6.75"
START DATE: 8/8/16 **START TIME (hours):** 1250	**FINISH DATE:** 8/8/16 **FINISH TIME (hours):** 1405		**LOGGED BY:** M. Lyter **CHECKED BY:** C. Clark

DEPTH (ft)	DESCRIPTION	GRAPHIC	ELEVATION	SAMPLES NUMBER	SAMPLES RECOVERY (ft)	SAMPLES METHOD	SAMPLES MOISTURE	SAMPLES BLOW CNT (6")	PID (ppm) SCAN	PID (ppm) HEADSPACE	REMARKS
0	**BLIND DRILL (0.0'-16.0')**		763.72								
8				A	--	HSA	--	--	--	--	
16			747.7								
16	**SAND (16.0'-19.6') SP** Brown, saturated, fine grained, some medium and coarse gravel Trace coarse gravel at 16.4'			B	2/2	HSA	S	--	--	--	
18				C	3.4/4	HSA	S	--	--	--	
20	**SILTY CLAY (19.6'-20.0') CL** Tan, saturated, stiff, high plasticity		744.1 743.7								

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BORING NO.: SB-20B | **PROJECT NO.:** 15-16013 | **PROJECT NAME:** Kirkland

DEPTH (ft)	DESCRIPTION	GRAPHIC	ELEVATION	SAMPLES NUMBER	SAMPLES RECOVERY (ft)	SAMPLES METHOD	SAMPLES MOISTURE	SAMPLES BLOW CNT (6")	PID (ppm) SCAN	PID (ppm) HEADSPACE	REMARKS
22	**CLAYEY SILT (20.0'-24.2') ML** Tan, saturated, soft, trace fine grained sand Red rust mottles from 20.3'-20.4' Grades gray at 20.9'			D		HSA	S	--	--	--	
				E	3.6/4	HSA	S/W	--	--	--	
24			739.5								
	SANDY CLAY (24.2'-25.1') GC Gray, saturated to wet, fine grained sand, stiff, medium plasticity, with fine and coarse gravel, with silt, some coarse grained sand		738.6	F		HSA	W/S	--	--	--	
26	**SILTY CLAY (25.1'-26.0') CL** Gray, moist, very stiff, trace fine gravel		737.7								
	End of Boring at 26.0'										
28											
30											
32											
34											
36											
38											
40											
42											

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ATTACHMENT C

BAT

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BEST AVAILABLE TECHNOLOGY

The surficial lithology occurrence in the vicinity of the Site consists of fill and cohesive, silty clay to a depth of approximately five to seven feet below ground surface (bgs). Underlying these surficial cohesive soils is a relatively homogenous layer of coarse grained sand and gravel to a depth of approximately 30 feet bgs. Below the sand and gravel is a relatively impermeable glacial till extending to a depth of approximately 70 feet bgs. Groundwater is present within the sand and gravel lithologies at a depth of approximately seven to nine feet bgs. The groundwater encountered within the sand and gravel lithologies is unconfined and flows to the north-northwest towards the South Branch of the Kishwakee River.

Groundwater samples collected at the Site in August and November 2016 identified the presence of concentrations of benzene and PNAs above their respective Tier 1 Class I GROs. Specifically, this includes benzene in monitoring wells MW-1, MW-3A, and MW-15 (August only) and various PNAs in monitoring wells MW-1 (November only), MW-6 and MW-14. Field parameters collected during the sampling event indicate the dissolved oxygen concentration ranged from 0.02 mg/l to 0.39 mg/l in the five monitoring wells identified above. This indicates that the constituents of concern are undergoing aerobic biodegradation where indigenous, naturally occurring microorganisms in the groundwater system are using the available DO to biodegrade the petroleum hydrocarbon occurrence within the area where DO concentrations are depleted. The lack of further benzene and PNA migration in groundwater at the site is attributable to the general availability of dissolved oxygen in the shallow glacial groundwater. The location of the monitoring wells and groundwater analytical sampling data, including dissolved oxygen, is summarized on Figures 7 and 8.

Based on the analytical results and the lithology below the Site, aerobic biodegradation of the contaminants of concern is being hindered by the depletion of DO within the area of petroleum impact. Therefore, SMA recommends the use of an air sparge system to increase the DO concentrations within the area to fully aerobically biodegrade the residual concentration of the remaining benzene and PNAs.

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AIR SPARGING

Air Sparging is a proven technology to remediate Sites where groundwater is contaminated with aerobically biodegradable hydrocarbons. The technology is most effective at Sites with relatively homogenous coarse grained materials with an aquifer thickness greater than five feet and where the water table is at least five-feet or greater below the ground surface . All three of these characteristics are present at the Blake site.

Air Sparging works by injecting compressed air into the groundwater system below the Site. The compressed air enters the groundwater system through a diffuser that creates smaller air bubbles to maximize the surface area and contact with the groundwater, and allow greater migration of the air away from the sparge points without dissolving first into the groundwater. As the compressed air more completely mixes with the groundwater system, oxygen dissolves into the groundwater (to its aqueous solubility of approximately 11 mg/L) thereby increasing the DO content of the groundwater. The DO is then transported via groundwater flow downgradient from the injection point. The DO in the groundwater is then available to facilitate natural aerobic biodegradation of the site contaminants in groundwater.

At an compressed air injection rate of one (1) standard cubic foot per minute (SCFM), as much as 10 kg/day of oxygen could be introduced into the system.[1] Given the low flow rate, long contact time, and the low concentrations of VOCs present at the site (highest benzene result in groundwater at the site is 0.076 mg/L – MW-3A), only a very small amount of vapor will be produced in the subsurface. Due to this fact, low-flow air-sparging systems are commonly installed without solvent vapor capture systems because they are not necessary.[1]

The advantages of Air Sparging include:

- Rapidly increases the dissolved oxygen content within the groundwater below the Site, thereby promoting the biodegradation of the hydrocarbons by indigenous bacteria;
- Specifically well-suited to the petroleum-based contaminants and the coarse-grained layer that exists beneath the surficial silt/clay layer at the Site;

[1] Battelle. 2001. Final Air Sparging Guidance Document. NFESC Technical Report, TR-2193-ENV. Prepared for the Naval Facilities Engineering Command. August.

- Proven technology to remediate the residual concentrations of benzene and PNAs in the groundwater to meet their respective Class I GROs;
- Does not require the injection of surfactants, bacteria, oxygen releasing compounds, or other non-naturally occurring constituents within the setback of the municipal wells;
- The low COC concentrations at the Site will only require low-flow rate air sparging at the site and will not require the use of a soil vapor extraction system;
- Simplicity in system design and operation;
- Is not impacted by freezing temperatures; and
- Minimal cost as compared to other technologies.

Best Available Technology (BAT) Analysis

The report prepared by Battelle for the Department of Defense defines the pros and cons of air-sparging compared to ten different remedial technologies. After reviewing the document and the attributes/constraints of the Site, it is SMA's opinion that air-sparging represents the BAT to achieve the remediation goals at the site. Below is a brief outline of why air-sparging is better for the Site than other available technologies.

- Pump and Treat
  This technology could provide a means of reducing the benzene levels at the site. However, it would not effect a significant reduction in the PNA levels at the site because these chemicals exist mostly as bound to small organic matter and soils beneath the site and are not readily water soluble. A reduction in PNAs would likely only occur within a small radius of influence around each extraction well, and the remediation would not be uniform across the site.
- In Situ Chemical Oxidation (ISCO)
  ISCO would likely serve to destroy much of the COCs present at the site. However, it generally is not uniformly effective and generally requires excavation and mixing of the soils at the site with the chemical oxidants. Furthermore, the introduction of additional chemicals near the set-back zone of the municipal well is of concern. Accordingly, the injection of ISCO is not a feasible solution at the Site.
- Enhanced In Situ Aerobic Bioremediation (EISAB)
  Air-sparging is a form of enhanced EISAB, which requires no further introduction of chemicals (other than air) near the municipal well set-back zone.

- Nutrient Addition for Enhanced In Situ Aerobic Bioremediation
  This method typically involves the injection of microbes, carbon sources (oils/fats/surfactants), and vitamins into the subsurface. This was proposed previously and rejected by the Illinois Pollution Control Board (IPCB). Again, this method would involve the injection of chemicals near and within the CWS set-back zones.

- In-Well Air Stripping/Groundwater Circulating Wells
  This method would effectively eliminate the benzene contamination migrating off the Site. However, the source area of petroleum hydrocarbon at the Site would remain unremediated and result in the operation of this system for a prolonged period of time. The PNAs present at the Site do not have appreciable vapor pressures, which means that they will not volatilize with air-stripping and would not be effectively remediated by this technology..

- Monitored Natural Attenuation
  This is effectively going on currently at the Site. SMA has presented figures showing the DO concentrations and COC concentrations at the site. These figures show that the indigenous microbes have depleted the DO at the source area while aerobically degrading the petroleum COCs there. Consequently, the existing DO levels are currently too low to effectively degrade the remaining contaminants to below the Class I GROs within the impacted area at the site. SMA believes that increasing the DO concentrations with air-sparging will allow further biodegradation of the hydrocarbon mass within the source area to a point where the Class I GROs can be met within groundwater on site in the existing groundwater monitoring network..

- Phytoremediation
  This treatment technology uses vegetation to breakdown COCs, and is not a feasible solution at the site because it cannot be implemented at the portion of the site where the great majority of the remaining petroleum hydrocarbon resides.

- Reactive Barriers
  This treatment technology would require that a large-scale excavation take place at the Site, and downgradient of the source zone (i.e. in the alley near the Canadian Pacific R.R. building) and would not reduce concentrations within the source area that currently exceed the Class I GROs. Additionally, the introduction of chemical oxidants would be necessary at the location of the barrier.

- Surfactant Enhanced Aquifer Remediation (SEAR)
  This method is similar to pump and treat, but requires the injection of a chemical surfactant to enhance COC recovery. This is not feasible near the municipal well set-back zone and it is highly probable that a significant amount of the remaining hydrocarbon mass in the source area is smeared across the capillary fringe due to seasonal fluctuation of the water table. The AS technology will remediate the capillary fringe. It is questionable if surfactant circulation and removal will be effective in the capillary fringe.

- In Situ Thermal Treatment
  This method essentially heats the groundwater to the point that VOCs change phase to gaseous vapor and then are removed via vapor extraction within the source area. This method would be effective for benzene removal. However, the low volatilities and high boiling points of the PNAs would result in the technology being ineffective for these compounds.

- Two-Phase (Dual-Phase) Extraction
  This method removes both the vapors from the soil and the liquid COCs from the groundwater via an extraction well. This technology is typically used at sites with recoverable, separate-phase petroleum hydrocarbon and likely will not be effective in meeting the Class I GROs at the Site. Additionally, it will not effect the reduction of the PNAs for the reasons discussed above.

After reviewing and analyzing the list of potential technologies above, SMA believes that it has demonstrated that air sparging is the best available control technology for application at the Site.

Costs

The cost estimate below is based on the installation and operation of an Air Sparging system for a period of 2 years. The estimate is based on the installation of 12 – 15 air injection stingers via 1-inch diameter monitoring wells located within of the area(s) of concern on site. The full system installation and operation and maintenance for two years is also included.

Task	Cost Estimate	
	Low	High
System Installation	$40,000	$65,000
System O&M (2 Years)	$40,000	$80,000
Total	$80,000	$145,000