Environmental Resources Management

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3 October 2018

Mr. Robert Weimer
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501
Via e-mail: robert.weimer@alaska.gov

Subject: Groundwater Monitoring and Drinking Water Well Sampling, Chugiak, Alaska; BSUM Claim 105081; ADEC File Number 2106.26.004, ADEC Hazard ID 24797

Dear Mr. Weimer:

ERM Alaska, Inc. (ERM) is submitting this work plan on behalf of Ms. Pomposa Poterfield (Property Owner) to conduct water sampling at three monitoring wells and the current drinking water well at the former Circle S Grocery site. The site is located at 22189 Birchwood Loop Road, Chugiak, Alaska (Attachment 1; Figure 1), Alaska Department of Environmental Conservation (ADEC) File Number 2106.26.004, Hazard ID 24797. The current property owner is Ms. Pomposa Porterfield. This work is being performed in response to the 7 June 2017 ADEC letter requesting for additional groundwater and drinking water monitoring at the site (ADEC 2017a).

BACKGROUND

In June 1995 two USTs, a 10,000-gallon gasoline UST and a 5,000-gallon diesel UST, were removed from the Site. Fuel contaminated soil was encountered during the removal action. Laboratory analysis of soil samples collected from the bottom of the excavation indicated that remaining soil was impacted above applicable ADEC cleanup levels for petroleum hydrocarbons.

The final excavation was approximately 15 feet deep and a fuel resistant liner was placed in the excavation prior to the installation of a new UST and clean backfill. The replacement UST, installed in 1995, was reported to be an 11,000-gallon dual compartment tank.

In August 1999, a limited site investigation was conducted to characterize the extent of petroleum hydrocarbon impacts to the subsurface at the site. Two soil boreholes were advanced to approximately 70 feet below ground surface (bgs). Laboratory results of soil

samples collected from the boreholes indicated that benzene and gasoline-range organics (GRO) concentrations exceeded ADEC cleanup levels. Although no groundwater was encountered in the boreholes, groundwater monitoring wells were installed. The monitoring wells were checked in September 1999 and no groundwater was detected in the wells. No additional assessment activities were completed, nor was the contamination delineated from the 1999 release.

In August 2012, the dual compartment UST was removed (reported as 15,000 gallons in the UST removal report). The excavation conducted to remove the UST did not extend past the liner placed in 1995 when the tank was installed. Laboratory results for soil samples collected from the excavation bottom indicated that benzene and diesel-range organics (DRO) exceeded ADEC cleanup levels. Soil removed from the excavation was stockpiled and sampled. Review of results for the soil stockpile samples indicated that this soil was not impacted above ADEC cleanup levels. The closure report did not state what material was used to backfill the excavation.

The ADEC sent a letter to Ms. Pomposa Porterfield, owner of the property, in June 2013 that outlined State of Alaska regulations concerning contaminated sites and responsibilities as a landowner. The letter requested that a work plan be developed to define the nature and extent of the contamination and submitted to ADEC.

ERM performed a limited site investigation in January 2014 and found petroleum hydrocarbon concentrations in excess of ADEC soil cleanup levels in samples between 14 feet bgs and 82 feet bgs within the former UST footprint. Of particular concern is the benzene detection that exceeded the ADEC soil cleanup level in the sample collected at 82 feet bgs as this represents a potentially complete exposure pathway to current receptors via ingestion of groundwater. ERM did not encounter groundwater in any of the boreholes installed in January 2014.

ERM sampled Ms. Porterfield's well in November 2014 and found detectable concentrations of benzene and ethylbenzene in the drinking water samples. The detected concentrations did not exceed applicable maximum contaminant levels (MCLs). ERM also performed a limited well search and determined that groundwater in the vicinity of the Site appears to flow to the north-northeast.

In a 7 April 2015 letter, ADEC requested that Ms. Porterfield conduct monthly drinking water sampling of the well serving her property for benzene, toluene, ethylbenzene, and total xylenes (collectively referred to as BTEX), beginning in the month of April 2015. BTEX were consistently detected in the drinking water samples collected from the residence at the former Circle S Grocery site (22179 Birchwood Loop Road). Concentrations of benzene exceeded the Title 18 of the Alaska Administrative Code Chapter 75 (18 AAC 75) Table C groundwater cleanup level in the samples collected in January 2016. ADEC also requested that the closest community well, located at 22208 Birchwood Loop Road, be sampled in April 2015 for BTEX as well. ERM conducted this sampling on 29 April 2015 and concentrations of BTEX in this sample did not exceed the laboratory method detection limits.

Three monitoring wells were installed at the former Circle S Grocery site in October 2015 and were sampled on a quarterly basis from November 2015 through October 2016 (Figure 2). GRO, DRO, residual range organics, and BTEX were detected in samples collected from all monitoring wells during the quarterly monitoring events.

In a 7 June 2017 letter, the ADEC requested the following:

- Need to discuss the current use of the on-property drinking water well. If it is currently in use or is used in the future it will need to be sampled on a monthly basis in accordance with past sampling and reporting requirements.
- The proposed two additional monitoring wells and monitoring well MW-02 need to be sampled on a quarterly basis, including depth to groundwater measurements on all of the monitoring wells and groundwater flow direction calculations for that monitoring event.
- ADEC approves, until further notice, a reduction in the collection of analytical samples from monitoring well MW-01 and MW-03 from quarterly to semi-annual and suspending RRO analysis for soil and groundwater sampling.
- Analytical soil samples need to be collected at the soil/water interface for the two additional monitoring wells. If based on field readings / observations another depth appears to be contaminated, then additional analytical samples need to be collected. The soil samples need to be analyzed for full VOCs (method 8260), GRO, DRO, and PAHs.
- The next groundwater sampling event in each monitoring well is to be analyzed for full VOCs method (8260), GRO, DRO, and PAHs. Based on the results you may request a reduction in the list of analytes.
- The next drinking water well sampling event is to be analyzed for VOC (method 524.2), GRO, DRO, and PAHs (method 525.2). Based on the results you may request a reduction in the list of analytes.
- Need a work plan for the installation and sampling of any replacement drinking water wells. The work plan needs to include proposed location(s) and applicable separation distances. Before use a drinking water well source the well will need analytical sampling and a pump test needs to be conducted to evaluate any drawdown in the on-property monitoring wells and water wells.
- Need to provide more detail on the depth of the pump intake during the groundwater sampling to document that is was within the top foot of the water column at the time of sampling.

CONCEPTUAL SITE MODEL

The conceptual site model (CSM) for the site was developed by ERM using the results of the April, May and June 2015 site investigation (ERM 2016) and ADEC's *Policy Guidance*

on Developing Conceptual Site Models (ADEC 2017e). The CSM conservatively assumes that there are completed exposure pathways between remaining contamination identified in site soils and future site receptors through incidental soil ingestion and inhalation of outdoor air. The results from the sampling events demonstrate that the human exposure pathway to groundwater is complete; however, the majority of samples showed contaminate concentrations below the ADEC Migration to Groundwater cleanup levels, with exception to benzene in the January 2016 sampling event. The CSM human health scoping form and graphical form are included as Attachment 2.

REGULATORY FRAMEWORK

The regulatory framework for this project was developed using the following regulations and guidance documents:

- 18 AAC 80, *Drinking Water* (ADEC 2017b);
- 18 AAC 78, *Underground Storage Tanks* (ADEC 2017c);
- 18 AAC 75, *Oil and Other Hazardous Substances Pollution Control* (ADEC 2017d);
- Title 40 of the Code of Federal Regulations (CFR), Protection of the Environment , Chapter 141 (USEPA 2014);
- ADEC *Policy Guidance on Developing Conceptual Site Models* (ADEC 2017e); and
- ADEC *Field Sampling Guidance* (ADEC 2017f).

Groundwater samples will be collected for the analyses listed below.

- GRO using Alaska Method AK 101
- DRO using Alaska Method AK 102
- Volatile Organic Compounds (VOC)s using USEPA Method 8260 for monitoring wells and USEPA Method 524.2 for the drinking water well
- Polycyclic Aromatic Hydrocarbons (PAH)s using USEPA Method SW8270D SIM for the monitoring wells and USEPA Method 525.2 for the drinking water well

FIELD ACTIVITIES

The ERM field team will consist of two people, meeting the definition of "qualified person" as per 18 AAC 75.990(100). Field work at the former Circle S Grocery site will consist of the following work elements:

- Monitoring wells MW-01, MW-02, and MW-03 will be surveyed for relative elevation to assess the groundwater flow direction at the site.
- Monitoring wells MW-01, MW-02, and MW-03 will be sampled for the analyses listed above under regulatory framework.

- Ms. Poterfield's current drinking water well will be sampled for the analyses listed above under regulatory framework.

Pre-field Activities

Following ADEC approval of this work plan, ERM will contact Ms. Pomposa Porterfield, the property owner of the drinking water well to request permission to sample her well. The project laboratory, SGS North America, Inc. (SGS) of Anchorage, Alaska will be contacted to obtain a sample kit for the field effort. ERM will notify the ADEC project manager, Mr. Robert Weimer, a minimum of 72 hours prior to conducting the field effort.

Water Sampling

Drinking Water Well Sampling

Prior to collecting a sample from Ms. Porterfield's well (22179 Birchwood Loop Road), ERM personnel will attempt to measure the depth to static water level using an electronic calibrated tape with an accuracy of 0.01 foot without removing the pitless adapter from the well. ERM will ensure that the electronic calibrated tape is completely decontaminated before it is used in the drinking water well; this will consist of using a water bleach mixture on the entire roll of tape. If ERM cannot safely access the drinking water well for measuring static depth or cannot successful decontaminate the entire tape the static water level will not be taken.

Drinking water sample collection will follow procedures outlined in ADEC's Field Sampling Guidance (ADEC 2017f) and those found on the following ADEC Drinking Water Program's website: http://dec.alaska.gov/eh/dw/publication/sample/. The drinking water sample from Ms. Porterfield's residence will be collected from the faucet that is closest to the pressure tank. The screen, hoses, aerators, and any other devices will be removed from the faucet prior to sample collection. ERM will run the water tap at one-half to three quarters of maximum flow for a sufficient amount of time to allow for water to be purged from the pressure tank. Once the water has been purged from the pressure tank, the flow will be reduced to a trickle to minimize aeration of the sample. The drinking water location will be sampled for VOCs, GRO, DRO, and PAH; in that order. The volatile samples (VOCs and GRO) will be collected as discussed below.

1. The sample will be collected using a slow, controlled flow down the side of a tilted sample bottle to minimize volatilization.
2. The vial will be filled until a meniscus is visible. Then the vial will be immediately sealed to reduce volatilization.
3. Once the vial is capped, invert the vial and gently tap it to ensure that no air bubbles are present. If air bubbles are present, repeat the process.

One drinking water well duplicate sample will be collected for the entire suite of analyses for quality control and quality assurance (QAQC) purposes.

Monitoring Well Sampling

ERM will sample the three monitoring wells, MW-01, MW-02, and MW-03 using a positive pressure submersible pump. ERM will measure the depth to groundwater prior to sampling the wells using a water level interface probe. Monitoring wells will be sampled in accordance to procedures and best practices described in ADEC's Field Sampling Guidance (ADEC 2017f) as well as the procedures below.

- Water will be purged from the wells using a low-flow technique. A positive pressure submersible pump will be placed within one foot of the top of the water table. The pump will be used to slowly purge the water while measuring water quality parameters (see below). When the parameters have stabilized within the criteria outline below the sample will be collected.
    - The pumping flow rate should be low enough to minimize drawdown on the system to the extent possible. Typically, flow rates on the order of 100 to 500 milliliters per minute (mL/min) are used, however it is dependent on site-specific hydrogeology. Check the water level periodically, to monitor drawdown in the well, as a guide to flow rate adjustment. The goal is minimal drawdown less than 0.3 feet while purging and sampling. Pumping rates will be limited to approximately 100 mL/min during collection of volatile organics.
- A YSI 556 water quality meter with a flow-through cell will be used to measure pH, conductivity, temperature, oxidation-reduction potential (ORP), and DO in the groundwater. Each well will be purged until water quality parameters are considered stable. Water quality parameters are considered stable when three successive readings, collected 3-5 minutes apart, are within:
    - ±3% for temperature (minimum of ± 0.2°C),
    - ±0.1 for pH,
    - ±3% for conductivity,
    - ±10 mV for ORP
    - ±10% for DO, and
    - ±10% for turbidity.

    Or three well volumes have been purged; whichever comes first. Periodically (i.e., every three to five minutes) these preliminary readings will be recorded on the sample data sheets. Once the parameters are stable, the final measurements will be recorded on the sample data sheets. The instruments and field screening methods will be calibrated and operated in accordance with the manufacturer's recommendations. If the well does not recover quickly enough to permit stabilization of parameters with continuous purging, the well will be purged dry and sampled immediately following 80% recovery sufficient to collect a sample.

- When transferring water from the pump tubing to sample containers, a purge water bucket (1- to 5-gallon capacity) will be positioned beneath the transfer point to catch any incidental spillage of water.
- Each monitoring well location will be sampled for VOCs, GRO, DRO, and PAHs; in that order. The analyses for these samples are provided in the regulatory framework section.
- Purge water from monitoring wells will be disposed of in either of the two ways.
    - It could be contained in a 55-gallon drum, labeled, and transported by NRC Alaska for disposal,
    - Or it will be put through a Granulated Activated Carbon (GAC) 5 gallon drum and disposed of on site.

Drinking water and monitoring well samples will be placed in an iced cooler immediately upon collection. All observable physical characteristics of the drinking water and groundwater (e.g., color, turbidity) will be recorded in the field logbook. Weather conditions at the time of sampling will be recorded (e.g., air temperature, wind direction, recent heavy rainfall, drought condition) in a field notebook and on groundwater sample data sheets (provided as Attachment 3). A chain-of-custody form will be completed and will accompany the samples to the project laboratory.

Equipment Decontamination

When possible, disposable sampling and personal protective equipment (PPE) will be used for field activities; however, some of the sampling equipment will be non-dedicated and will require decontamination between uses. Equipment anticipated for field decontamination includes, but is not limited to the following items:

- Water level indicator
- Submersible pump
- Flow-through cell and probes

The primary intent of field decontamination is to prevent cross-contamination of samples, control the spread of contaminants to uncontaminated areas, and prevent chemical exposure to the sampling team. The decontamination procedures for all sampling equipment will consist of a consecutive series of the following wash and rinses:

- Scrub to remove all visible material,
- Scrub with brushes using Alconox detergent solution,
- Double rinse with potable water,
- Rinse with organic-free deionized water, and
- Air dry.

Non-disposable protective clothing will be washed with a water and Alconox solution and will be rinsed with potable water. Disposable PPE will be disposed of as shown in the Investigation Derived Waste section below.

Investigation Derived Waste

Investigation-derived waste anticipated to be generated is limited to PPE and purge water or GAC. Used PPE will be collected in a garbage bag, taped shut and disposed of as solid waste in the Anchorage Regional Landfill. The purge water will be disposed of in one of two ways; the purge water will be collected in a 55-gallon drum and will be disposed of through NRC Alaska, or the purge water will be treated using GAC and disposed of on site.The GAC can treat up to 500 gallons of water. The amount of water poured through the GAC will be documented in the field notebook. After 500 gallons, the GAC will be taken to NRC for disposal.

QUALITY ASSURANCE/QUALITY CONTROL

The field effort will be performed in accordance with the quality assurance QAQC procedures presented in this section.

Quality Assurance

Field personnel will collect samples in a manner that preserves the integrity of the sample matrix. Samplers will use certified sample media and dedicated PPE to prevent cross-contamination between samples at each location. Sampling equipment will be dedicated to each sample location to the extent practical. Sample containers will be sealed, labeled and preserved in accordance with the analytical method. Equipment will be calibrated, maintained and operated according to manufacturer recommendations.

Field Documentation

Field documentation will consist of the use of field notebooks, sample data sheets, sample identification labels, and photographs. A field logbook will be maintained by the ERM field team leader to record a description of field activities and samples collected.

The field logbook will be a bound, waterproof notebook containing consecutively numbered pages. All entries will be made in waterproof ink. No pages will be removed for any reason.

At a minimum, the following information will be recorded:

- Name of person making entry (signature);
- Names of team members on site;
- Levels of personal protection;
- Documentation on samples taken, including:
    - Sample identification numbers,

  - Sampling location and station numbers,
  - Sampling date and time, sampling personnel,
  - Type of sample, matrix, and
  - Number of samples collected;
- Field observations and remarks;
- Weather conditions, precipitation, wind direction, etc.;
- Unusual circumstances or difficulties;
- Monitoring equipment used (brand, model, serial number);
- Monitoring equipment calibration;
- Initials of person recording the information; and
- Corrections to documentation.

All entries for field logbooks, sample identification labels, COC records, and other forms must be written in waterproof ink. Sampling forms will not be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. Any corrections will be made by drawing a single line though the original entry (so that the original entry can still be read), and writing the corrected entry alongside. The correction must be initialed and dated.

Sample Identification

Samples collected for laboratory analysis will be identified with a standard sample identification number format. Sample numbers will use the following format: 18-CSG-01-MW

In this example, "18" represents the calendar year; "CSG" represents "Circle S Grocery;"; "01" is a sequential sample number; and "MW" is the designator for sample type. Possible sample types for this project are listed below.

- MW- monitoring well
- DW- drinking water well
- TB – trip blank sample

Sample Handling

Samples will be tracked by the use of chain-of-custody (COC) laboratory forms. Each sample will be individually identified on a COC form. These forms will include the sample identification number, sample date, sample time, requested analysis, type and number of sample containers, QC information and requested analytical turnaround time. Each form will be signed and dated on relinquishment to the laboratory to maintain the custody of the samples.

Quality Control

QC samples will be collected and prepared to assess potential errors introduced during sample collection, handling and analysis. As part of the QA/QC program, a field duplicate sample will be collected and analyzed.

One field duplicate sample will be collected for all analyses to verify the reproducibility of data within the project laboratory. The duplicate sample will be handled, labeled and documented in the same manner as the regular field sample to prevent bias in the laboratory results.

Data Quality Objectives

Data Quality Objectives (DQOs) have been established for this project to ensure that the monitoring data is of sufficient quantity and quality to accomplish the following:

- Perform routine monitoring well and drinking water monitoring to document constituent concentrations, trends, and migration.
- Compare results to applicable ADEC Contaminated Sites Program cleanup levels outlines in 18 AAC 75 (ADEC 2017d) and monitor contaminant concentrations for comparison to maximum contaminant levels (MCLs) set forth in 40 CFR 141.61 (USEPA 2014), as adopted by reference in 18 AAC 80.010(a)(10)(A) (ADEC 2017b);
- Ensure that the integrity of the results is legally defensible.

Data Reduction, Validation, and Reporting

Validation and review of all analytical data will be performed by a qualified professional experienced in data verification/validation procedures. Data will be verified in accordance with the USEPA procedural guidance documents and the ADEC regulatory guidance documents as appropriate. The reference documents include the USEPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA-540-R-08-01), June 2008; and the USEPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA-540-R-10-011), January 2010.

Additionally, the data verification will conform to the ADEC *Environmental Laboratory Data and Quality Assurance Requirements*, Technical Memo-06-2002, dated March 2009 (ADEC 2009). Laboratory performance and analytical results will be checked through a QA review, which will include the ADEC's *Laboratory Data Review Checklist* (ADEC 2010a). The review will assess analytical quality through five data quality indicators: completeness, accuracy, precision, comparability and representativeness. The impact of any discrepancies will be discussed with respect to the quality and usability of the data.

A groundwater monitoring report will be prepared following the monitoring event. The report will describe field activities completed, provide tabulated summaries of field and analytical data, present conclusions, provide recommendations for future work. Analytical results will be compared to 18 AAC 75 Table C groundwater cleanup levels, and in the case of the drinking water analytical results, to maximum contaminant levels

(MCLs) as well. An ADEC laboratory checklist will be included in the report for the purpose of data validation. Figures presenting analytical results and groundwater flow direction will be attached to the report.

A draft report will be submitted, electronically, to Berkley Specialty Underwriting Managers (BSUM – Insurance representative) for review. After any requested revisions, we will submit the report to ADEC, electronically via Alaska ZendTo Service, for their review and approval. Any comments or revisions requested by ADEC will be discussed with BSUM and Ms. Porterfield prior to finalizing the report. A copy of the report will be provided to Ms. Porterfield via U.S. mail.

SCHEDULE

Pending ADEC approval of this work plan, we anticipate conducting this field effort in October. ERM will prepare a final report detailing the findings and results from this field effort approximately four weeks after the receipt of laboratory analytical results.

Sincerely,

Jeremy Stariwat
Project Manager

Thomas Beckman
Contract Manager

cc:

Ms. Pomposa Porterfield, property owner
Mr. Daryl Gottilla, Senior Claims Examiner, Berkley Specialty Underwriting Managers

Attachments:

1. Figures
2. Conceptual Site Model
3. Sample Data Sheets

REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2009. Environmental Laboratory Data and Quality Assurance Requirements, Technical Memo-06-2002. March.

ADEC. 2010. Laboratory Data Review Checklist. January.

ADEC. 2017a. Letter from Mr. Robert Weimer to Ms. Pomposa Porterfield Regarding Circle S Grocery, Hazard ID No. 24797. 7 June.

ADEC. 2017b. 18 AAC 80 Drinking Water. As amended on 7 November.

ADEC. 2017c. 18 AAC 78 Underground Storage Tanks. As amended 7 November.

ADEC. 2017d. 18 AAC 75 Oil and Other Hazardous Substances Pollution Control. As amended through 7 November.

ADEC. 2017e. Guidance on Developing Conceptual Site Models. January.

ADEC. 2017f. Field Sampling Guidance. August.

Environmental Resources Management (ERM). 2016. Circle S Grocery Quarterly Drinking Water Summary Report, Chugiak, Alaska, BSUM Claim 105081, ADEC File No. 2106.26.004, ADEC Hazard ID 24797.11 July.

United States Environmental Protection Agency (USEPA). 2008. Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review. June. (EPA 540-R-08-01).

USEPA. 2010. Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review. January. (EPA-540-R-10-011).

USEPA. 2014. Title 40 Code of Federal Regulations, Protection of Environment. As revised 1 July.

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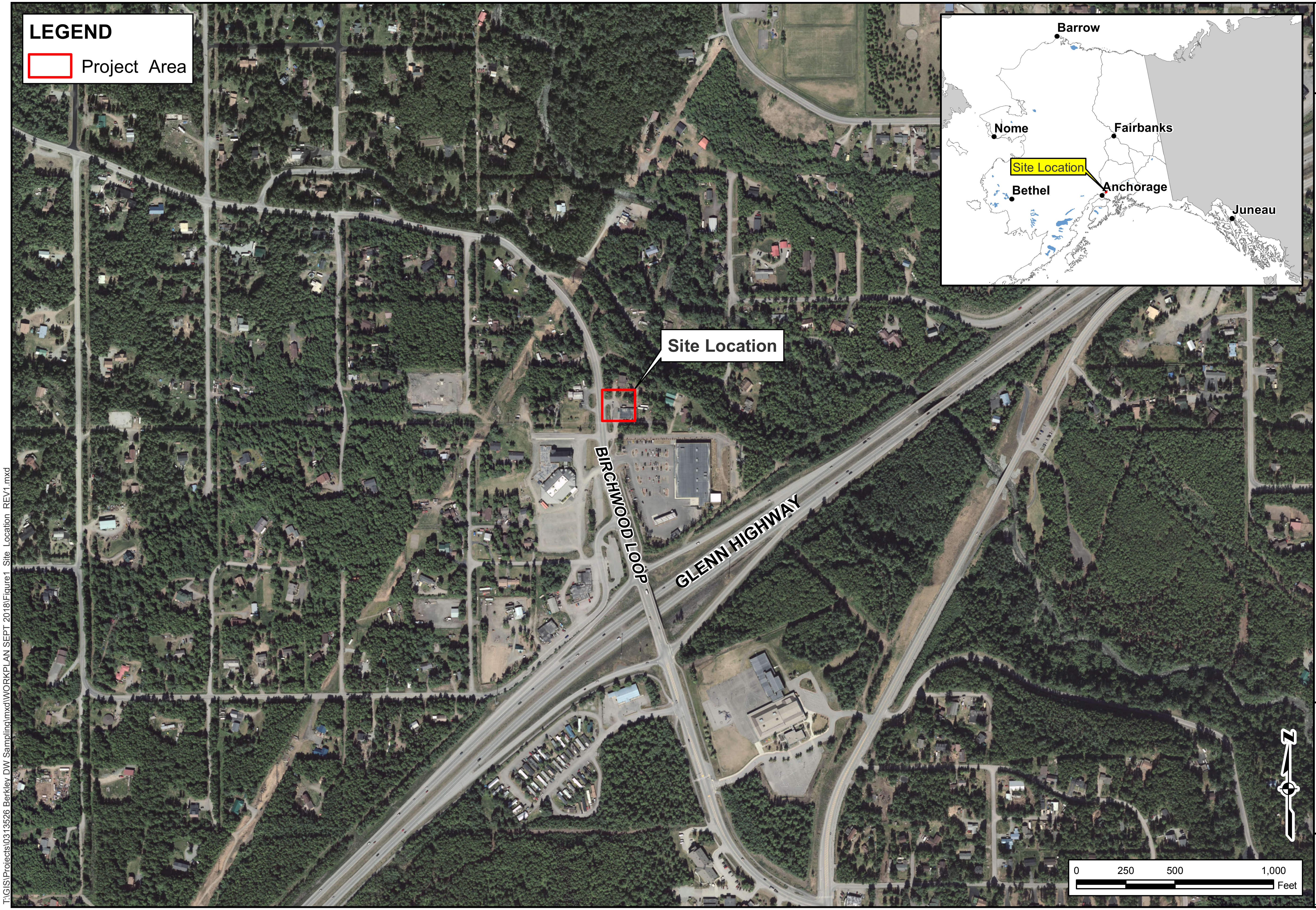
ATTACHMENT 1

Figures



SOURCE: City of Anchorage orthoimagery, flown 5/4/2015 at 6in per pixel

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FIGURE 1

SITE LOCATION MAP - CIRCLE S GROCERY
22189 BIRCHWOOD LOOP ROAD

IRCLE S GROCERY SITE GROUNDWATER AND DRINKING WATER WELL SAMPLING
Chugiak, Alaska

DATE: SEP. 2018
CHKD: J.N.S.
DRWN: N.W.C.
PROJ. No.: 0474463

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ERM

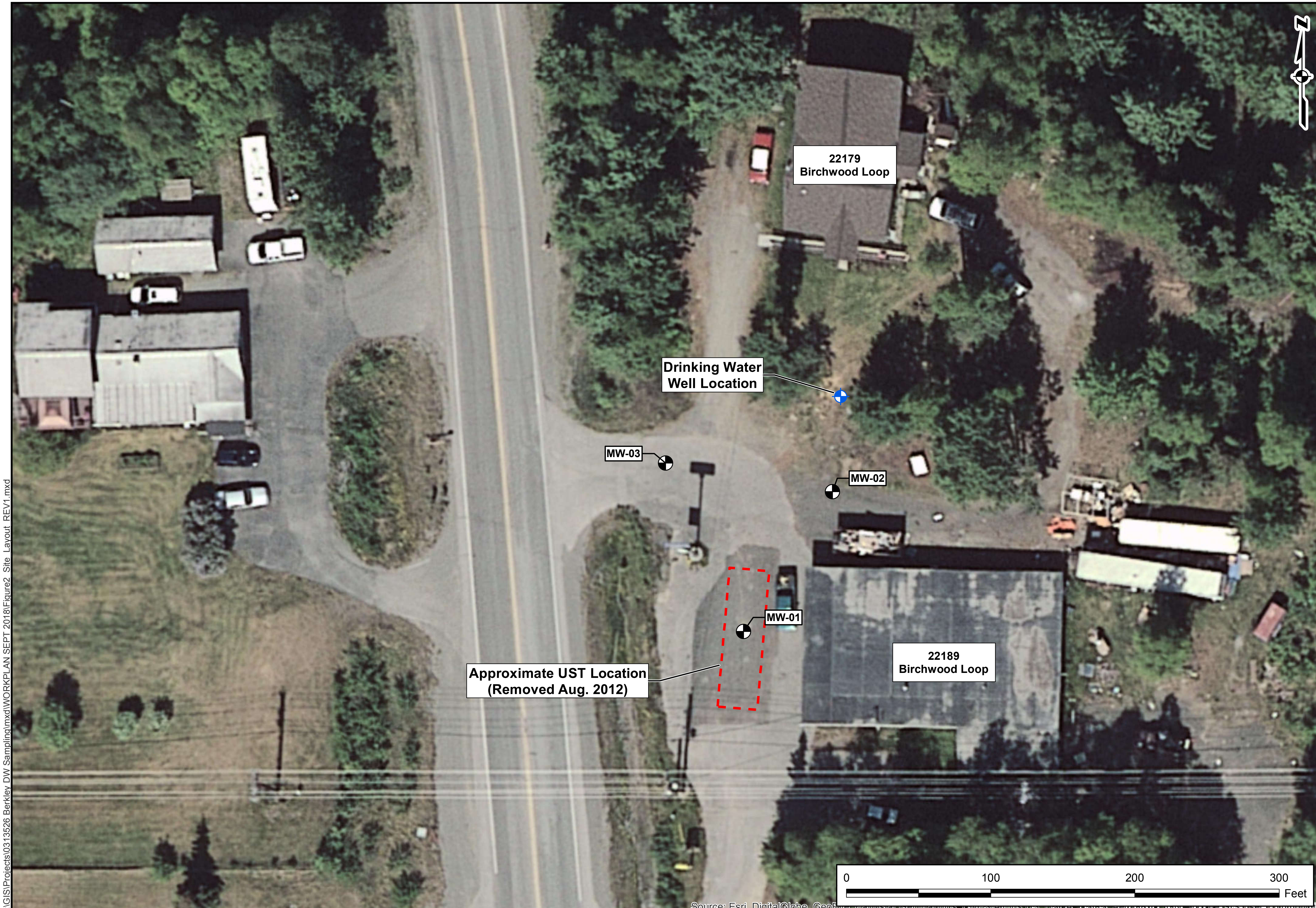

FIGURE 2

SITE LAYOUT

CIRCLE S GROCERY SITE GROUNDWATER AND DRINKING WATER WELL SAMPLING
Chugiak, Alaska

DATE: SEPT. 2018
CHKD: J.N.S.
DRWN: N.W.C.
PROJ. No.: 0474463

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ERM

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ATTACHMENT 2

Conceptual Site Model

Print Form

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name: Circle S Grocery

File Number: 2106.26.004

Completed by: Kassi Murray/Project Engineer

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☒ USTs
- ☐ ASTs
- ☒ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☐ Other:

Release Mechanisms *(check potential release mechanisms at the site)*

- ☐ Spills
- ☒ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☐ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☒ Air
- ☐ Sediment
- ☒ Groundwater
- ☐ Surface water
- ☐ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☒ Residents (adult or child)
- ☒ Commercial or industrial worker
- ☒ Construction worker
- ☐ Subsistence harvester (i.e. gathers wild foods)
- ☐ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

Concentrations of DRO and benzene exceeded their applicable ADEC soil cleanup levels in one sample collected at a depth interval of 14 to 16 feet below ground surface (bgs).

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

The compounds detected in the soil samples collected at depths shallower than 15 feet bgs are not listed in Appendix B of the guidance document.

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Groundwater was encountered in the 3 soil borings advanced to depths of approximately 120 feet bgs at the site in October 2015. Groundwater monitoring at the site conducted in November 2015 showed detectable levels of GRO, DRO and BTEX constituents in two of the monitoring wells. the monitoring well located closest to the on-site drinking water well showed benzene concentrations of 0.104 mg/L

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

Surface water bodies are not present in close proximity to the site.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☐

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☐

If all of the boxes are checked, label this pathway complete: Incomplete

Comments:

Site contaminants are not listed in Appendix C of the guidance document.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Benzene was detected at a concentration greater than the ADEC soil cleanup level in 1 sample collected at a depth interval of 14 to 16 feet bgs. Given the depth to contaminated soil and the fact that potential exposure would come from outdoor air, any exposure to site contaminants via this pathway would be insignificant.

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☐

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Incomplete

Comments:

The occupied building present at the site is located greater than 30 horizontal feet from the petroleum contaminated soil remaining at the site.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Circle S Grocery
ADEC File No. 2106.26.004

Completed By: Kassi Murray/ Project Engineer
Date Completed: 8/29/2018

***Instructions*: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Media	Transport Mechanisms	Exposure Media	Exposure Pathway/Route	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☐ Surface Soil (0-2 ft bgs)	☐ Direct release to surface soil — check soil									
	☐ Migration to subsurface — check soil									
	☐ Migration to groundwater — check groundwater									
	☐ Volatilization — check air									
	☐ Runoff or erosion — check surface water									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil									
	☑ Migration to groundwater — check groundwater									
	☑ Volatilization — check air									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Ground-water	☑ Direct release to groundwater — check groundwater	☑ soil	☑ Incidental Soil Ingestion	F	F	F	F			
	☑ Volatilization — check air		☐ Dermal Absorption of Contaminants from Soil							
	☐ Flow to surface water body — check surface water		☐ Inhalation of Fugitive Dust							
	☐ Flow to sediment — check sediment	☑ groundwater	☑ Ingestion of Groundwater	C	C	C	C			
	☐ Uptake by plants or animals — check biota		☑ Dermal Absorption of Contaminants in Groundwater	C						
	☐ Other (list):		☐ Inhalation of Volatile Compounds in Tap Water	C	C	C	C			
		☑ air	☑ Inhalation of Outdoor Air	I	I	I	I			
			☐ Inhalation of Indoor Air							
			☐ Inhalation of Fugitive Dust							
☐ Surface Water	☐ Direct release to surface water — check surface water	☐ surface water	☐ Ingestion of Surface Water							
	☐ Volatilization — check air		☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Sedimentation — check sediment		☐ Inhalation of Volatile Compounds in Tap Water							
	☐ Uptake by plants or animals — check biota	☐ sediment	☐ Direct Contact with Sediment							
	☐ Other (list):	☐ biota	☐ Ingestion of Wild or Farmed Foods							
☐ Sediment	☐ Direct release to sediment — check sediment									
	☐ Resuspension, runoff, or erosion — check surface water									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									

Revised, 10/01/2010

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ATTACHMENT 3

Sample Data Sheets

GROUNDWATER SAMPLING FORM

CLIENT:

SITE:

SAMPLER(S) NAME:

DATE:

SAMPLE ID ON COC:

MONITORING WELL ID:

YSI #/SN:

SHEET **OF**

Weather:

1 in = 0.083 ft; 2 in = 0.167 ft; 3 in = 0.25 ft; 4 in = 0.333 ft

PRODUCT PRESENT:

DIAMETER OF WELL: (FT)

PURGE AND SAMPLE METHOD: Low Flow

RADIUS OF WELL (R): (FT)

WATER LEVEL MEASURING DEVICE: Oil/Water Interface Probe

TOTAL DEPTH OF WELL BELOW MEASURING POINT (D): (FT)

TYPE OF PUMP: Peristaltic

DEPTH TO GW BELOW MEASURING POINT (d): (FT)

WELL INTEGRITY:

LENGTH OF WATER COLUMN (L): (D-d)= (FT)

REQUIRED REPAIRS:

VOLUME OF WATER COLUMN (V): (3.14xRxRxL) (CUBIC FT)

PUMP INTAKE DEPTH:

WELL VOLUME: (7.48xV)= (GAL) **X3=** (GAL)

Min Purge Volume **Max Purge Volume**

Note: Groundwater volumes above were calculated in the field and used for approximate purge volumes; rounded values are shown for informational purposes only.

TIME	VOLUME (GAL)	WATER LEVEL (ft BTOC)	TEMP (deg C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	TURBIDITY (Visual: High, Med, Low, Clear)	APPEARANCE OF WATER (Visual)	ODOR

(1) STABILIZATION is achieved when three (3) consecutive readings of the below parameters.

in 3-5 minute intervals meet the following criteria:

- ±0.1 standard units for pH
- ±3% for temperature
- ±3% for conductivity
- ±10 mV for ORP
- ±10% for DO
- ±10% for turbidity

PURGE UNTIL PARAMETER STABILIZATION or UNTIL 3 WELL VOLUMES ARE REMOVED

TOTAL VOLUME PURGED: **(GAL)** **FLOW RATE (desired range is 100 to 500 mL/min):**

SAMPLE TIME: **QC SAMPLES COLLECTED:**

ANALYSIS (fill in number of bottles collected)

GRO (3 vials, HCL)				
VOC (3 vials, HCL)				
DRO ([2] 250ml ambers, HCL)				
PAHs ([2] 1-L ambers)			Other:	

COMMENTS:

Turbidity (NTU): _____

Sampler Signature

QC Check Signature

Drinking Water Sampling Worksheet

Location _____
Project # : _____ Date: _____
Project Name: _____ Start Time: _____
End Time: _____
Field Team: _____
Sample ID: _____ Time: _____ primary dup
Sample ID: _____ Time: _____ primary dup
Weather Conditions:

Sensory Observations (circle all that apply)

Color: Clear, Amber, Tan, Brown, Grey, Milky White, Other:

Sheen: No, Petrogenic, Biogenic

Odor: None, Low, Medium, High, Very Strong, H2S, Fuel like, Chemical ?, Unknown

Debris: Yes, No

Turbidity None, Low, Medium, High, Very Turbid, Heavy Silts

Instrument Observations

Temp (°C)	Spec. Cond. (mS/cm^{C})	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)

Velocity (ft/sec)	Turbidity (NTU)			

Location Diagram/Notes

Analyses	# of Bottles Collected	Bottle Type (preservative)	Comments:

Signed: _____ **Date:** _____

Signed/reviewer: **Date:**

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