Appendix G
ECA Geophysics – Geophysical Investigation Report, UPRR GHFF and the Freeman School District Complex

Geophysical Investigation Report
UPRR GHF and the FSD Complex

Freeman, Washington

July 19, 2019

Prepared for:

Jacobs Engineering Group
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3rd Floor
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Prepared by:

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APPENDICES

Certification

Utilizing the multi-electrode Electrical Resistivity (RES) and Induced Polarization (IP) surveying method, **ECA Geophysics** recently completed a geophysical investigation of the Union Pacific Railroad Grain Handling Facility (UPRR GHF) and the adjacent Freeman School District Complex (FSD Complex), which is situated approximately 8 miles south of Spokane Valley, Washington. The work was requested by Jacobs Engineering Group, on behalf of the Union Pacific Railroad and performed through the utilization of methods and procedures consistent with good commercial or customary practice designed to conform to acceptable industry standards. The independent conclusions contained in this report represent the best professional judgment of **ECA Geophysics**, based upon information and data available to us during the course of this assignment. Additionally, the conclusions and recommendations presented herein are based upon the conditions that existed and the information that was available at the time of the investigation.

Performed and written by:

_____

Brett D. Smith PE, LG
(registrations in ID, NV, OR, WA)

1.0 Introduction

Jacobs Engineering Group (**Client**) hired **ECA Geophysics** to perform a multi-electrode electrical resistivity (RES) / induced polarization (IP) survey along Client-approved two-dimensional (2D) profiles at selected locations within an approximate 76-acre area comprising the UPRR GHF and the FSD Complex (Survey Area) shown in the Site Map in Appendix A.

During May 6-13, 2019 **ECA Geophysics** performed a geophysical investigation that incorporated RES/IP surveys within the boundaries of the Survey Area. At the request of the **Client**, this work was performed to address the project goals of identifying the *lateral extent* and continuity of three predominant geologic units comprising the upper unconsolidated sediments, the lower basalt unit and the deep decomposed (weathered granite unit; all of which may contain carbon tetrachloride contaminated groundwater. Acquisition of RES/IP data was appropriate, since RES data typically identify general water-bearing characteristics and IP data typically provide more specific information such as gravel composition and/or fracturing that provide greater quantities of groundwater (and contaminants).

2.0 Survey Instrumentation

The SuperSting™ R8/IP (SSR8) system, manufactured by Advanced Geosciences, Incorporated (AGI) of Austin, Texas, was utilized to acquire the RES/IP data for this field investigation. This system incorporates a patented dual mode multi-electrode configuration that takes up to 8 readings for each current injection and subsequently performs eight times faster than any single channel instrument. This system has a proven track record in performing large-area time-consuming surveys and is designed for resistivity imaging in such applications as groundwater exploration, geotechnical investigations, mapping contaminant plumes and other environmental work. An unanticipated and unusual equipment malfunction occurred at the beginning of this investigation, causing a two day delay in RES/IP data acquisition. Upon receipt of an operational system, fieldwork commenced without incident. The replacement RES/IP data acquisition system was again "receiver tested" and found in satisfactory operational condition, as confirmed by the certification in Appendix B.

The **Trimble Geo XH™** Global Positioning System (GPS) was utilized to gather accurate horizontal (locational) coordinates and elevations for slope changes that occurred along each linear resistivity array (section). Utilizing the recently enhanced WAAS system of satellites and ground stations, this instrument acquired GPS coordinates at accuracies predominantly ±2.2 feet vertically and ±1.3 feet horizontally, when post-processed by a qualified third-party GIS engineering firm who utilized highly-accurate proximal signal beacons. All GPS readings were individually acquired and recorded by the geophysical surveyor. See spreadsheet in Appendix B.

3.0 Survey Approach and Quality Management

ECA Geophysics conferred with the Client, to determine the best locations for the six RES/IP line profiles shown in the Site Map. Whenever feasible, we acquired RES/IP data near previously drilled borings, in order to strengthen interpretations and to improve the vertical accuracy of depth to target picks. The following subsections describe the resistivity surveys, the quality of the resistivity data and the resultant calculated RES/IP profiles shown in Appendix B.

3.1 Survey Approach

Array Configuration - To properly image the upper 250 feet of the subsurface, an energy penetration depth of 300 feet was selected, in order to provide sufficient data coverage throughout the subsurface profile. For Lines 1-6, an 84-electrode system was deployed, using a 20-ft electrode spacing, to create a 1,660-ft long linear RES/IP array. Line 4 was *horizontally* extended an additional 420 feet, by adding a 21-electrode "rollalong" section, to create a 2,080

long linear RES/IP array (see Site Map). According to AGI, the *horizontal* resolution is typically *one-half* the electrode spacing, so a 20-ft electrode spacing was utilized for all six lines to achieve the 10-ft horizontal resolution desired by the Client. From personal (and also industry) experience, the imaging or energy penetration depth is typically *one-fifth* the array length, provided surface energy attenuation effects are minimal. Accordingly, the above surveying parameters were utilized to image as deep as 332 feet, with a horizontal resolution of 10 feet. Inspection of the calculated resistivity sections in Appendix B reveals that only one RES/IP profile (Line 5) fell significantly short of this depth penetration goal, by imaging to a depth of 226 feet. The other profiles acquired data to depths ranging from 292 feet to 343 feet. The exact locations and extent of the six RES/IP arrays (lines) are shown in the Site Map.

The dipole-dipole array configuration best addresses project goals that require good *horizontal* resolution, as this array is sensitive to horizontal changes in resistivity (1, 2). Combining this array type with a 20-ft electrode spacing, laterally variable, high-angle fracture zones or buried stream channels should be effectively sampled (imaged). Additionally, the dipole-dipole array was augmented with gradient array properties, to improve resolution and imaging depth (2).

Energy Source – The SSR8-based resistivity arrays require 12-volts of DC power. To ensure sufficient energy injection, an additional "booster" battery was connected (in parallel) to the SSR8 system during recording, to provide as-needed additional current for distant readings.

Data Recording – Utilizing proprietary AGI software, a command file was created to automatically (ie, no surveyor assistance required) direct the SSR8 system to inject current at myriad preselected current electrodes along the extensive array, to acquire as many as 583 measurements per recording event. This file was then downloaded to the SSR8 system, where only a few in-field entries (ie, filename, electrode spacing, and command file) are required to initiate the RES/IP data acquisition process. During the in-field entry process, the RES/IP mode was also selected, to enable the measurement / collection of the potential difference (ie, voltage) *time decays* that occur at potential electrodes when the energizing current is terminated. This decaying potential difference is known as induced polarization (IP) in the time domain. When the RES/IP mode is selected, the IP data are collected *immediately after* RES data acquisition.

The SSR8 recording system performed internal checks including continuity and electrode contact resistances, such that unacceptable readings pause the recording of all measurements and triggered an alarm to notify the operator to correct issues. No alarms occurred during any of the surveys, because the resistivity electrodes were placed in a manner that minimized the contact resistance between the former and the ground, as discussed in Section 3.2 below. After all measurements for a particular array were made, **ECA Geophysics** utilized AGI's EarthImager 2D™ software to create a *preliminary* apparent resistivity pseudosection. When the RES/IP model revealed root mean square (RMS) errors less than 10 percent, the data were deemed adequate and a field decision was made to pull the array and mobilize to the next location.

3.2 Data Quality and Resolution

GPS Data - Slope changes along each of the six lines were measured, utilizing a GPS system that provided locational and elevation accuracies at the accuracies stated in Section 2.0.

Resistivity Data - Key elements to an accurate resistivity survey include straight transects (sections), accurate electrode elevations, good electrode-to-soil contact (ie, low contact resistance) and demonstrated repeatability of the method. The standard tolerance for array straightness and elevation errors between adjacent electrodes is a distance and height no greater than *one-half* the electrode spacing or 10 feet. During array set-ups, considerable care was taken to establish line-of-sight straightness, such that maximum *observed* horizontal deviations (errors) never exceeded 2 feet over the straight sections of each array and the maximum profile bend

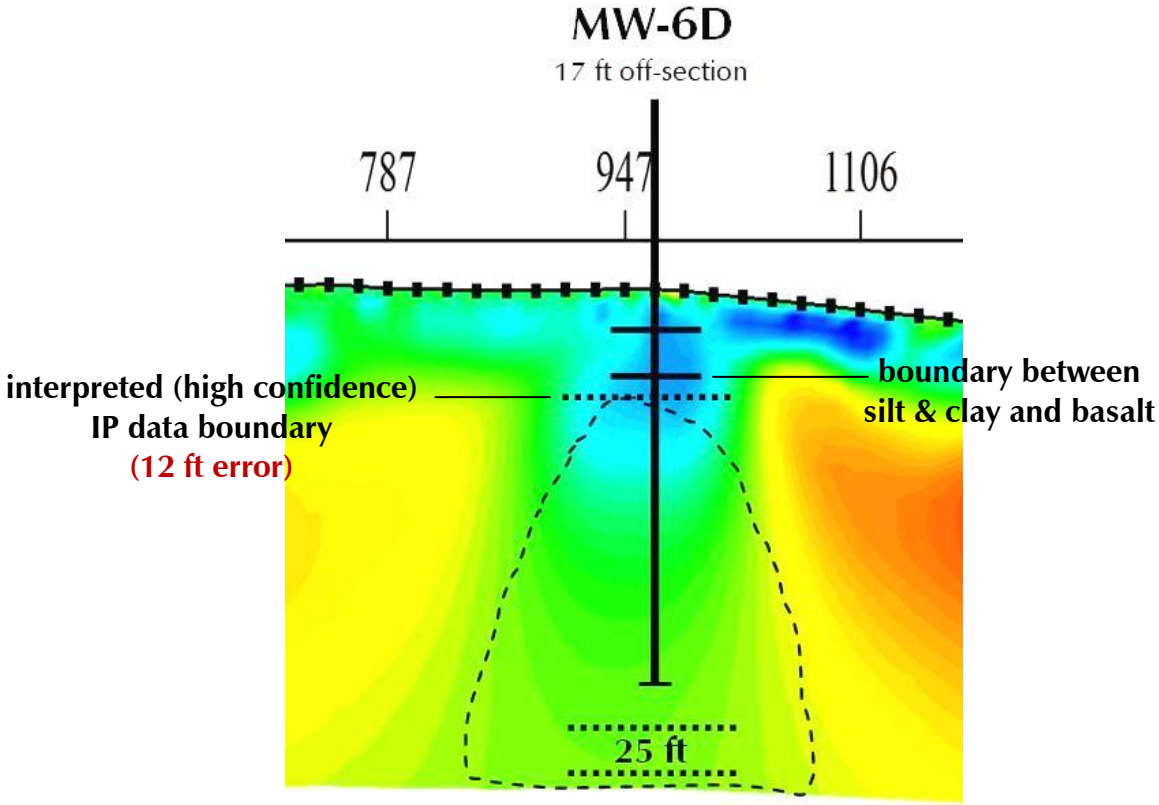
never exceed 10 degrees, which is *considerably less* than allowed tolerances. Finally, the maximum elevation errors never exceeded 5 feet, which is also *considerably less* than the allowed tolerance. All lines approximated 1,660 feet in length, with the exception of Line 4, which was 2,080 feet long.

In order to account for local undulating topography, terrain files were incorporated into each array's specifications, as shown in the RES/IP profiles in Appendix A. Prior to making measurements, the contact resistance (CR) for all array electrodes was noted and remedied, as needed. No set tolerance exists but ideally CRs *should never exceed 5,000 ohms*. The following CR measurement ranges for each resistivity array are noted below:

Line 1	=	65 to 1,200 ohms
Line 2	=	140 to 3,200 ohms
Line 3	=	110 to 4,800 ohms
Line 4	=	135 to 2,000 ohms
Line 5	=	140 to 4,500 ohms
Line 6	=	120 to 950 ohms

As needed, additional pounding of electrodes and/or the addition of saltwater around electrodes kept CR values low, thus ensuring good overall quality of the acquired data. The predominant near-surface silts and clays in the Survey Area were a mixed blessing, in that they unfortunately absorbed and thus attenuated the downward transmission of the injected current. However, these same conductive near-surface soils also enabled low CRs, thus enhancing current injection and transmission, to enable good depth imaging.

Figure 1 (below) shows an *empirical* confirmation of vertical resolutions that range from approximately 7 to 12 feet.



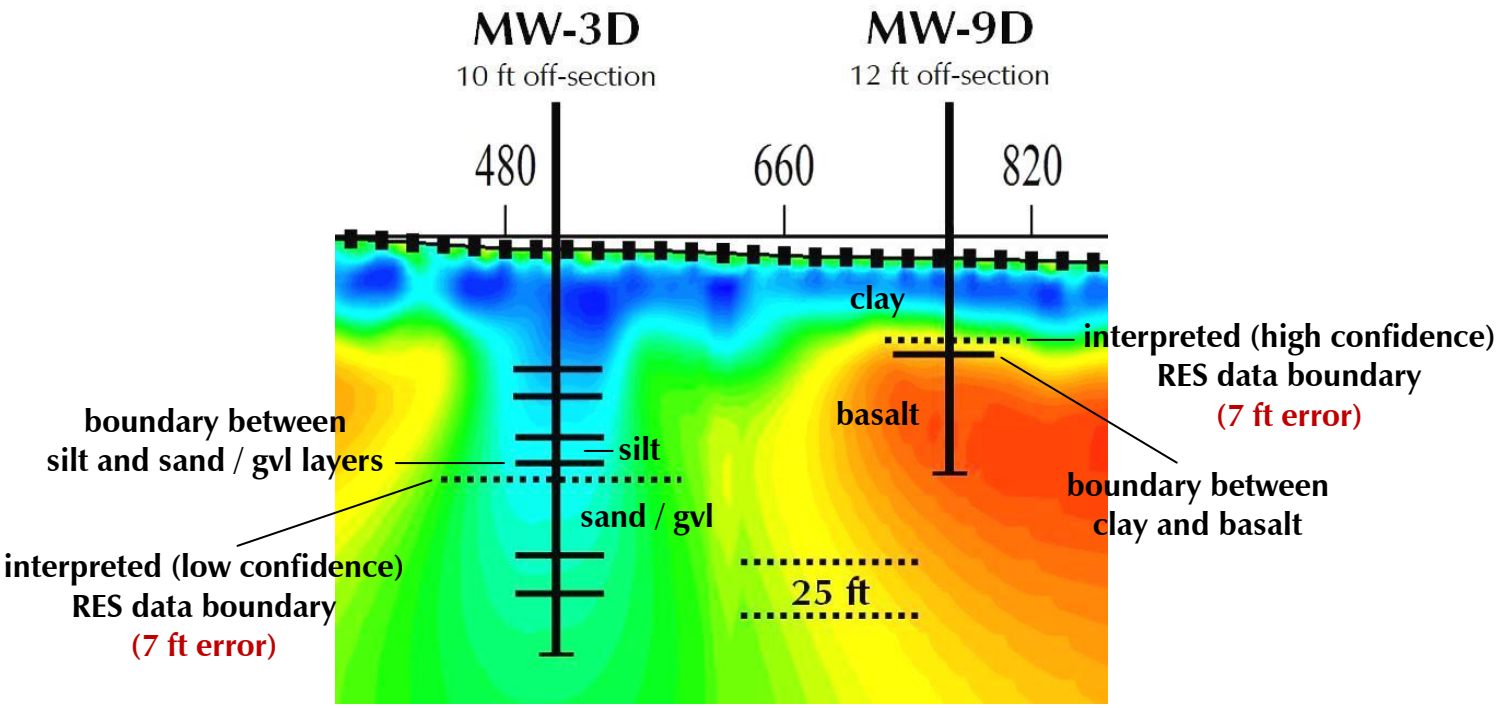


Figure 1 – Approximate vertical resolution (ie, accuracy) of RES/IP data, as determined from an empirical analysis of the correlation of the data with boring log information.

As previously stated, the horizontal resolution is assumed to be approximately 10 feet or one-half the 20-ft electrode spacing (2).

3.3 RES/IP Model Quality

Resistivity surveys measure injected current (I) through transmitting electrodes and potential difference or voltage (V) between two receiving electrodes. Measured current and voltage, together with electrode geometry (K), may be converted into apparent resistivity (ρ_a). V/I and ρ_a data are equivalent quantities that can be transformed back and forth via K. The goal of a resistivity survey is to image a subsurface resistivity distribution that closely fits the subsurface geology, where the subsurface resistivity distribution is the model parameter in the inversion.

The calculated RES/IP profiles (models) are the partial differential equation that governs the relationship between data and model parameters. The forward and inversion modeling of the acquired data was performed using AGI's EarthImager 2D™ software. Forward modeling is defined as the process of predicting the data on the basis of a known distribution of a model parameter and electrode configuration and maps from the model space to the data space. Inversion is defined as the process of determining the estimates of the model parameter on the basis of the data and the model. Inversion is a mapping from the data space to model space, and it reconstructs the subsurface resistivity distribution from measured voltage and current data.

The RES/IP data inversion proceeded as follows.

1) Through several trial and error analyses of RES data misfit crossplots (see Appendix B) initial site specific settings were established, regarding acceptable minimum / maximum RES/IP data and RES data having more than 7 percent error in repeat measurements.
2) Those data not meeting the above parameters were removed, namely 17-28 percent of all data from Lines 1-5 and 47 percent of all data from Line 6.
3) A starting model was based upon an average apparent resistivity, user assumption or existing knowledge of subsurface resistivity distributions.

4) Forward modeling was carried out for a predicted data set over the starting model. The initial RMS error at the initial iteration was calculated at this step.
5) A linearized inverse problem was resolved, based upon the current model and data misfit for a model update (Δm).
6) The model was updated using a formula like this: $m_{i+1} = m_i + \Delta m$. The model parameter "m" consists of electrical conductivity of all model blocks in the finite difference or finite element mesh. The symbol "i" is the iteration number.
7) A forward model was again run, based upon the updated model for a predicted data set.
8) A new RMS error regarding predicted versus measured data was calculated. Final RMS errors should ideally be less than 5 percent and preferably never exceed 10 percent.

When any of the stop criteria were satisfied, the inversion stopped. Otherwise, Steps 3) to 6) were repeated. During the data RES modeling process for each profile, a Data Misfit crossplot was displayed, to check how well the calculated (predicted) apparent resistivity fits the corresponding measured apparent resistivity, whereas a Data Correlation plot was displayed to check the quality of the exponential decay of the secondary voltage that measures IP (see Appendix B). A perfect *predicted versus actual* apparent resistivity fit occurs along the diagonal green line displayed in the crossplots. Acceptable data misfit or "goodness of fit" occurs when the maximum RES RMS error is less than 10 percent and "L2" (another data misfit indicator) is less than 2. A perfect exponential decay curve for IP data is indicated by a normalized value of -1.0. As previously stated, all bad RES/IP data were removed prior to the forward / inversion modeling process.

The IP Data Correlation plots reveal a predominance of favorable decay events, indicating good IP data quality. Every opportunity was made to ensure that good predicted versus actual convergence occurred, in that anywhere from 14 to 21 modeling trials were made regarding Lines 1-6. Only 5 modeling trials were needed for Line 3, due to very similar findings for nearby, parallel Lines 1 and 2. The maximum RMS error was 7.8 percent in Line 6 and the maximum L2 was 1.2 in Line 1, yet still being within acceptable tolerances (see Appendix B). Though the Data Misfit crossplot for Line 6 had the worst (albeit acceptable) convergence, numerous trials revealed no appreciable improvement in the RMS error, so it was decided to forgo the removal of potentially viable data.

The six RES/IP profiles show good repeatability, as similar-looking anomalies line up in a geologically plausible manner (see Appendix C). Such displays are more than likely caused by subsurface features and not by artifacts generated during data acquisition and/or data processing.

3.4 Tie Line Analysis

Three intersections between the acquired RES/IP lines exist, namely near the ends of Line 5, where it crosses Line 3 and Line 6 and in Line 4 and Line 6, where the intersection occurs midway in Line 6, as shown in the Site Map. At arbitrarily chosen depths, the respective RES intersection values were noted and listed in Table 1 below:

Table 1 – Comparison of RES Tie Line Values

Intersection	Line RES (ohm-m)	Line RES (ohm-m)	Depth (ft bgs)	Tie error (%)
Line 3 / Line 5	Line 3 - 39	Line 5 - 36	87	8
Line 4 / Line 6	Line 4 - 74	Line 6 - 89	78	20
Line 5 / Line 6	Line 5 - 72	Line 6 - 89	89	24

Given an approximate vertical resolution error of 10 feet and the large changes in RES values over tightly-grouped color contours, the above errors are not remarkable. Though the RES line ties were read at maximum zoom and at excellent screen resolution, the possibility exists that as much as half of each error could result from simply misreading the correct color contour. Additionally, lateral anisotropy could affect this analysis. For example, where Line 6 intersects Line 4, the accumulated E-W RES measurement may differ from the accumulated N-S RES measurement at the same location on Line 6. Nevertheless, the observed RES line tie analyses reveal acceptable repeatability within the RES database.

4.0 Data Interpretation

4.1 RES - Borehole Data Correlations and Effects

Inspection of the profiles for Lines 1-6 reveals good correlations between the RES data and the boring logs for holes drilled nearby the arrays. For instance, high RES values (in ohm-meters or ohm-m) should occur in basalt and low RES values should occur in clays. These values should be reduced in the presence of water, matrix decomposition (weathering) and the presence of surface minerals (mineralization) that enhance ionic conduction. These effects are clearly revealed in the upper RES profiles. Additionally, competent (unweathered) basalt that would typically have very high RES values can have a wide range of high to low values in the presence of a wet rock *surface*, due to the resistivity-lowering effect of conductive (ion-rich) groundwater that enhances current flow. Conversely, the absence of water (dryness) offsets the resistivity-lowering effects of clay and mineralization, as ionic conduction is dramatically hindered, as air is a perfect resistor. Finally, other significant barriers to ionic conduction are high pore-space tortuosity and low porosity (ie, low pore space volume).

Since RES/IP data have non-unique solutions (ie, low RES could be due to wetness or more clay), interpretations may vary. Accordingly, all of our interpretations have been based predominantly upon geologic context (ie, boring data).

Another challenge to making confident interpretations is the presence of anisotropy or the effect of subsurface directionality upon RES/IP measurements. For instance, fractures within the underlying and extensive Columbia River Basalt may include water and/or clay that disproportionately alter RES/IP responses (values). For this reason, boring data must be judiciously utilized, with much greater reliance upon proximity, as seen in the calculated RES/IP profiles for Lines 4 and 6 in the area by boring MW-6D, where RES values vary from ~50 ohm-m (Line 6) to ~100 ohm-m (Line 4). This discrepancy is most likely due to the boring being located just 17 feet off-section regarding Line 6 but as much as 137 feet off-section for Line 4, where anisotropy may indeed be a major factor.

Table 2 (below) lists typical RES values for sand, silt, clay and basalt. Site *specific* information for sand, silt and clay were not readily available.

Table 2 – Typical RES Values

Material	Resistivity (ohm-m)	Reference (Section 7.0)
dry sand	10 - 800	3
silt	50 - 2,000	4
clay	1 - 100	3
competent basalt	200 - 2,000	5
fractured basalt	100 - 500	5
The introduction of water to pore spaces, fractures and surfaces lowers RES values (4, 5).		

4.2 IP Data Correlations and Effects

Inspection of the profiles for Lines 1-6 reveals strong correlations between the effects of certain physical conditions and the chargeability magnitude of the IP data (in millivolts / volt or mV/V). For instance, clay is a dominant source of induced polarization in unmineralized rocks, such that the chargeability greatly increases in the presence of clay. The display captions in Appendix C discuss "dirty" (ie, clay-rich) conditions that refer to the relative amount of clay in the rock matrix or on its surface, whereby dirtier means more clay. Throughout the interpretations, it should be noted that silt is not to be confused with clay, as it is considered to be a finer-grained material that may or may not contain clay particles. Lastly, mineralization also greatly enhances chargeability and is why the IP method is utilized extensively in mining exploration studies, where metal-oxides and metal-sulfides create very large chargeabilities or IP values (6). Chargeabilities for sand, silt, clay and basalt were not readily available.

4.3 Buried Channel

Inspection of the profiles for Lines 1-6 reveals a buried stream channel, as evidenced by subsurface zones of significantly lower resistivity (ie, high conductivity) within the marked areas of these lines. Aside from the distinct differences in the color contours for these profiles, the *interpreted* lithologies further support this interpretation, as revealed by dry sandstone / sand being separated by wet clayey sand (Line 1), dry sands being separated by wet silty sand (Line 2), dry sand / basalt being separated by moist sand / silt / clay (Line 3) and deep, clay-filled incisions into weathered basalt (Lines 4-6). The map view trend of this interpreted channel is shown in Appendix D.

5.0 Recommendations

The six RES/IP model profiles included in Appendix C are information-rich and need to be carefully scrutinized for project-specific use. For instance, a buried stream channel appears to exist, as evidenced by distinct RES value changes revealed on all six lines. The lithologies shown in the profiles are based upon the boring data and nothing else. Needless to say, very extensive sections of each displayed RES/IP profile lack boring information. The inclusion of the IP data has been most useful in this regard, as it provides a viable constraint to the RES data interpretations. The two sets of data seem to complement each other; a good sign from an interpretation perspective.

When possible, subsequent drilling activities should occur within 50 feet of Lines 1-6, in order to further constrain (and improve) the interpretations made in this Report. Given the satisfactory imaging and depth penetration achieved during this investigation, the RES/IP method appears to be a useful subsurface imaging tool for the Survey Area.

6.0 Closing Comments

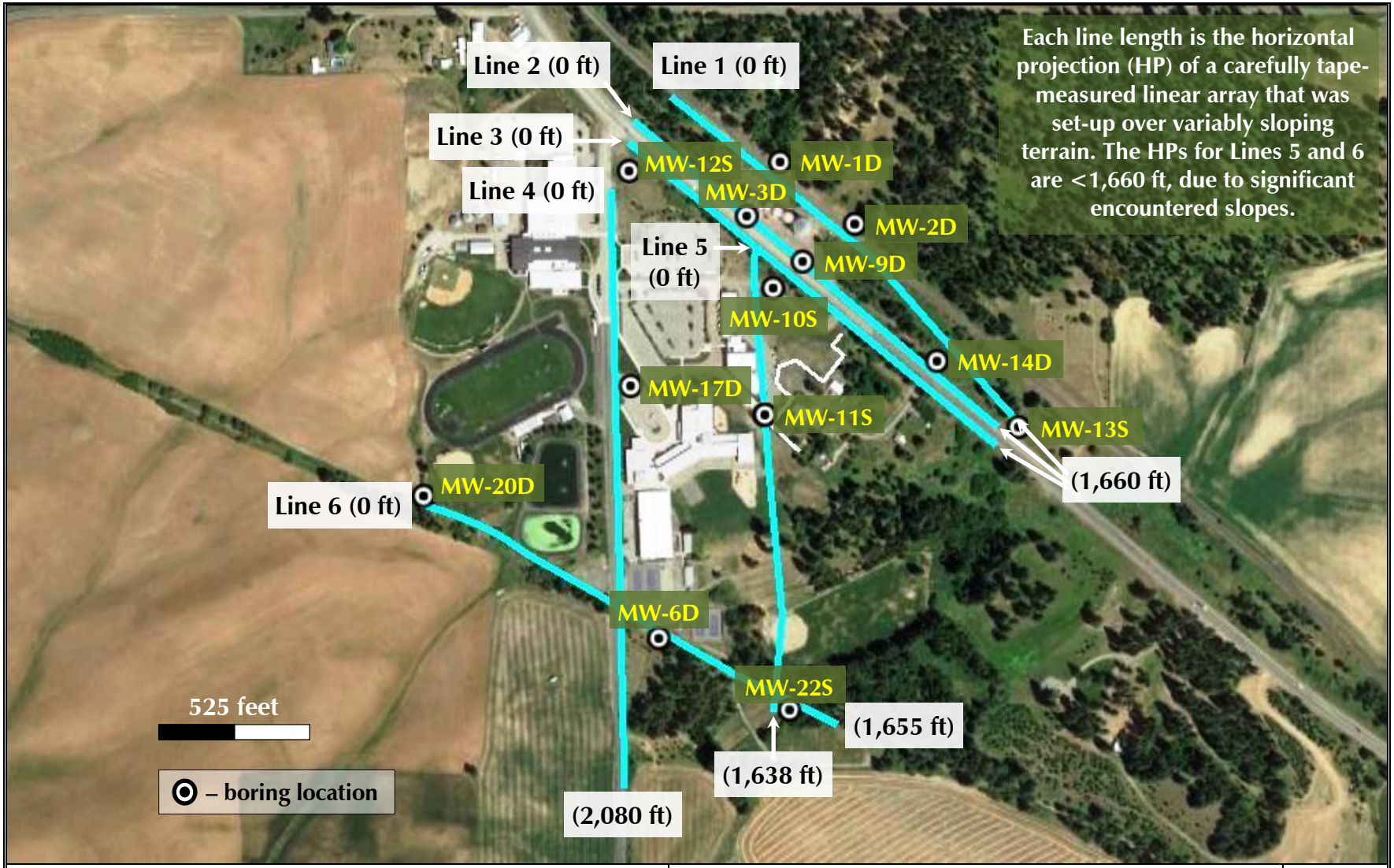
ECA Geophysics performed this geophysical surveying project, utilizing best available methods and practices. However, all interpretations, opinions and recommendations presented herein should in no way be considered as unequivocal, legally-binding facts. Accordingly, we do not guarantee the validity or accuracy of offered interpretations, as they constitute simply *conjecture* based upon the limited information obtained from this investigation.

7.0 References

1. Loke, M.H., *2-D and 3-D electrical imaging surveys*, 2001.
2. Advanced Geosciences, Incorporated (AGI), *Field survey setup FAQ*, current website.
3. Telford, W.M., et al: *Applied Geophysics*, 1976.
4. McNeill, J.D. of Geonics Limited: *Technical Note 5*, 1980.
5. Geochemistry, Geophysics, Geosystems: *Petrophysical and geochemical properties of Columbia River flood basalt*, 2012.
6. Amadasun, V.O., et al: *Optimizing geophysical tomographic approaches in a road failure*, 2018.

APPENDIX A

SITE MAP



ECA Geophysics 372 S Eagle Road, Suite 146 Eagle, ID 83616	**SITE MAP** 1 inch = 525 feet	N
ECA Project No. 19ECA268	**UPRR Grain Handling Facility Area** **RES / IP Investigation**	

APPENDIX B

RES/IP SYSTEM CERTIFICATION

GPS COORDINATES

RES/ IP DATA QUALITY PLOTS

environmental
EQUIPMENT+SUPPLY

491-L Blue Eagle Ave. Harrisburg, PA 17112
717-901-8891 ofc. 717-901-8114 fax

SUPER STING R8 RECEIVER TEST

This is to certify that the Super Sting R8 Resistivity Unit SN SS0611179, Asset Number 16616 was tested satisfactorily iaw Sect 5.1.3 of the Advanced Geosciences, Inc – Super Sting with Swift Manual. The following tests were performed:

5.1.3.1 The Contact Resistance Test
5.1.3.2 The Cable Test
5.1.3.3 The Receiver Test
5.1.3.4 The Relay Test

I have inspected the operation and appearance of this instrument and approve it for meeting the specified requirements for proper operation.

Performed by: _____

Date:: 4/10/2019

DISCLAIMER: The listed equipment was tested using accepted industry standards. The safe and proper use of this equipment is the ultimate responsibility of the user. Environmental Equipment and Supply is not responsible for damage or injury resulting from use of this equipment.

ENVIRONMENTAL EQUIPMENT + SUPPLY

491 L BLUE EAGLE AVE.
HARRISBURG, PA 17112

717 901-8891

environmental
EQUIPMENT+SUPPLY

WORK ORDER: 56842
TECHNICIAN: PULASKIC
DATE CREATED: 4/9/2019 4:23:00 PM
MFG: AGI
MODEL: SUPER STING
SERIAL NUMBER: SS0611179

TASK: SUPER STING INVENTORY

DESCRIPTION

DOWNLOAD AND DELETE DATA
CLEAN AND INSPECT STING AND BOX
AC ADAPTER
COMPUTER COMM CABLE
FIRMWARE LOADING CABLE
BLACK POWER CABLE WITH CLIPS
BLACK POWER BOOSTER CABLE - PIGTAIL
ADMIN SOFTWARE DISK
MANUAL

DATE	LABOR DESCRIPTION	TECHNICIAN	HOURS	RATE	EXT RATE
				TOTAL LABOR:	

PART	PART DESCRIPTION	QTY	PRICE	EXT COST
			TOTAL PARTS:	

TASK: SUPER STING RECIEVER TEST

DESCRIPTION

DATE	LABOR DESCRIPTION	TECHNICIAN	HOURS	RATE	EXT RATE
				TOTAL LABOR:	

PART	PART DESCRIPTION	QTY	PRICE	EXT COST
			TOTAL PARTS:	

GRAND TOTAL PARTS:	$0.00
GRAND TOTAL LABOR:	$0.00
GRAND TOTAL WORK ORDER:	$0.00

GPS Coordinates for Survey Area Features

NORTHING	EASTING	ELEV (raw)	ELEV (+0.5 ft)	LOCATION	LINE	Vert acc (ft)	Horiz (acc) (ft)
211129.536	2538983.999	2608.5	2609.0	e1	**L3**	3.6	2.0
211048.247	2539097.725	2606.4	2606.9	e8	**L3**	2.6	1.6
211013.795	2539146.102	2609.1	2609.6	e11	**L3**	2.6	1.6
211002.164	2539161.365	2611.7	2612.2	e12	**L3**	2.6	1.6
210979.315	2539194.034	2611.4	2611.9	e14	**L3**	2.6	1.6
210956.806	2539227.524	2610.7	2611.2	e16	**L3**	3.3	2.6
210873.939	2539340.044	2606.3	2606.8	e23	**L3**	3.0	2.0
210791.808	2539453.234	2602.1	2602.6	e30	**L3**	3.3	2.3
210709.051	2539565.942	2600.0	2600.5	e37	**L3**	2.6	1.6
210672.426	2539613.581	2596.3	2596.8	e40	**L3**	3.3	2.0
210626.551	2539679.894	2596.9	2597.4	e44	**L3**	3.0	2.0
210614.275	2539695.892	2596.5	2597.0	e45	**L3**	3.0	2.0
210603.168	2539711.796	2596.3	2596.8	e46	**L3**	3.0	2.0
210591.542	2539728.376	2594.7	2595.2	e47	**L3**	2.6	1.6
210556.986	2539777.461	2593.4	2593.9	e50	**L3**	3.0	2.0
210477.784	2539892.491	2591.9	2592.4	e57	**L3**	3.0	2.3
210391.917	2540006.297	2590.0	2590.5	e64	**L3**	2.6	2.0
210364.416	2540035.237	2585.5	2586.0	e66	**L3**	3.0	1.6
210330.901	2540082.989	2584.9	2585.4	e69	**L3**	3.0	2.0
210294.487	2540130.348	2581.7	2582.2	e72	**L3**	2.6	1.6
210234.222	2540210.581	2579.3	2579.8	e77	**L3**	2.6	1.6
210198.316	2540258.908	2579.4	2579.9	e80	**L3**	2.6	1.6
210149.552	2540322.208	2578.1	2578.6	e84	**L3**	3.0	1.6
210966.052	2538930.958	2625.5	2626.0	e1	**L4**	3.3	4.3
210904.994	2538934.888	2625.7	2626.2	e4	**L4**	3.3	1.6
210866.651	2538938.174	2628.9	2629.4	e6	**L4**	3.0	2.6
210785.88	2538943.796	2627.3	2627.8	e10	**L4**	3.0	3.3
210765.768	2538945.459	2628.3	2628.8	e11	**L4**	3.0	3.3
210685.563	2538951.137	2625.0	2625.5	e15	**L4**	4.3	1.6

Lat, Lon Datum = WGS84 (NAD84)
(columns hidden)

N, E Datum = NAD83 (WA State Plane N, ft)
Elevation datum = NAVD88

Elevations increased 0.5 ft,
to correct inaccurate 4.0-ft antenna height to
actual 3.5-ft antenna height above ground.

GPS data were post-procesed by
Monsen Engineering of SLC Utah, utilizing
accepted industry practices.

Electrode location (e1 = Electrode 1)

Line ID (L1 = Line 1)

210606.368	2538957.31	2625.3	2625.8	e19	**L4**	3.0	1.6	
210546.178	2538961.26	2621.1	2621.6	e22	**L4**	3.0	2.0	
210526.34	2538962.812	2623.5	2624.0	e23	**L4**	2.3	2.3	
210446.954	2538968.348	2619.8	2620.3	e27	**L4**	2.3	1.6	
210347.084	2538973.531	2619.3	2619.8	e32	**L4**	2.3	1.6	
210287.713	2538977.918	2617.7	2618.2	e35	**L4**	2.3	2.0	
210147.135	2538987.871	2614.7	2615.2	e42	**L4**	2.3	1.6	
210047.489	2538994.407	2611.3	2611.8	e47	**L4**	2.3	2.0	
209928.309	2539002.522	2608.6	2609.1	e53	**L4**	2.3	2.3	
209828.043	2539008.876	2603.2	2603.7	e58	**L4**	3.0	2.0	
209688.744	2539018.845	2597.2	2597.7	e65	**L4**	2.6	2.3	
209509.788	2539032.084	2591.9	2592.4	e74	**L4**	2.6	2.3	
209469.803	2539035.718	2592.5	2593.0	e76	**L4**	3.0	2.3	
209389.924	2539040.059	2586.9	2587.4	e80	**L4**	3.3	2.3	
209311.363	2539044.312	2582.2	2582.7	e84	**L4**	3.6	2.3	
209289.592	2539047.177	2580.7	2581.2	e1 (RA)	**L4**	3.6	2.3	**RA = rollalong**
209250.517	2539048.574	2578.9	2579.4	e3 (RA)	**L4**	3.0	2.0	
209212.042	2539051.143	2577.6	2578.1	e5 (RA)	**L4**	5.9	3.9	
209151.127	2539057.402	2569.2	2569.7	e8 (RA)	**L4**	5.9	3.3	
209052.812	2539062.096	2564.7	2565.2	e13 (RA)	**L4**	4.9	3.6	
208972.034	2539067.19	2560.3	2560.8	e17 (RA)	**L4**	5.2	3.6	
208892.208	2539070.729	2556.2	2556.7	e21 (RA)	**L4**	3.6	3.3	
210798.603	2539444.583	2602.8	2603.3	e1	**L5**	6.2	2.3	
210743.304	2539439.084	2619.8	2620.3	e4	**L5**	6.2	2.3	
210723.438	2539439.006	2627.3	2627.8	e5	**L5**	6.6	2.3	
210704.49	2539439.89	2627.2	2627.7	e6	**L5**	6.6	2.3	
210685.445	2539442.174	2622.2	2622.7	e7	**L5**	6.6	2.3	
210665.568	2539444.729	2620.2	2620.7	e8	**L5**	6.6	2.3	
210645.941	2539447.081	2619.4	2619.9	e9	**L5**	6.6	2.3	
210626.186	2539448.751	2614.6	2615.1	e10	**L5**	6.6	2.3	
210607.193	2539453.384	2604.4	2604.9	e11	**L5**	6.9	2.6	
210584.844	2539456.619	2610.4	2610.9	e12	**L5**	6.6	2.3	
210567.289	2539456.038	2610.6	2611.1	e13	**L5**	6.6	2.3	

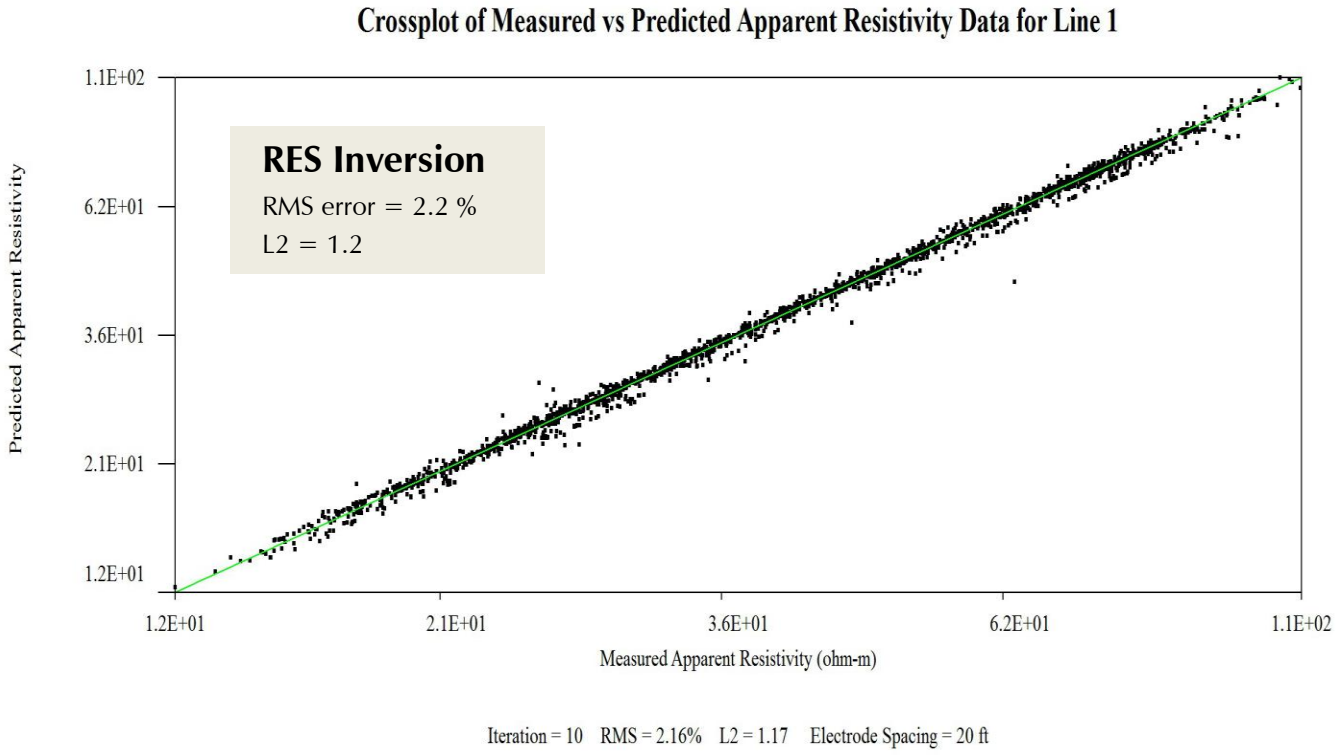
210547.662	2539458.688	2611.8	2612.3	e14	**L5**	6.6	2.3
210528.748	2539461.154	2615.8	2616.3	e15	**L5**	6.6	2.3
210509.545	2539463.506	2621.9	2622.4	e16	**L5**	6.6	2.3
210489.165	2539466.37	2623.0	2623.5	e17	**L5**	6.6	2.3
210469.252	2539468.659	2623.4	2623.9	e18	**L5**	6.6	2.3
210429.494	2539473.503	2623.6	2624.1	e20	**L5**	6.6	2.3
210350.221	2539482.977	2623.1	2623.6	e24	**L5**	6.6	2.3
210250.546	2539494.917	2622.5	2623.0	e29	**L5**	6.6	2.3
210210.945	2539500.347	2622.3	2622.8	e31	**L5**	6.6	2.3
210131.902	2539511.564	2612.7	2613.2	e35	**L5**	6.6	2.3
210092.623	2539516.586	2609.6	2610.1	e37	**L5**	6.2	2.3
210052.952	2539522.476	2605.9	2606.4	e39	**L5**	6.2	2.3
209993.643	2539530.717	2601.1	2601.6	e42	**L5**	6.2	2.3
209974.936	2539533.309	2599.2	2599.7	e43	**L5**	6.2	2.3
209955.023	2539536.317	2596.1	2596.6	e44	**L5**	5.9	2.3
209875.617	2539547.244	2594.2	2594.7	e48	**L5**	5.9	2.3
209855.753	2539549.873	2592.0	2592.5	e49	**L5**	5.9	2.3
209816.722	2539555.2	2586.3	2586.8	e51	**L5**	5.6	2.3
209777.212	2539561.497	2584.2	2584.7	e53	**L5**	5.6	2.6
209757.202	2539564.326	2582.2	2582.7	e54	**L5**	5.6	2.6
209717.807	2539570.031	2579.8	2580.3	e56	**L5**	4.9	2.3
209638.626	2539581.608	2575.1	2575.6	e60	**L5**	5.2	2.6
209599.037	2539587.458	2573.9	2574.4	e62	**L5**	5.2	2.6
209579.253	2539589.971	2572.9	2573.4	e63	**L5**	3.9	2.3
209558.678	2539592.919	2569.7	2570.2	e64	**L5**	4.9	2.6
209539.984	2539595.509	2567.6	2568.1	e65	**L5**	3.9	2.3
209520.012	2539598.772	2564.0	2564.5	e66	**L5**	4.9	2.6
209420.414	2539609.836	2564.6	2565.1	e71	**L5**	4.6	2.6
209363.303	2539615.095	2559.6	2560.1	e74	**L5**	3.6	2.3
209319.264	2539622.285	2562.7	2563.2	e76	**L5**	6.2	3.3
209298.437	2539623.448	2571.9	2572.4	e77	**L5**	7.9	3.3
209281.99	2539619.886	2581.9	2582.4	e78	**L5**	7.5	3.0
209267.703	2539618.886	2585.1	2585.6	e79	**L5**	6.6	3.3
209233.116	2539605.968	2567.8	2568.3	e81	**L5**	5.2	3.0

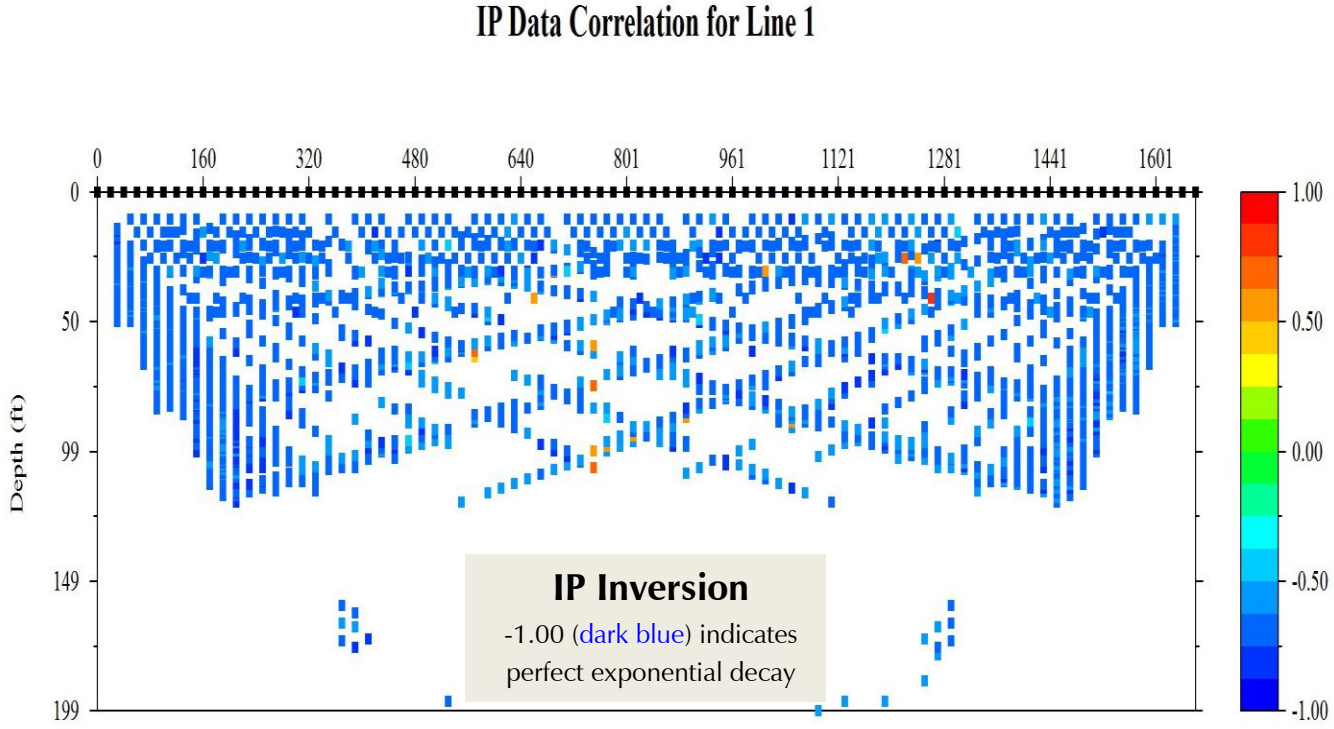
209216.003	2539598.374	2559.5	2560.0	e82	**L5**	6.2	3.6
209198.055	2539591.274	2557.8	2558.3	e83	**L5**	4.9	2.6
209180.591	2539583.833	2553.4	2553.9	e84	**L5**	4.9	2.6
209851.8	2538316.055	2617.1	2617.6	e1	**L6**	3.6	2.3
209830.327	2538396.445	2618.5	2619.0	e5	**L6**	5.6	3.3
209820.084	2538433.375	2610.1	2610.6	e7	**L6**	5.6	3.9
209812.837	2538451.279	2615.2	2615.7	e8	**L6**	3.9	2.3
209793.482	2538507.315	2612.6	2613.1	e11	**L6**	3.9	2.3
209785.738	2538526.333	2611.4	2611.9	e12	**L6**	3.3	2.3
209777.045	2538543.543	2605.1	2605.6	e13	**L6**	4.3	2.3
209769.429	2538561.101	2596.2	2596.7	e14	**L6**	3.6	3.3
209760.365	2538580.238	2599.5	2600.0	e15	**L6**	3.3	2.3
209743.883	2538613.86	2592.3	2592.8	e17	**L6**	4.9	2.6
209734.237	2538631.383	2596.7	2597.2	e18	**L6**	3.6	3.0
209724.136	2538648.325	2598.7	2599.2	e19	**L6**	3.6	3.0
209712.787	2538664.716	2600.1	2600.6	e20	**L6**	3.3	2.3
209691.579	2538699.052	2599.5	2600.0	e22	**L6**	3.6	2.3
209664.122	2538751.886	2594.5	2595.0	e25	**L6**	3.6	3.0
209655.945	2538770.376	2593.4	2593.9	e26	**L6**	3.9	3.0
209613.624	2538859.72	2592.5	2593.0	e31	**L6**	3.9	2.3
209594.393	2538896.273	2595.7	2596.2	e33	**L6**	3.6	2.3
209567.04	2538948.739	2591.0	2591.5	e36	**L6**	3.6	2.3
209557.908	2538966.499	2591.9	2592.4	e37	**L6**	3.6	2.3
209536.023	2538977.569	2566.5	2567.0	e38	**L6**	5.6	3.3
209536.427	2539000.569	2592.3	2592.8	e39	**L6**	4.6	2.6
209528.326	2539020.076	2590.6	2591.1	e40	**L6**	4.3	2.6
209518.318	2539037.003	2589.4	2589.9	e41	**L6**	3.9	2.6
209509.899	2539055.131	2589.5	2590.0	e42	**L6**	3.9	2.6
209492.284	2539091.129	2588.5	2589.0	e44	**L6**	4.3	2.6
209438.101	2539197.939	2589.1	2589.6	e50	**L6**	3.6	2.3
209391.233	2539286.796	2580.3	2580.8	e55	**L6**	4.3	3.0
209331.507	2539389.332	2568.3	2568.8	e61	**L6**	4.3	2.6
209325.277	2539410.169	2569.1	2569.6	e62	**L6**	4.3	4.6

209305.942	2539444.883	2565.8	2566.3	e64	**L6**	4.3	4.3
209281.788	2539499.338	2566.4	2566.9	e67	**L6**	4.3	3.3
209236.143	2539611.186	2566.9	2567.4	e73	**L6**	3.9	2.3
209208.054	2539663.557	2582.2	2582.7	e76	**L6**	5.2	4.6
209205.32	2539683.115	2558.7	2559.2	e77	**L6**	4.3	4.3
209170.996	2539757.475	2560.0	2560.5	e81	**L6**	3.9	3.6
209146.442	2539811.67	2553.5	2554.0	e84	**L6**	3.9	3.3
211205.489	2538993.847	2610.6	2611.1	e1	**L2**	4.9	2.0
211160.264	2539058.999	2610.3	2610.8	e5	**L2**	3.3	1.6
211099.226	2539137.16	2612.3	2612.8	e10	**L2**	3.6	1.6
211038.089	2539216.263	2611.0	2611.5	e15	**L2**	3.3	1.6
210977.202	2539296.085	2611.5	2612.0	e20	**L2**	3.3	1.6
210916.93	2539376.745	2606.5	2607.0	e25	**L2**	5.6	3.0
210858.715	2539456.532	2605.9	2606.4	e30	**L2**	3.6	1.6
210799.022	2539537.794	2602.8	2603.3	e35	**L2**	3.6	1.6
210739.687	2539618.413	2601.4	2601.9	e40	**L2**	3.3	1.6
210680.295	2539698.425	2598.8	2599.3	e45	**L2**	3.3	1.6
210619.829	2539779.163	2595.5	2596.0	e50	**L2**	3.6	2.0
210559.389	2539859.523	2593.1	2593.6	e55	**L2**	3.3	2.0
210499.182	2539939.52	2592.9	2593.4	e60	**L2**	3.9	2.0
210440.068	2540019.722	2589.9	2590.4	e65	**L2**	3.3	1.6
210380.356	2540099.432	2586.5	2587.0	e70	**L2**	3.3	1.6
210320.77	2540180.307	2583.8	2584.3	e75	**L2**	3.3	1.6
210260.487	2540259.989	2582.7	2583.2	e80	**L2**	3.6	2.0
210237.043	2540291.931	2581.0	2581.5	e82	**L2**	4.6	2.6
210213.629	2540323.686	2580.2	2580.7	e84	**L2**	3.6	2.0
211278.084	2539154.474	2604.7	2605.2	e3	**L1**	6.6	2.6
211253.751	2539190.104	2595.5	2596.0	e5	**L1**	6.6	2.6
211217.578	2539238.297	2599.2	2599.7	e8	**L1**	6.2	2.6
211100.859	2539401.258	2593.6	2594.1	e18	**L1**	5.9	2.3
210995.619	2539545.01	2610.1	2610.6	e27	**L1**	5.6	2.3
210879.552	2539709.083	2597.4	2597.9	e37	**L1**	5.2	2.3
210775.494	2539856.438	2593.4	2593.9	e46	**L1**	5.2	2.6

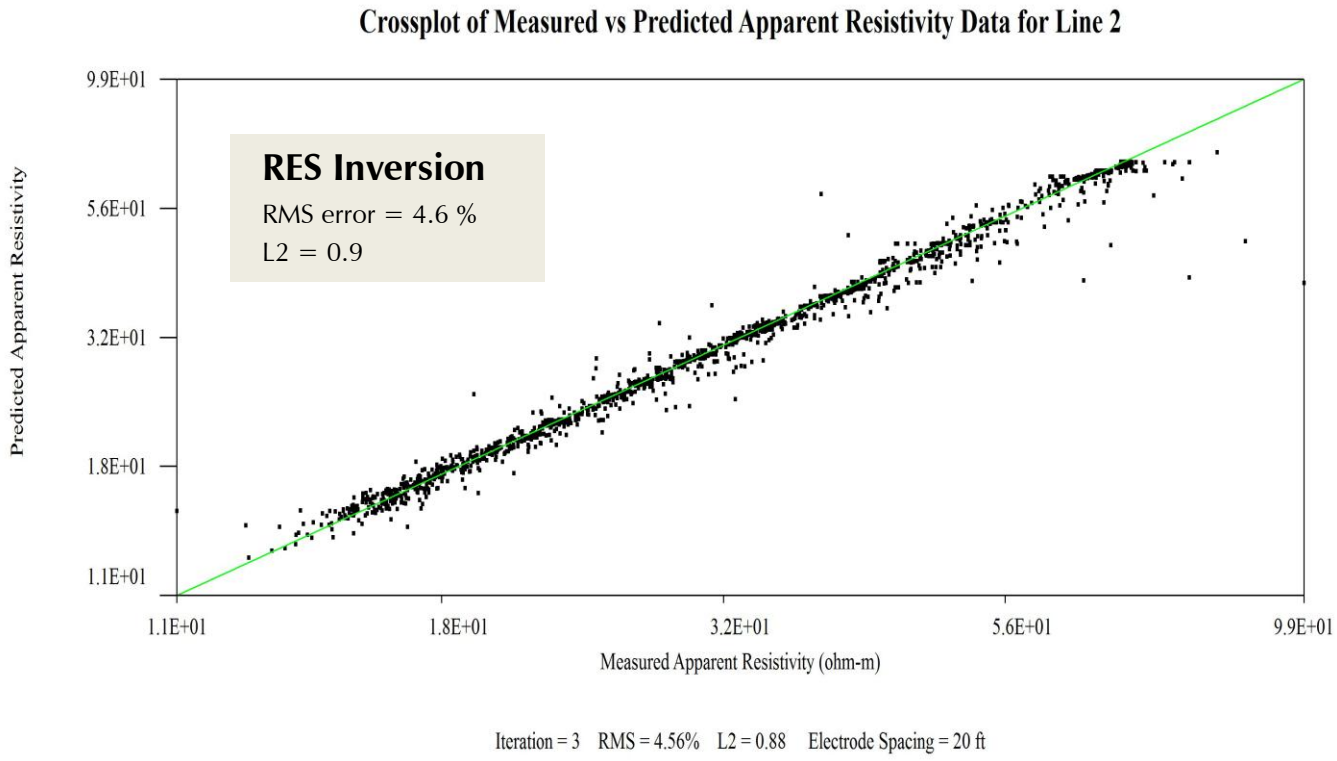
210746.333	2539881.669	2589.1	2589.6	e48	**L1**	5.2	2.6	
210731.446	2539896.535	2584.3	2584.8	e49	**L1**	3.9	2.6	
210704.178	2539924.152	2583.4	2583.9	e51	**L1**	5.2	2.6	
210647.929	2539980.879	2579.5	2580.0	e55	**L1**	3.9	2.6	
210592.492	2540038.425	2578.7	2579.2	e59	**L1**	4.6	2.6	
210563.485	2540066.579	2578.5	2579.0	e61	**L1**	3.6	2.3	
210492.645	2540138.858	2577.9	2578.4	e66	**L1**	5.6	3.0	
210449.442	2540180.368	2576.0	2576.5	e69	**L1**	4.3	2.6	
210407.175	2540222.685	2573.5	2574.0	e72	**L1**	3.6	2.3	
210349.727	2540279.218	2576.7	2577.2	e76	**L1**	3.6	2.3	
210307.006	2540321.968	2582.0	2582.5	e79	**L1**	5.6	3.0	
210250.043	2540378.283	2582.5	2583.0	e83	**L1**	4.3	3.0	
210235.381	2540391.765	2581.3	2581.8	e84	**L1**	3.9	3.0	
210894.9954	2539787.153	2601.3	2601.8	MW 2s by L1	**WELLS**	5.2	2.6	**MW = monitor well**
211102.3151	2539512.094	2598.3	2598.8	MW 1S by L1	**WELLS**	5.2	2.6	
210943.2038	2539550.751	2605.9	2606.4	MW by silos	**WELLS**	4.3	3.0	
210660.4084	2539510.661	2615.2	2615.7	MW 10 by N L5	**WELLS**	3.3	2.6	
210221.299	2540402.577	2579.7	2580.2	MW by L2 e84	**WELLS**	3.3	2.0	
210436.922	2540104.768	2579.5	2580.0	MW by L2 e68	**WELLS**	3.0	2.0	
210730.852	2539649.807	2598.8	2599.3	MW by L2 e41	**WELLS**	3.0	1.6	
210759.036	2539613.029	2599.6	2600.1	MW by L2 e39	**WELLS**	3.0	1.6	
210770.277	2539596.152	2598.9	2599.4	MW by L2 e38	**WELLS**	2.6	1.6	
210806.478	2539556.172	2600.9	2601.4	MW by L2 e35	**WELLS**	2.6	1.6	
210904.654	2539410.728	2606.5	2607.0	MW by L2 e27	**WELLS**	3.0	2.0	
209431.718	2539166.224	2591.4	2591.9	E MW by L6	**WELLS**	4.3	3.3	
209466.674	2539135.983	2590.0	2590.5	W MW by L6	**WELLS**	4.3	3.3	
209898.877	2538317.454	2614.2	2614.7	MW by e1 of L6	**WELLS**	3.6	2.6	
210221.346	2540401.559	2578.9	2579.4	MW by e84 L1/L2	**WELLS**	3.0	1.6	
210222.876	2539504.188	2622.8	2623.3	MW by L5 e30	**WELLS**	2.3	1.6	
210292.585	2539040.155	2604.0	2604.5	MW N1/3 L4	**WELLS**	3.0	2.3	
211037.074	2538989.987	2621.5	2622.0	MW by bol for L3/L4	**WELLS**	2.6	2.6	
						4.3	**2.5**	**AVG**

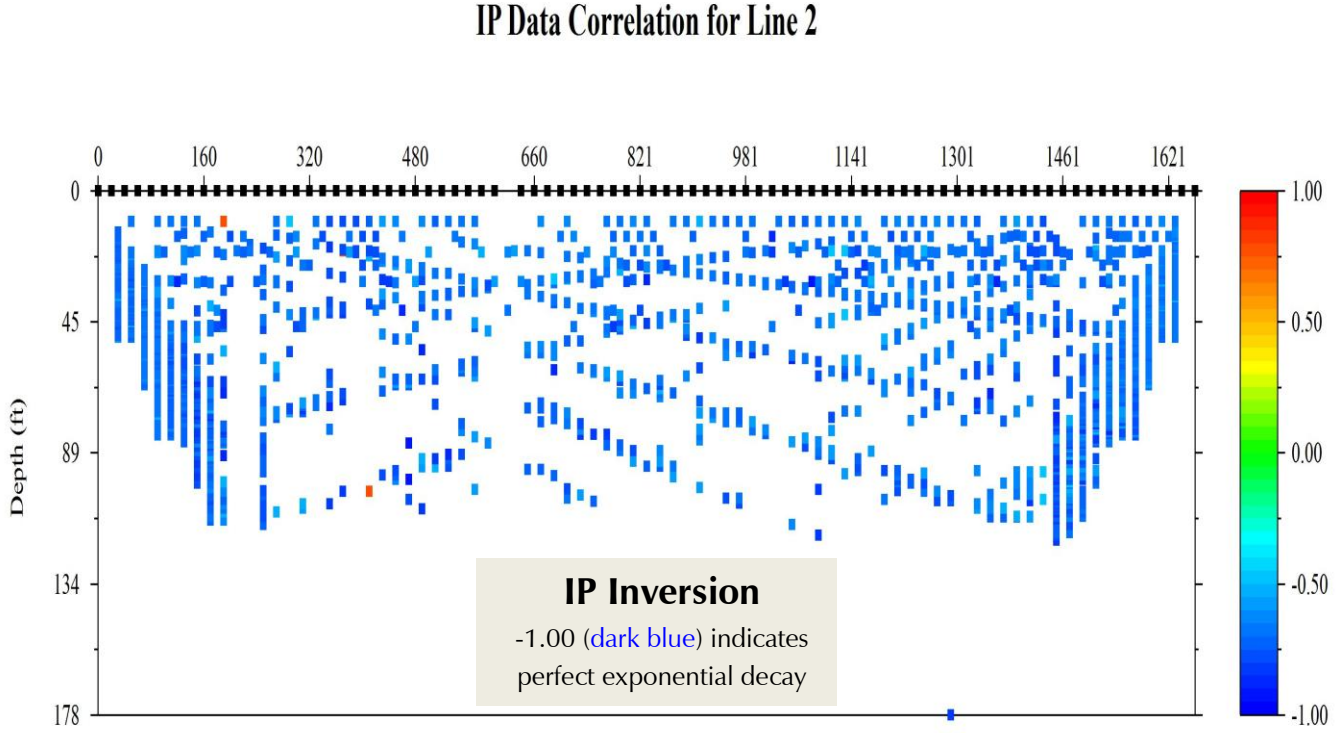
Line 1 RES and IP Data Quality



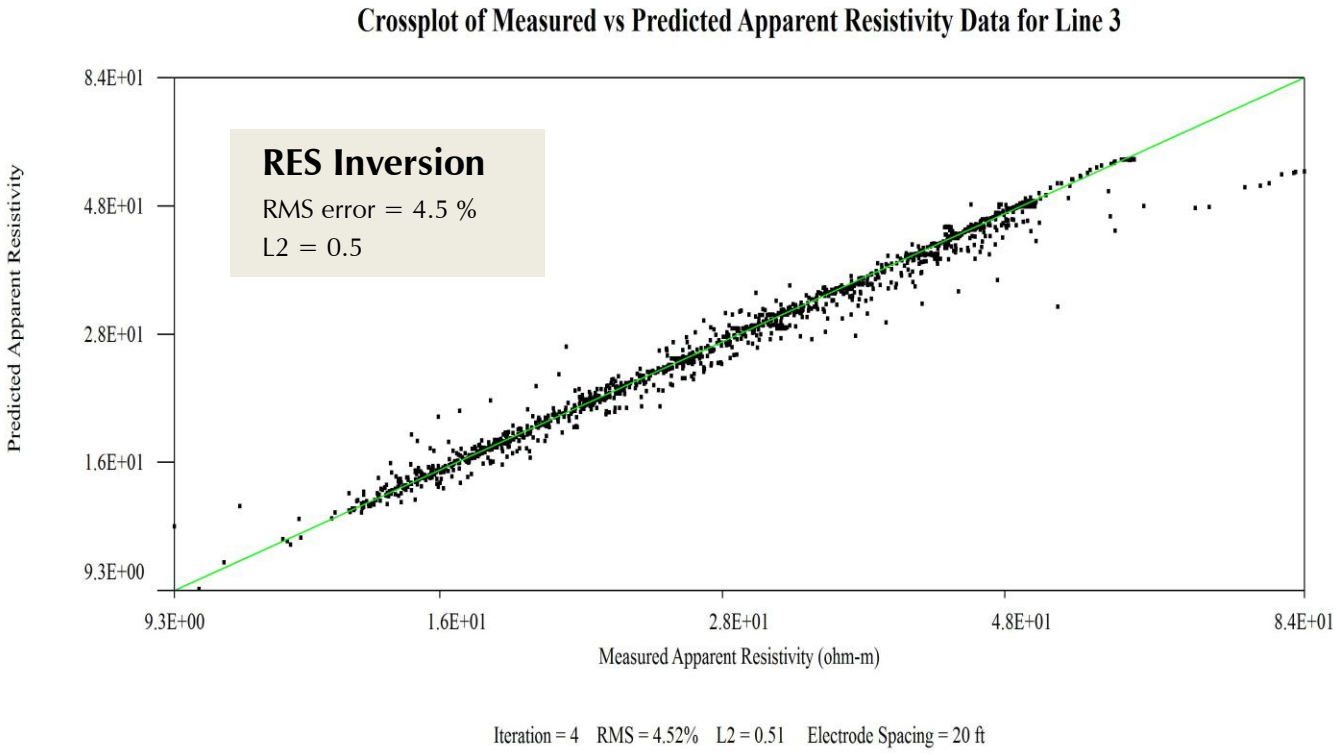


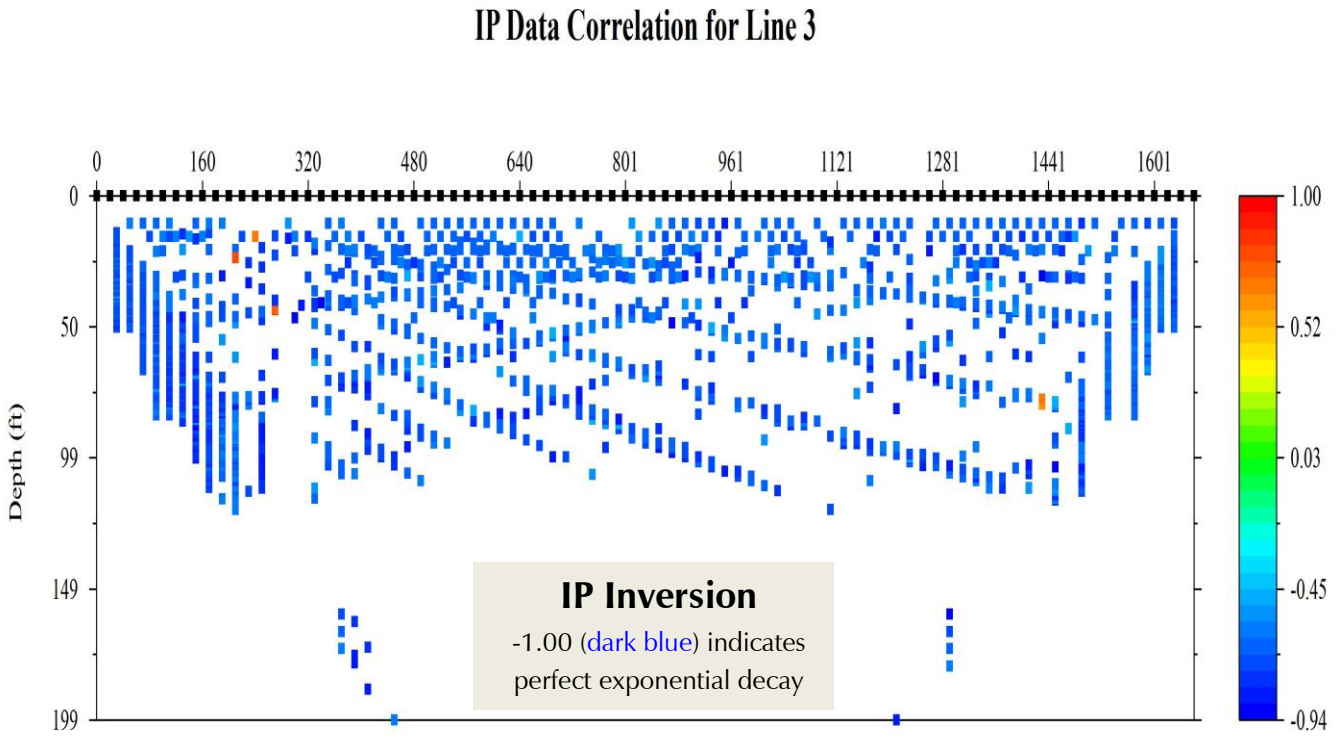
Line 2 RES and IP Data Quality



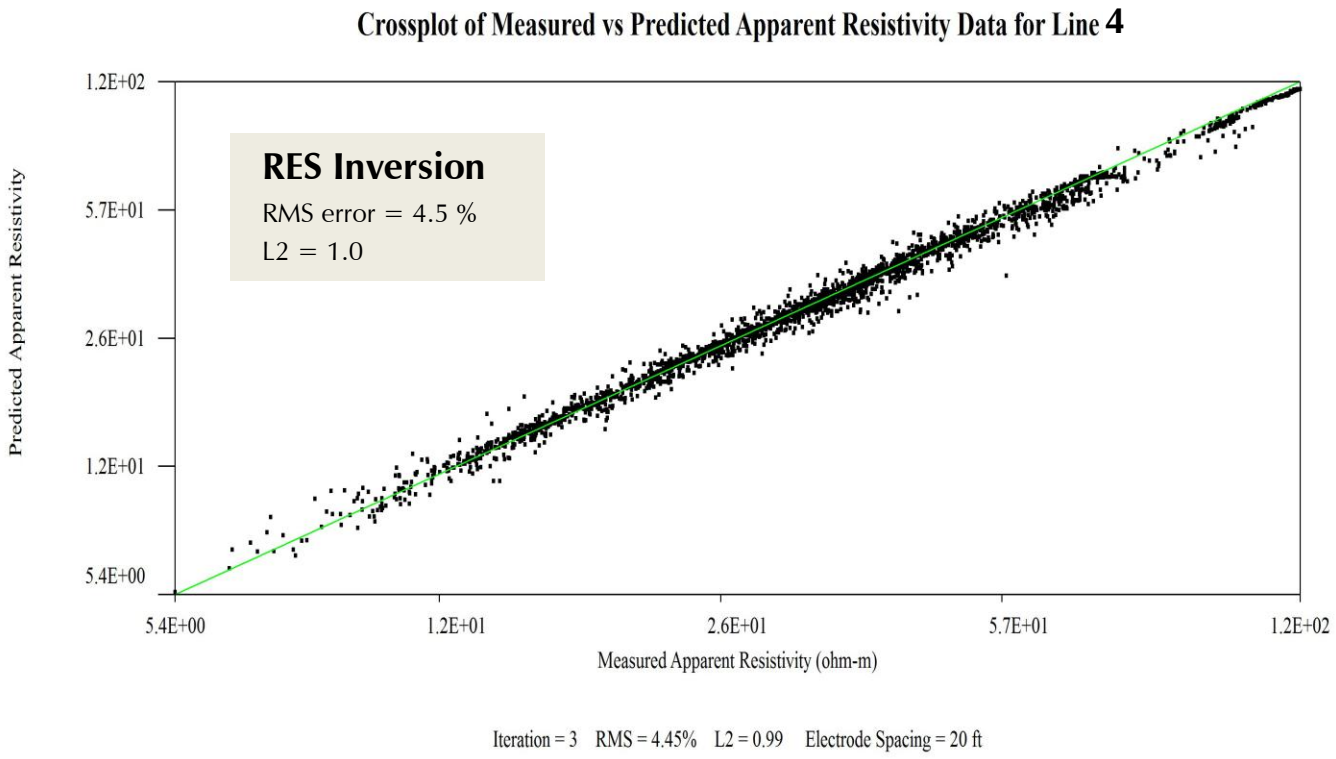


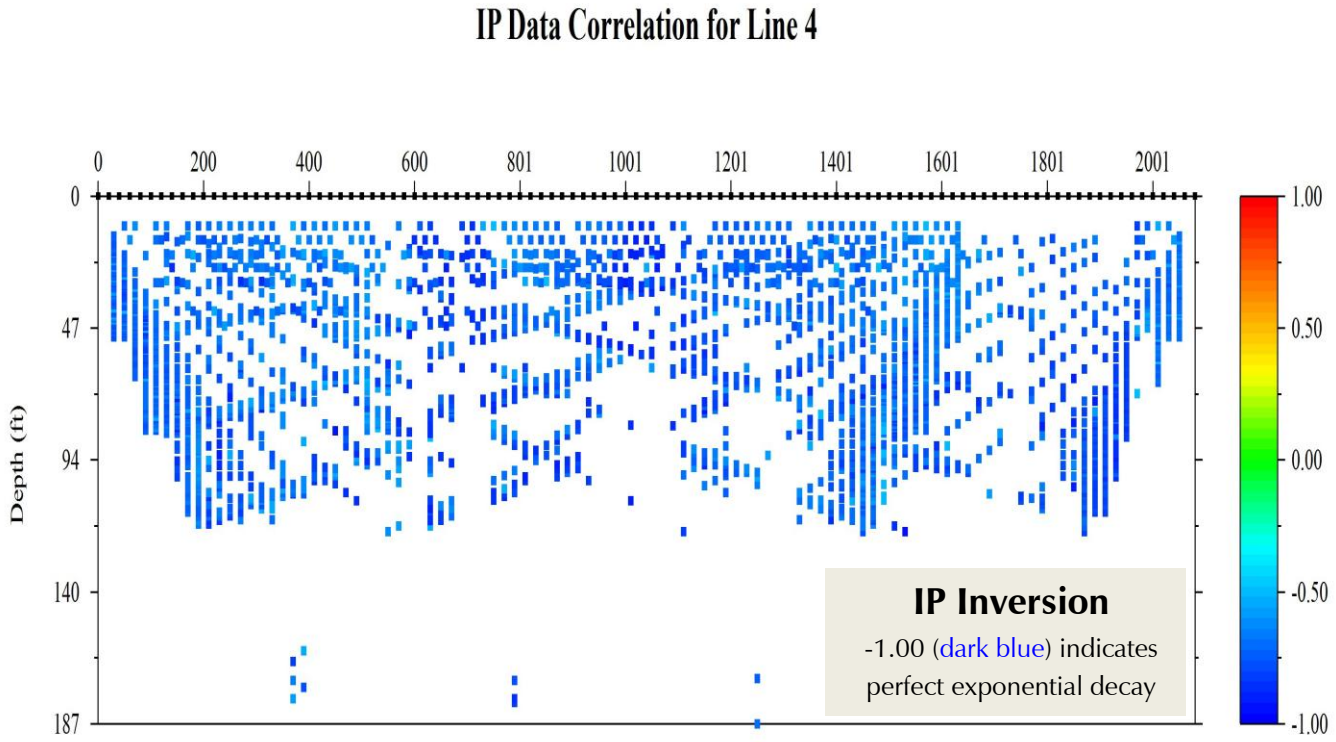
Line 3 RES and IP Data Quality



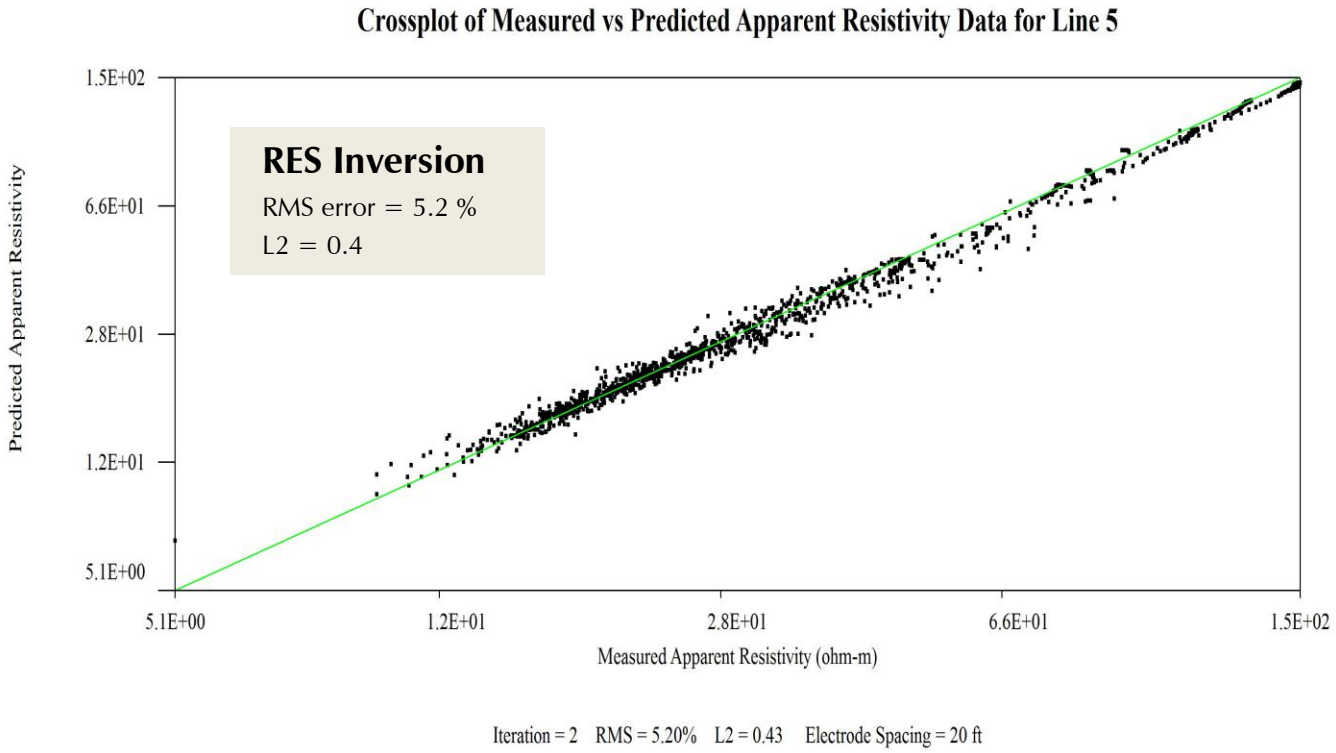


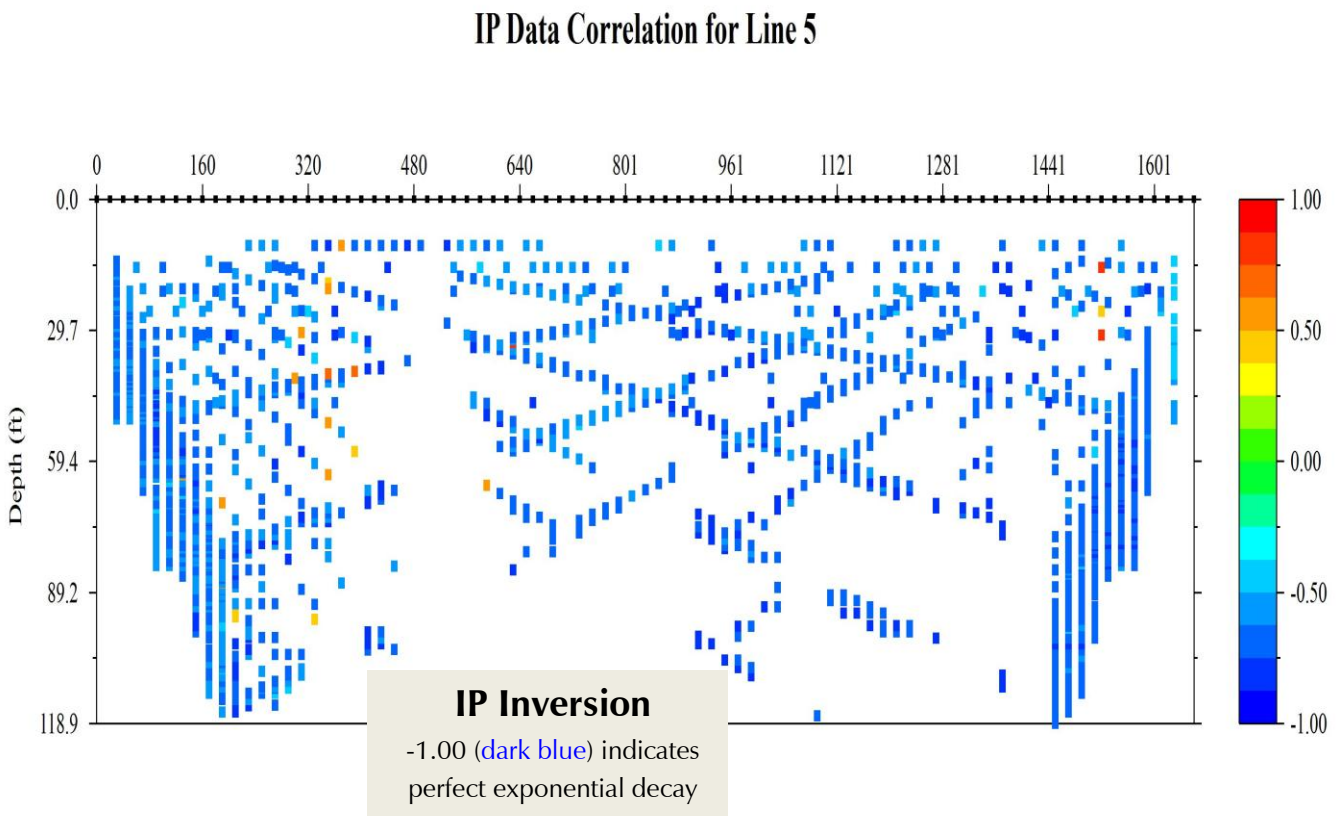
Line 4 RES and IP Data Quality



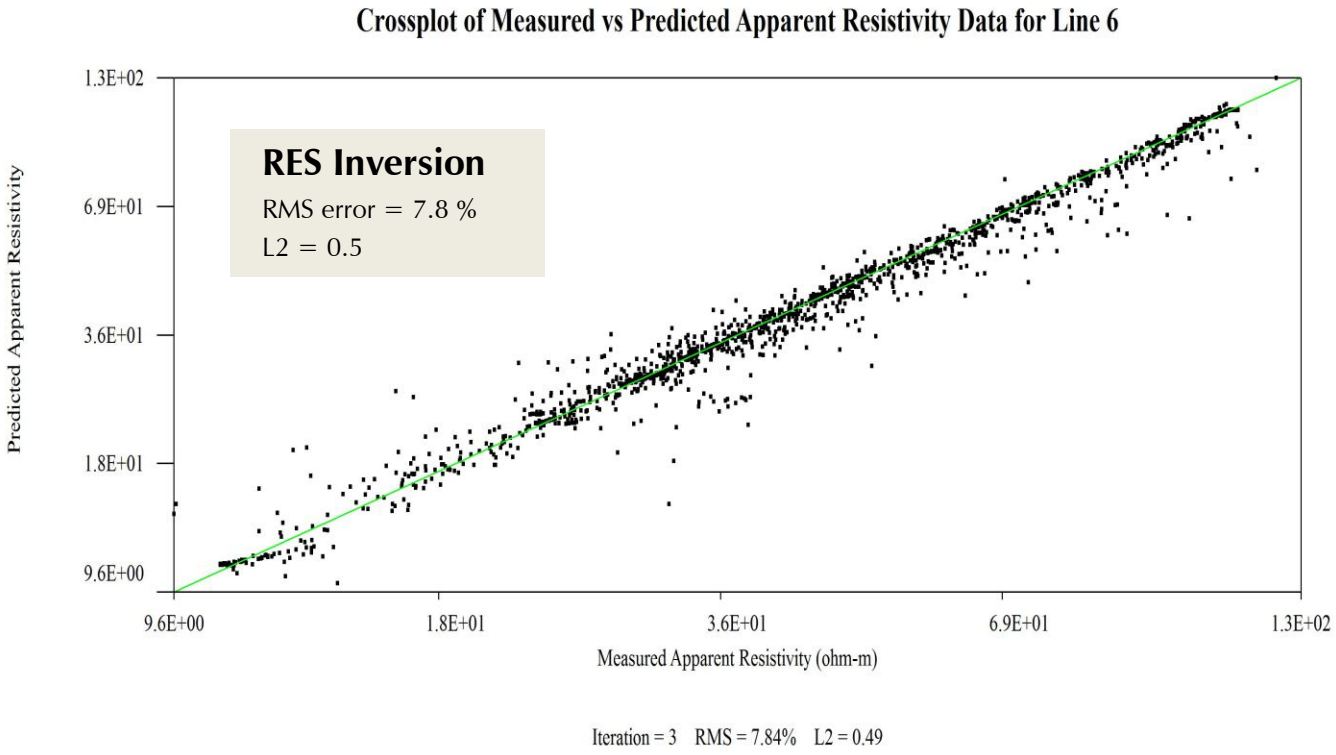


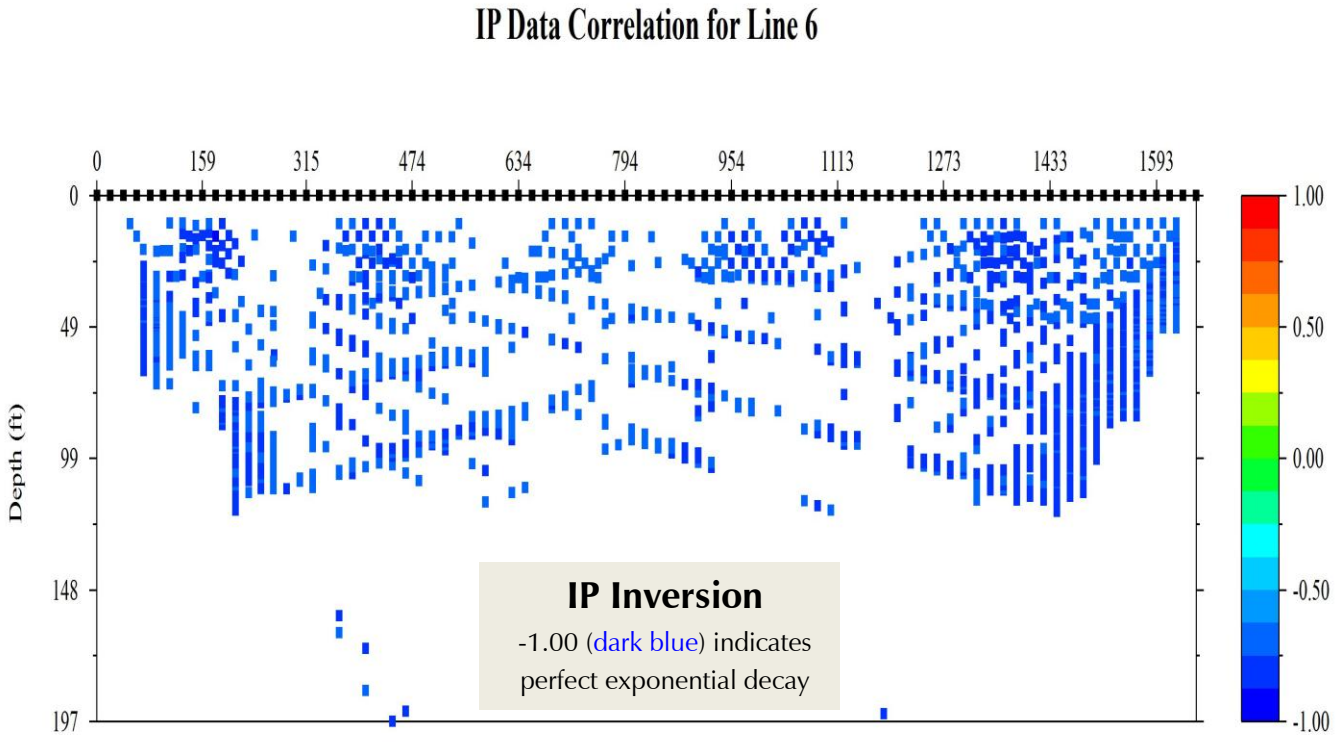
Line 5 RES and IP Data Quality





Line 6 RES and IP Data Quality





APPENDIX C

RES/IP PROFILES

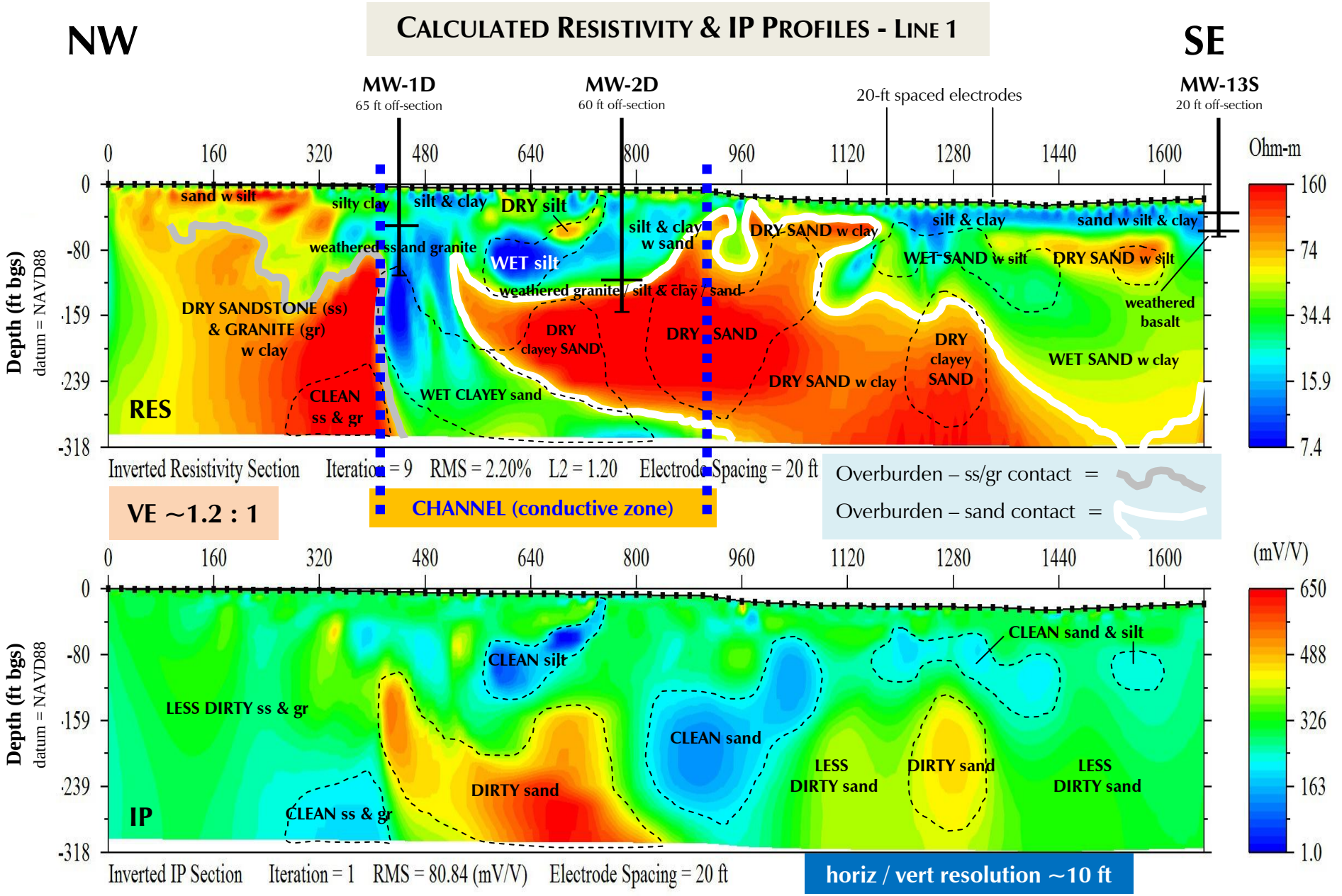


Figure 1 – Boring data for MW-1D, MW-2D and MW-13S (located 20 to 65 feet off-section) are summarized and displayed above. Interpretations *away from* the borings are qualitative best-fits between the RES and IP data, with the assumption that medium-to-low energy sand / silt / clay deposits are extensive. The RES/IP anomalies are most likely due to moisture content (wetness) and clay content, with CAPITALIZED descriptors indicating primary anomalous effects. "Dirty" refers to a clay-rich matrix, where "clean" refers to an absence of clay in sands and *also* silts. Because ionic conduction is *greatly reduced* in *dry* soils, the ***overall*** resistivity-lowering effect of wet clay is absent. **See explanations regarding resolution and RES/IP effects in Sections 3.0 and 4.0, respectively.**

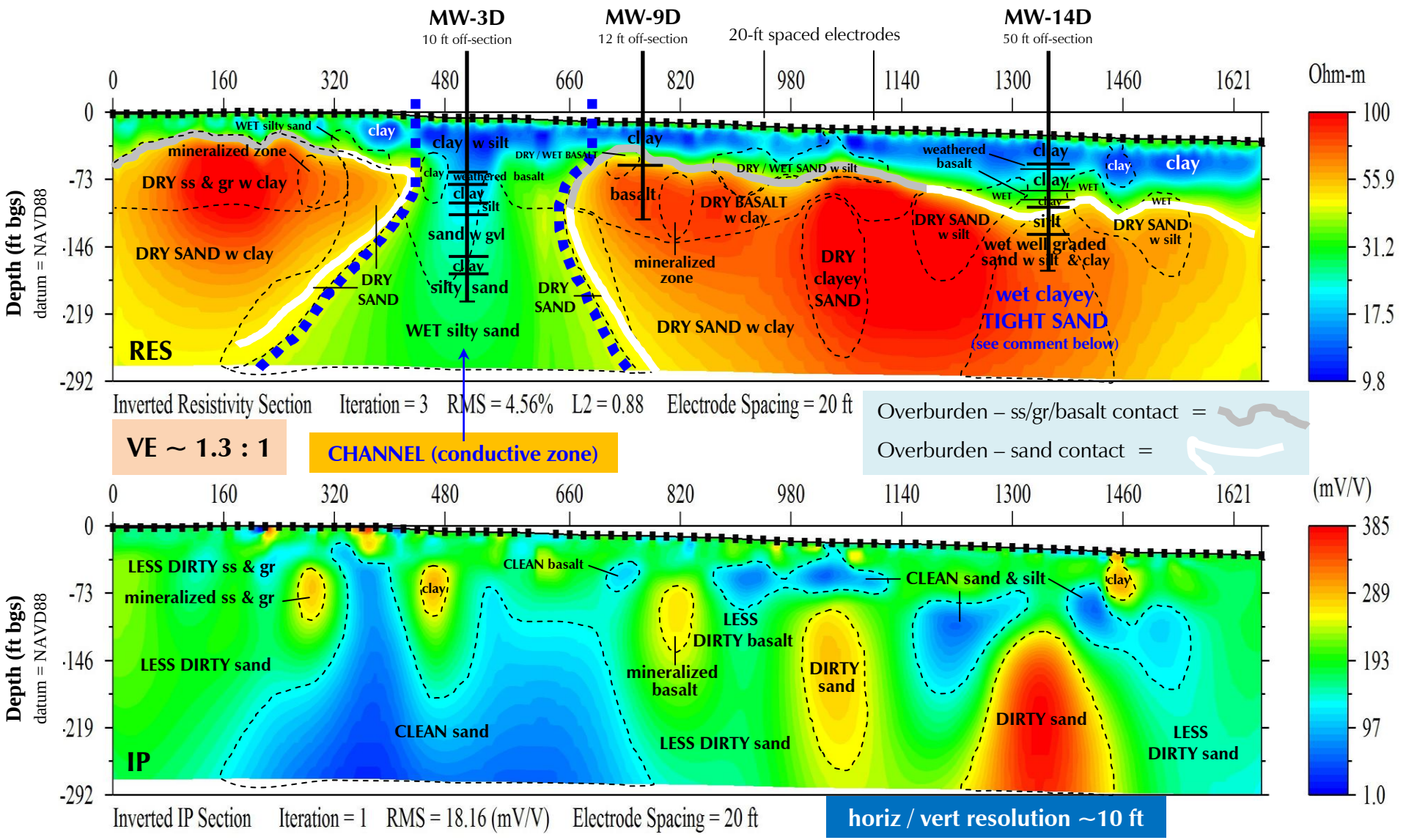


Figure 2 – Boring data for MW-3D, MW-9D and MW-14D (located 10 to 50 feet off-section) are summarized and displayed above. Interpretations *away from* the borings are qualitative best-fits between the RES and IP data, with the assumption that basalt flows and sand / silt / clay deposits are extensive. The RES/IP anomalies are most likely due to moisture content (wetness) and clay content, with CAPITALIZED descriptors indicating primary anomalous effects. "Dirty" refers to a clay-rich matrix, where "clean" refers to an absence of clay in sands and *also* silts. Because ionic conduction is *greatly reduced* in tight (low porosity) well-graded sand, the ***overall*** resistivity is raised sufficiently to offset the lowering effects of wetness and clay.

See explanations regarding resolution and RES/IP effects in Sections 3.0 and 4.0, respectively.

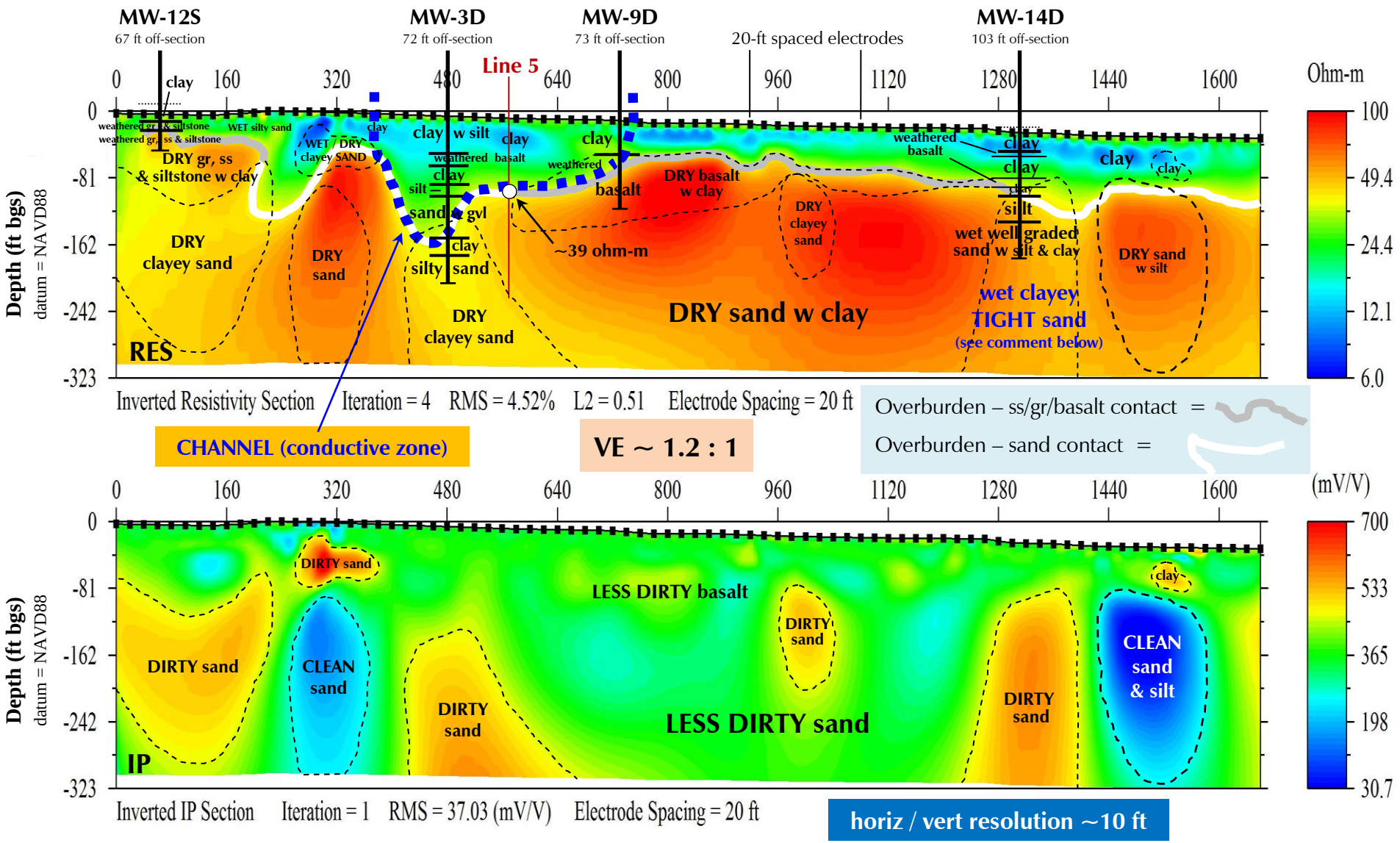
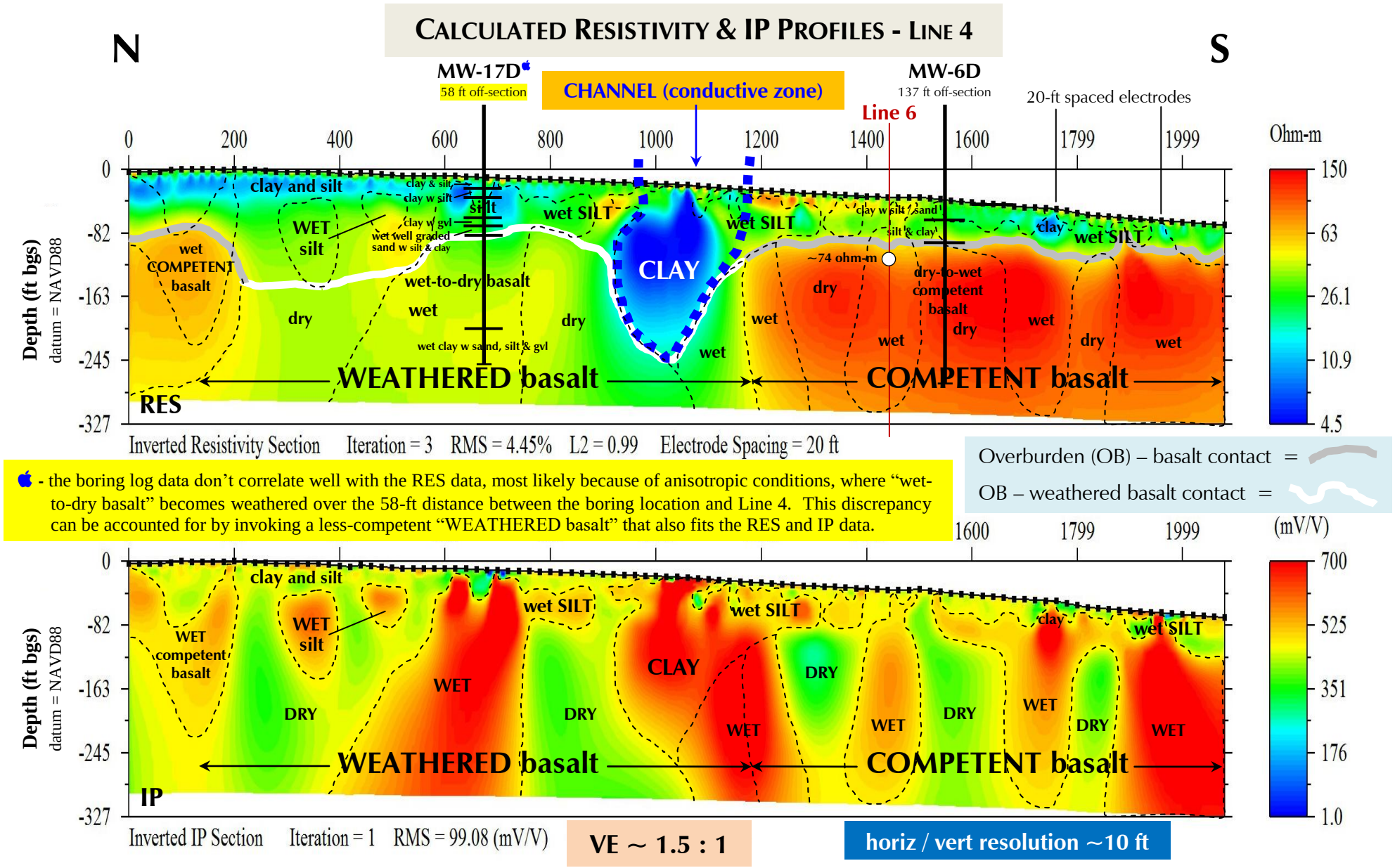


Figure 3 – Boring data for MW-12S, MW-3D, MW-9D and MW-14D (located 67 to 103 feet off-section) are summarized and displayed above. Interpretations *away from* the borings are qualitative best-fits between the RES and IP data, with the assumption that basalt flows and sand / silt / clay deposits are extensive. The RES/IP anomalies are most likely due to moisture content (wetness) and clay content, with CAPITALIZED descriptors indicating primary anomalous effects. "Dirty" refers to a clay-rich matrix, where "clean" refers to an absence of clay in sands and *also* silts. Because ionic conduction is *greatly reduced in tight* (low porosity) well-graded sand, the ***overall*** resistivity is raised sufficiently to offset the lowering effects of wetness and clay.

See explanations regarding resolution and RES/IP effects in Sections 3.0 and 4.0, respectively.



- the boring log data don't correlate well with the RES data, most likely because of anisotropic conditions, where "wet-to-dry basalt" becomes weathered over the 58-ft distance between the boring location and Line 4. This discrepancy can be accounted for by invoking a less-competent "WEATHERED basalt" that also fits the RES and IP data.

Figure 4 – Boring data for MW-17D and MW-6D (located 58 and 137 feet off-section) are summarized and displayed above. Interpretations *away from* the borings are qualitative best-fits between the RES and IP data, with the assumption that basalt flows and sand / silt / clay deposits are extensive. The RES/IP anomalies are most likely due to moisture content (wetness) and clay content, with CAPITALIZED descriptors indicating primary anomalous effects. The *competency* of basalt significantly affects RES values, where wetness is interpreted to be insignificant, as opposed to IP where wetness is important.

See explanations regarding resolution and RES/IP effects in Sections 3.0 and 4.0, respectively.

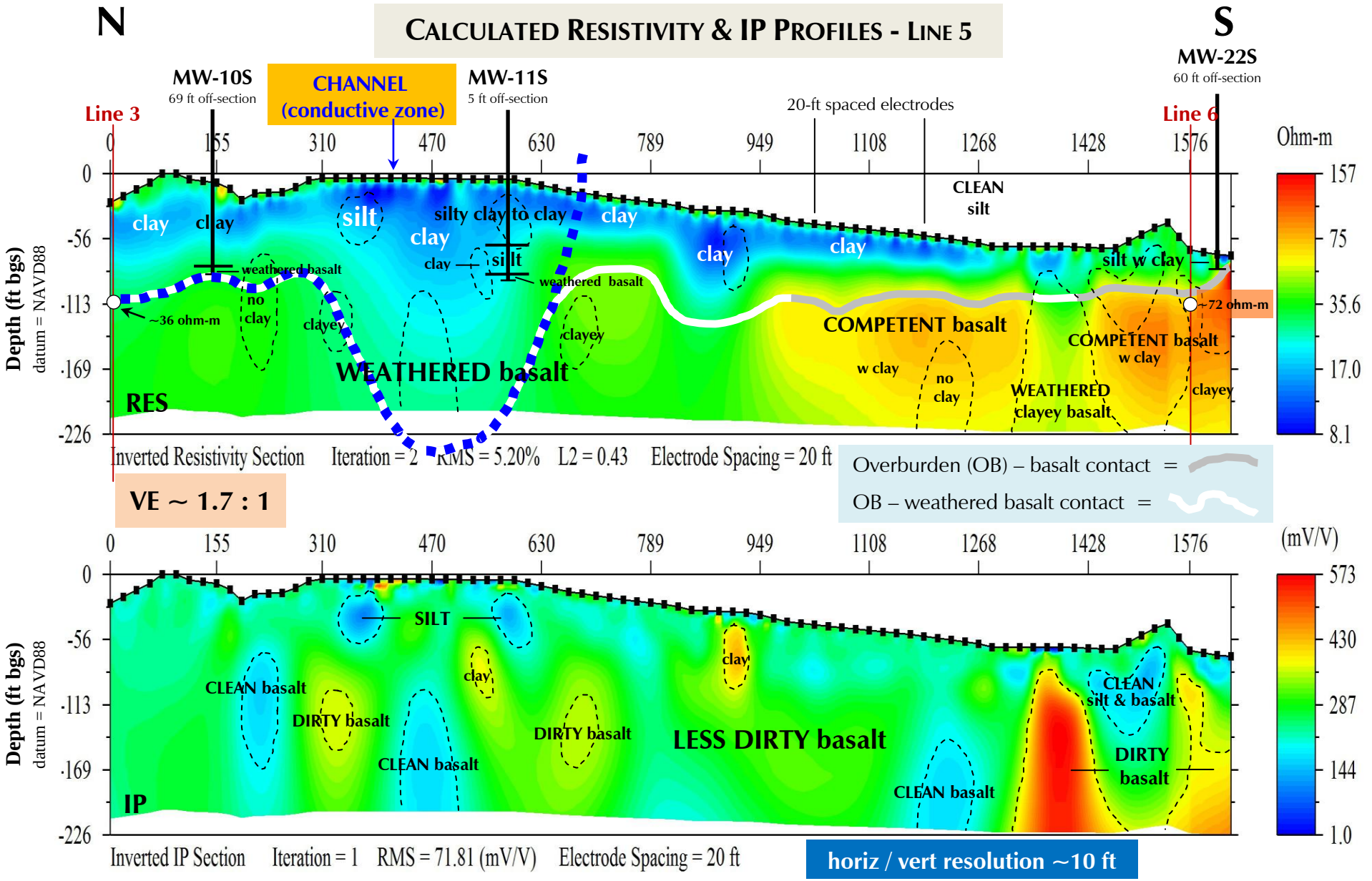


Figure 5 – Boring data for MW-10S, MW-11S and MW-22S (located 5 to 69 feet off-section) are summarized and displayed above. Interpretations *away from* the borings are qualitative best-fits between the RES and IP data, with the assumption that basalt flows and sand / silt / clay deposits are extensive. The RES/IP anomalies are most likely due to moisture content (wetness) and clay content, with CAPITALIZED descriptors indicating primary anomalous effects. "Dirty" refers to a clay-rich matrix, where "clean" refers to an absence of clay in sands and *also* silts. The *competency* of basalt significantly affects RES values.

See explanations regarding resolution and RES/IP effects in Sections 3.0 and 4.0, respectively.

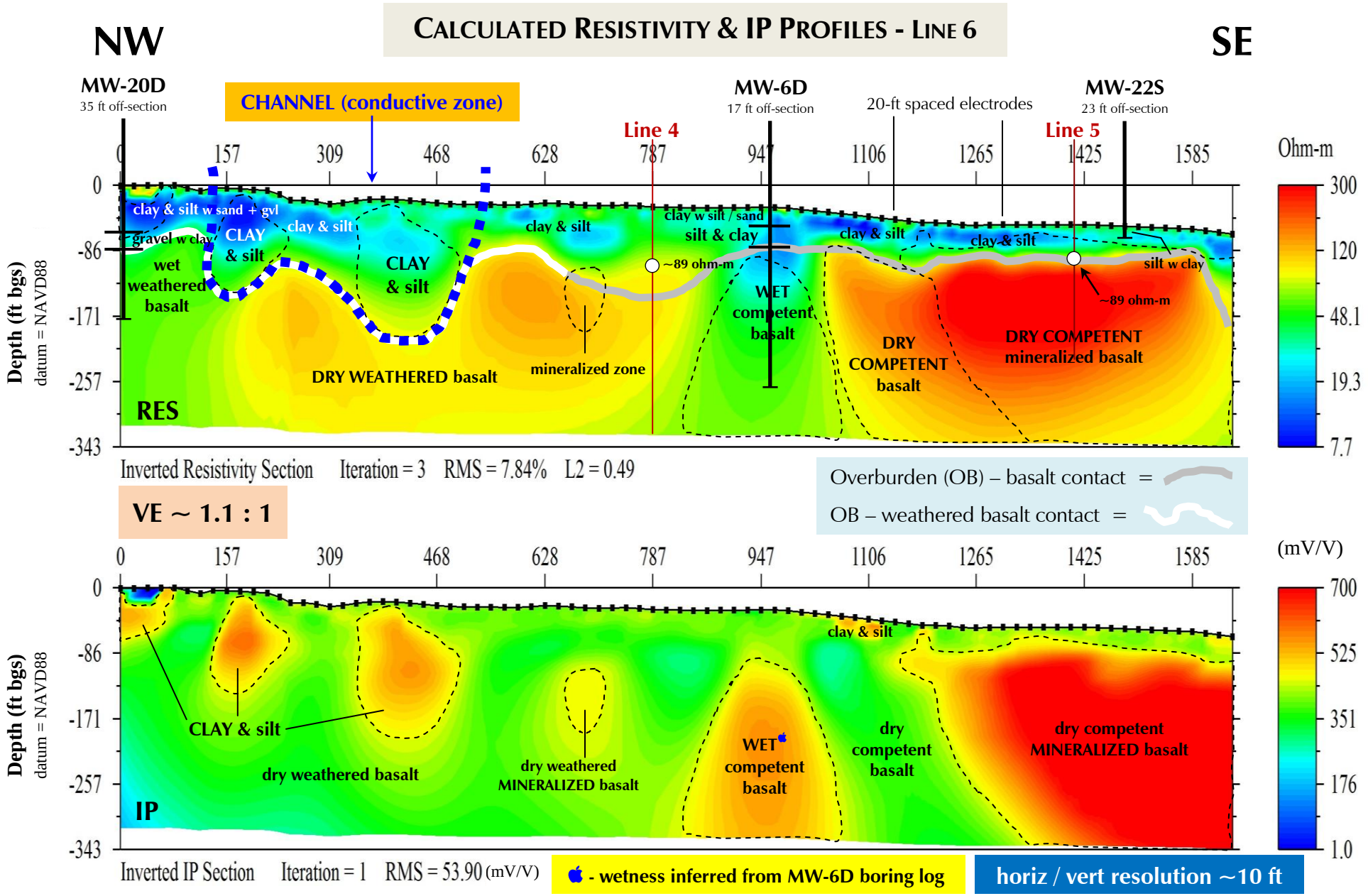
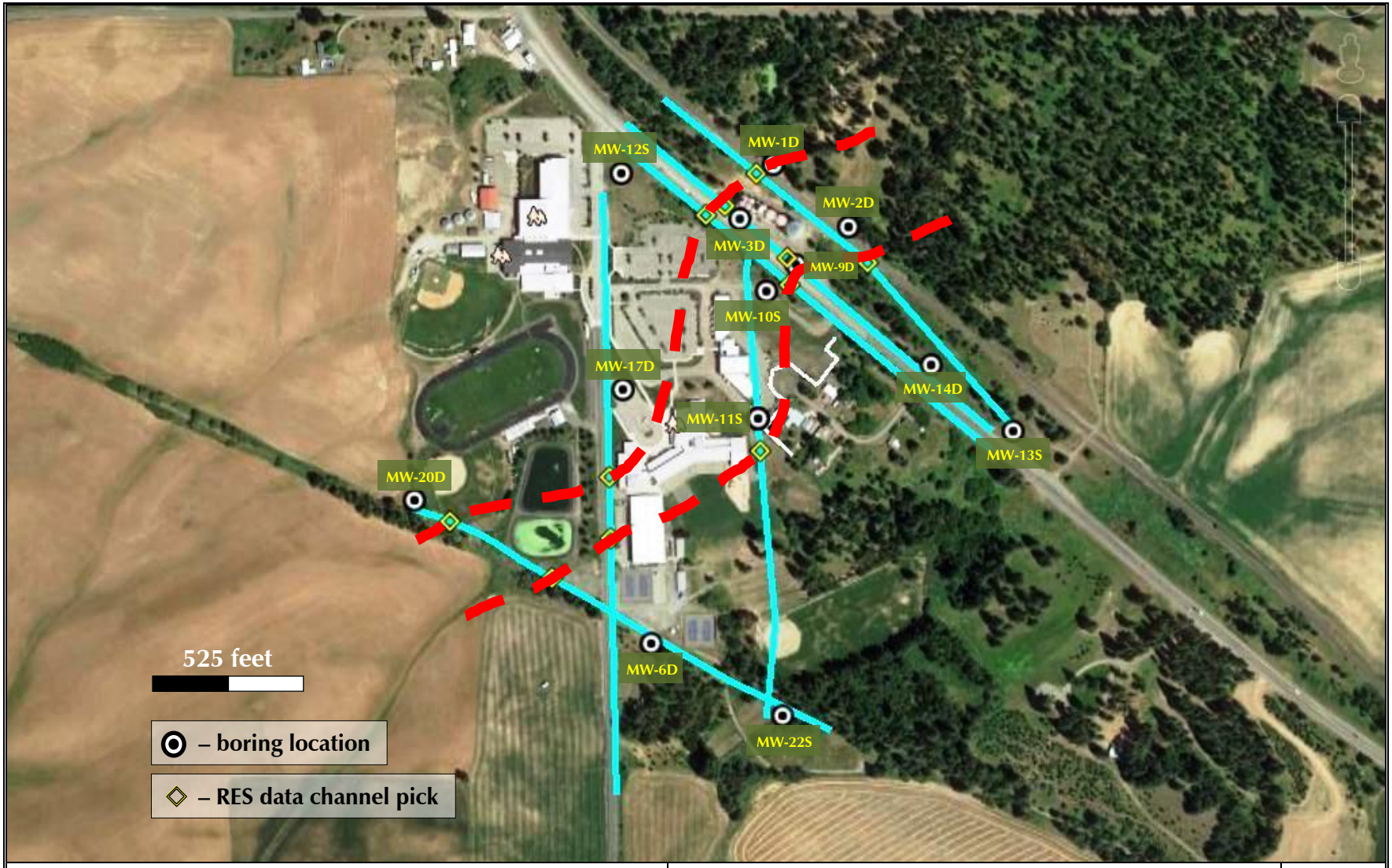


Figure 6 – Boring data for MW-20D, MW-6D and MW-22S (located 17 to 35 feet off-section) are summarized and displayed above. Interpretations *away from* the borings are qualitative best-fits between the RES and IP data, with the assumption that basalt flows and clay / silt deposits are extensive. The RES/IP anomalies are most likely due to moisture content (wetness), weathering and the amount of mineralization, with CAPITALIZED descriptors indicating primary anomalous effects. Because ionic conduction is *greatly reduced* in *dry* rock, the ***overall*** resistivity-lowering effect of mineralization is absent. Conversely, *wet* unmineralized basalt should be less resistive, since wetness *enhances* ionic conduction through dissolution. **See explanations regarding resolution and RES/IP effects in Sections 3.0 and 4.0, respectively.**

APPENDIX D

Buried Channel



ECA Geophysics 372 S Eagle Road, Suite 146 Eagle, ID 83616	**BURIED CHANNEL** 1 inch = 525 feet	N
ECA Project No. 19ECA268	**UPRR Grain Handling Facility Area** **RES/IP Investigation**	

Appendix H
Vapor Intrusion Assessment Report

JACOBS®

Memorandum

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Subject	**Vapor Intrusion Assessment of Schools and Residences, Grain-Handling Facility at Freeman, Freeman, Washington**
Attention	Union Pacific Railroad (UPRR)
From	Jacobs Engineering Group Inc. (Jacobs)
Date	May 18, 2020

1. Introduction

This technical memorandum summarizes the investigation activities and results of a vapor intrusion (VI) assessment of school buildings and residences located around the Grain Handling Facility at Freeman (GHFF) in Freeman, Washington. This VI assessment is a part of the remedial investigation/feasibility study required by the State of Washington Department of Ecology (Ecology) and prepared in accordance with the Model Toxics Control Act.

2. Background

The GHFF is located along State Highway 27 in Freeman, Washington and consists of 11 grain silos, grain elevator, and subterranean receiving pit. UPRR owns and operates a railway line parallel to State Highway 27. To the west and south of the GHFF are buildings for the Freeman School District Campus and several residences. The campus covers approximately 56 acres and includes elementary school, middle school, and high school buildings. Three residences with domestic wells are located on East Prospect Lane southeast of the GHFF. The GHFF and these surrounding buildings are shown on Figure H-1.

The potential sources for VI pathways around the GHFF are concentrations of carbon tetrachloride and chloroform detected in shallow groundwater. A preliminary assessment performed in 2013 identified the GHFF as a potential source of carbon tetrachloride groundwater contamination, although the use of carbon tetrachloride at this location had not yet been confirmed. Other potential sources of carbon tetrachloride contamination to groundwater were identified in the preliminary assessment. Concentration of carbon tetrachloride and chloroform detected in groundwater have been low. Carbon tetrachloride concentrations detected in wells supplying the schools ranged from non-detected to 22 micrograms per liter (µg/L). Chloroform concentrations ranged from non-detected to 2.4 µg/L (CH2M, 2016a). Carbon tetrachloride and chloroform in residential wells have been detected up to 402 µg/L and 20 µg/L, respectively. Wellhead treatment was implemented in late 2016 as an interim action to control carbon tetrachloride and chloroform in groundwater.

3. Scope of Work

The VI assessment was conducted in accordance with State of Washington guidelines. This guidance uses a tiered process for data collection where, at each tier, there is an opportunity to conclude that volatile organic compounds (VOCs) in the subsurface does not pose an unacceptable threat to indoor air quality. These points are considered “off-ramps” from the VI assessment process. Some off-ramps lead to no further investigation, which represents a completion of the VI assessment process. With scenarios

where VI is not unacceptably impacting indoor air quality under current conditions, assessment off-ramps may lead to follow up actions such as monitoring or the imposition of land use controls (Ecology, 2016).

The VI assessment addressed all steps in the Tier I/II assessment process; though, in consultation with Ecology, portions of the Tier II assessment (that is., indoor air sampling) was performed before the Tier I assessment. The VI assessment was conducted in accordance with work plans approved by Ecology (CH2M, 2016b; CH2M, 2017).

Tap water is supplied to the school buildings and residences from groundwater wells. VOCs in domestic-use and drinking water can volatilize and produce indoor air concentrations. Carbon tetrachloride and chloroform have been confirmed to be present in background air around the GHFF site. Finally, chloroform in air can form from chlorine-containing cleaning products reacting with dissolved organic carbon on indoor surfaces. Therefore, the possibility exists that carbon tetrachloride and chloroform detected in indoor air is unrelated to VI. Investigative steps were performed in 2016 to further assess these potential VOC sources and consisted of (1) real-time measurements of carbon tetrachloride and chloroform in indoor air using a portable gas chromatograph/mass spectrometer, and (2) a background study of outdoor air concentrations of carbon tetrachloride and chloroform performed in accordance with Washington Administrative Code (WAC) 173-340-709, Methods for Defining Background Concentrations. The background study was conducted in 2016 in accordance with a work plan approved by Ecology (CH2M, 2016c). Additional residential air sampling was conducted at the Davey residence in 2019 at the request of the property owner.

4. Data Collection Activities

Data collection activities included indoor and outdoor air samples from the residences and school buildings, background outdoor air samples collected from locations away from the GHFF, subslab samples from the schools and crawl space, and cellar or basement samples from the residences. An attempt in 2017 to collect shallow soil vapor samples around the schools was unsuccessful. Excessive vacuum in the soil vapor probes prevented sample collection. The sample locations are shown on Figure H-1.

Indoor air samples were collected during two sampling events from the Marlow and Randall residences. One outdoor air sample was collected near the Marlow residence. Indoor air samples were collected from the high school, middle school, and elementary school offices; the preschool; and the middle school north and south modular buildings. One outdoor air sample was collected near the middle school. Table H-1 shows the sampling dates for these buildings.

Table H-1. Event Sampling Dates

Vapor Intrusion Assessment of Schools and Residences, Grain-Handling Facility at Freeman, Freeman, Washington

	Residences	Schools
Event 1	8/31/2016 9/8/2016 9/9/2016	8/26/2016 8/27/2016 8/28/2016
Event 2	10/19/2016 10/20/2016 10/21/2016	10/19/2016 10/20/2016 10/21/2016

One indoor air sampling event was performed at the Davey residence on September 10, 2016. The residence has been vacant since this sampling in 2016. The owner proposed to reoccupy the residence. Prior to reoccupying the residence, the owner requested additional indoor air sampling. Two rounds of samples were collected as part of this second event on September 20 and 27, 2019.

Indoor and outdoor air samples were collected for 24 hours in individually-certified 6 liter evacuated stainless steel canisters and were analyzed by U.S. Environmental Protection Agency (EPA) Method TO-15 with selective ion monitoring (SIM).

The real-time indoor air survey using the HAPSITE gas chromatograph/ mass spectrometer was performed on September 7 and 9, 2016. One-minute samples were analyzed with the HAPSITE so that the results represent instantaneous measurements of concentrations in air. The survey was performed at different locations in and around the school buildings and residences. Both general room-air measurements were made in addition to point-source measurements from water taps with water running. The results from the HAPSITE survey along with pre-sampling building survey forms are presented in Attachment H-1.

Background outdoor air samples were collected in 2016 from four locations shown on Figure H-2. It was assumed that a distance of 1 mile accurately represented a suitable distance from the site so as not to be influenced by any site-specific sources, but close enough to represent the local background conditions. According to WAC 173-340-709, sample locations should have the same basic characteristics as the medium of concern at the site (air), should have not been influenced by releases from the site or by releases from other localized human activities. Three samples were collected from each background location on October 19, 20, and 21, 2016. Background outdoor air samples were collected for 24 hours in individually-certified 6-liter evacuated stainless steel canisters and were analyzed by EPA Method TO-15 SIM.

Subslab sampling was not attempted in the residences. The lowest accessible levels of the residences generally were not concrete-paved and therefore not suitable for subslab sampling. In one residence, a concrete-floored basement was observed, but contained numerous cracks and penetrations, which created high communication between basement air and the subsurface. Based on these conditions, ambient air samples were collected from the residences to assess potential migration from subsurface to indoor air. One subslab probe was installed in each of the three permanent school buildings (elementary school, middle school, and high school). The subslab probes were installed using Cox-Colvin vapor pins. Subslab probes were leak-tested using helium and purged before sampling in accordance with the standard operating procedure included in the work plan (CH2M, 2017). Subslab samples were collected using batch-certified 1-liter evacuated stainless steel canisters and were analyzed by EPA Method TO-15.

5. Results

Sampling results are presented in tables in Sections 4.6.4 and 4.6.5 of the remedial investigation (RI) report, and are briefly described in the following subsections.

5.1 Screening Levels for Assessing Sampling Results

The screening levels for assessing concentrations detected in indoor, outdoor, crawl space, and subslab samples were developed in accordance with the Ecology VI guidance (Ecology, 2016) and the background sampling and statistical procedure described in WAC-173-340-709. Two screening levels were used: (1) a background threshold value calculated from air samples collected away from the GHFF, and (2) the Method B concentration in air calculated as described in WAC-173-340-750. Subslab screening levels were derived as described in the Ecology VI guidance (Ecology, 2016). The Method B values in indoor air and subslab samples were obtained online from the Ecology Cleanup Levels and Risk Calculation (Ecology, 2015).

5.2 Background in Air

Ecology states that a VI assessment focuses not on general indoor air contamination, but in the subsurface contribution to indoor air contamination. It is expected that most measurements of indoor air VOCs will be affected by background sources, and Ecology recommends that measured indoor air concentrations be corrected for this contribution if it can be done conservatively. Indoor air measurements may be adjusted (corrected) by subtracting these estimates when the estimates are based on ambient air

measurements concurrently taken upwind of the building(s) in which indoor air samples are being obtained (Ecology, 2016).

An approach was used to obtain the background contribution with the background determination procedure described in WAC 173-340-709. The background sampling results are presented in Section 4.6.4 of the RI report. The carbon tetrachloride concentrations in air were normally distributed and the background statistic (0.68 micrograms per cubic meter [µg/m^3]) was the 80th percentile concentration or 4 times the median (50th percentile), whichever was lower (WAC 173-340-709(3)(d)). The chloroform concentrations in air were log-normally distributed and the background statistic in ambient air (0.08 µg/m^3) was the 90th percentile concentration or 4 times the median, whichever was lower (WAC 173-340-709(3)(c)). The goodness-of-fit statistical analysis was performed using ProUCL version 5.00.00 (EPA, 2013) as shown in Attachment H-2. The 80th percentile from a normal distribution was calculated as follows:

$$\hat{x}_p = \bar{x} + sz_p$$

where:

- $\hat{x}_p$ = upper percentile value
- $\bar{x}$ = mean
- s = standard deviation
- z_p = area under a standard normal distribution at the pth percentile.

The 90th percentile from a log-normal distribution was calculated as follows:

$$\hat{x}_p = \exp(\bar{y} + s_y z_p)$$

where:

- $\hat{x}_p$ = upper percentile value
- $\bar{y}$ = mean of log-transformed data
- s_y = standard deviation of log-transformed data
- z_p = area under a standard normal distribution at the pth percentile.

5.3 Indoor and Outdoor Air Sample Results

Indoor and outdoor air sample results for carbon tetrachloride are shown on Figure H-3 (August 2016, September 2016 and September 2019) and Figure H-4 (October 2016). Indoor and outdoor air sample results for chloroform are shown on Figure H-5 (August 2016, September 2016 and September 2019) and Figure H-6 (October 2016). Indoor air sample results were corrected by subtracting background concentrations then were compared with Method B concentrations in air, as shown in Attachment H-3.

Carbon tetrachloride in indoor air was detected above the site-specific background in 11 of 53 samples. The highest concentrations detected (2.5 µg/m^3 measured on August 31, 2016; 1.5 µg/m^3 measured on September 8, 2016; and 4.7 µg/m^3 measured on September 10, 2016) were from samples collected from residences before the installation of wellhead treatment. The remaining results appear similar with background carbon tetrachloride concentrations. Though slightly higher than the 80th percentile statistic for site-specific background, these concentrations are consistent with historical background levels measured in Washington State by Ecology and EPA (EPA, 2015). When adjusted by subtracting out background contribution, all carbon tetrachloride results in indoor air fall below a Method B standard with the exception of the three measurements before installation of wellhead treatment.

Outdoor air concentrations of chloroform generally are low, as shown by the site-specific background study and available background data for the State of Washington (EPA, 2015). Background chloroform in indoor air largely occurs from emissions from the use of chlorine-containing household products. Emissions from use of chlorine-containing household products have been identified as a primary source of chloroform concentrations in indoor air (Odabasi, 2008; Odabasi et al., 2014; Weisel, 2008; Shepard

et al., 2012; Andelman, 1990). As noted by Ecology (Ecology, 2016), the background adjustment approach does not account for indoor VOC source contributions. Ecology also recommends removing, isolating or controlling indoor volatile hazardous substances as much as possible before and during indoor air sampling. During indoor air sampling events, reasonable efforts were made to identify and control indoor sources. However, as sampling results and field observations showed, there were some background influences to chloroform indoor air concentrations. Chloroform concentrations reported in indoor air were higher than the site-specific outdoor air background concentration in all samples, but were similar to a concentration range in the literature for indoor air concentrations. These were related to various factors as listed below:

- Indoor air samples collected during the August/September 2016 indoor air sampling event were analyzed using standard EPA Method TO-15 analysis, which did not achieve the lower reporting limits as did the EPA Method TO-15 SIM analysis. Chloroform was not detected in 12 of 18 indoor air samples collected during this sampling event, with reporting limits ranging from less than 0.18 to less than 0.35 µg/m^3. Indoor air samples collected during the October 2016 and September 2019 sampling event were analyzed using EPA Method TO-15 SIM, and chloroform was not detected in approximately 37% (13 of 35) samples with reporting limits ranging from less than 0.083 to less than 0.14 µg/m^3. In evaluating the lines of evidence regarding VI, less weight is placed on the chloroform indoor air sampling data from the August/September 2016 sampling event based on the elevated reporting limits.
- The highest chloroform concentrations in indoor air were associated with indoor sources. A chloroform concentration of 1.2 µg/m^3 was measured on September 27, 2016, in the high school office that had been freshly painted. Point-source measurements made concurrently using the HAPSITE detected chloroform concentrations over the painted surfaces. A chloroform concentration of 1.4 µg/m^3 was measured in a residence on September 10, 2016, before installation of wellhead treatment. Chloroform concentrations of 0.53, 6.4, and 6.6 µg/m^3 were measured in a residence on October 19, 20, and 21, 2016, respectively. During the October 20 and 21 sampling events, the field team observed the resident on those days had used a household cleaning product containing chlorine bleach. As they are source-dominated, less weight is placed on these results as lines of evidence regarding the occurrence of VI at the GHFF.
- A total of 25 indoor air samples were collected from the school buildings and residences during the October 2016 sampling event. Two of those samples were source-dominated, and chloroform was not detected in 13 samples. Chloroform was detected in 10 samples at concentrations ranging from 0.1 to 0.53 µg/m^3. The sample results from the high school office, 0.2 µg/m^3 (October 19, 2016), 0.11 µg/m^3 (October 20, 2016), and 0.25 µg/m^3 (October 21, 2016) could represent residual emissions from surfaces painted in August 2016. However, this is uncertain, as point source measurements from the painted surfaces were not available during the October 2016 indoor air sampling event.

Removing the source-dominated values and non-detected results with elevated reporting limits, there were 22 indoor air samples with chloroform concentrations higher than site-specific background (0.08 µg/m^3). Following correction for the site-specific background concentration in air, the chloroform concentrations in 10 of these 22 samples were higher than the Method B Standard. The site-specific background does not consider chloroform concentrations resulting from indoor sources. The 10 indoor air sample results, with concentrations ranging from 0.2 to 1.4 µg/m^3, are lower than the 90th percentile background concentrations frequently reported in the literature (EPA, 2011; Weisel et al., 2008). In a study of 100 homes in suburban and rural areas of New Jersey, the 90th percentile chloroform concentration was 2.62 µg/m^3 (Weisel et al., 2008). The well-documented role of indoor sources for chloroform indoor air concentrations is considered in evaluating chloroform indoor air concentrations at the GHFF as a line of evidence for VI.

5.4 Crawl Space and Subslab Samples

Analytical results from crawl space samples collected from the residences are presented in Attachment H-3. The concentrations of carbon tetrachloride and chloroform, when compared with the background statistics and previous indoor air sampling data, are considered to resemble background levels in ambient air.

Analytical results from subslab samples are presented in Section 4.6.5 of the RI report. The concentrations of carbon tetrachloride and chloroform are much lower than the Method B subslab screening level.

6. Assessment of Potential for Vapor Intrusion Pathways at the GHFF

Low concentrations of carbon tetrachloride and chloroform have been detected in groundwater wells supplying tap water to the school buildings and residences. Indoor air pathways of exposure could occur from volatilization from uses of water for cooking, cleaning, or bathing; from VI from groundwater; and from background concentrations normally present in indoor and outdoor air. Chloroform is also formed in indoor air as a disinfection byproduct from the reaction between chlorine in cleaning products and dissolved organic carbon. The sampling and monitoring activities during the VI assessment were performed to distinguish potential VI pathways from other sources of carbon tetrachloride and chloroform.

Indoor air concentrations of carbon tetrachloride and chloroform higher than Method B standards were related to source-dominated conditions, such as volatilization from indoor water use. This was confirmed by HAPSITE measurements of emissions from running tap water. Following the installation of wellhead treatment, indoor air concentrations resembled site-specific background levels. Indoor air concentrations of chloroform higher than the Method B standard detected in the school buildings were related to emissions from freshly painted surfaces. This was confirmed by HAPSITE measurements of emissions from the painted surfaces. Indoor air concentrations of chloroform higher than the Method B standard were detected in one residences on days when use of chlorine-based household cleaners was also observed.

Shallow soil vapor sampling was attempted around the school buildings. Soil vapor sampling was unsuccessful because of the excessive vacuum encountered during probe purging. Carbon tetrachloride and chloroform were detected in subslab samples collected from the school buildings at concentrations below Method B subslab screening levels provided in the Ecology VI guidance. In the residences, ambient air samples were collected from the lowest levels in the buildings to assess potential volatilization from the subsurface. The lowest levels of the residences had crawl spaces or basements with either an earthen floor or a concrete floor with multiple cracks and penetrations. Based on these conditions, and with concurrence by Ecology, ambient air samples from the lowest levels of the residences were considered more appropriate to assess potential subsurface volatilization. Carbon tetrachloride concentrations in the crawl space or basement samples were similar to site-specific background levels. Chloroform concentrations in these samples were slightly higher than site-specific background levels but were on the low end of the range of indoor air concentrations of chloroform reported in the literature.

VI pathways are not present at the GHFF as there are no structures at the facility beyond the tunnels. Risk to workers from VI pathways are considered unlikely because tunnels in grain handling facilities are stringently regulated in accordance with the Occupational Safety and Health Administration standard 29 *Code of Federal Regulations* 1910.272 and corresponding state standard. This includes a requirement to provide ventilation for unsafe conditions per 1910.272(g)(1)(iii)(A) or use of respiratory protection if hazardous conditions cannot be eliminated using ventilation per 1910.272(g)(1)(iii)(B). These practices would address potential exposures from volatilization of VOCs which might be in subsurface soil.

The results from this VI assessment (from 2016 sample events with additional sampling in 2019) show that VI pathways from groundwater to the school buildings and residences are not complete. The lines of evidence supporting this conclusion are:

- Indoor air concentrations of carbon tetrachloride and chloroform are consistent with site-specific background levels in air. Higher concentrations of carbon tetrachloride and chloroform in indoor air were attributable to emissions from tap water based on HAPSITE survey results. Indoor air concentrations of chloroform were attributable to indoor sources such as freshly painted surfaces (confirmed by HAPSITE survey results) or observations of use of hypochlorite cleaners on sampling days.
- Soils around the buildings are fine-grained with relatively low porosity that retards vapor diffusion. This was indicated by the excessive vacuum observed during purging of soil vapor probes. The depth to groundwater, fine-grained soils, and low source strength in groundwater suggest that a VI pathway from groundwater is unlikely. In addition, subslab samples collected from the school buildings detected carbon tetrachloride and chloroform concentrations lower than conservative screening levels.

7. References

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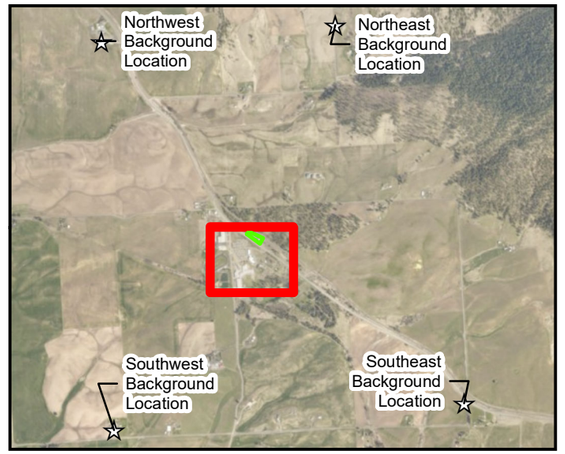
Figures



LEGEND

- Crawl Space
- Indoor Air
- Outdoor Air
- Soil Vapor
- Sub-slab Soil Vapor
- Background Air
- Grain Handling Facility at Freeman
- Freeman School District

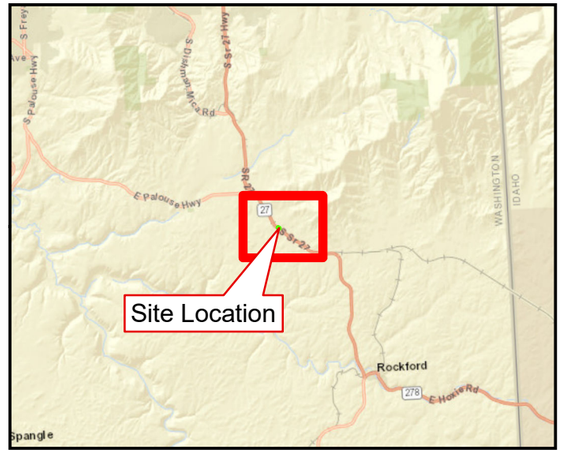
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 95 190 380 Feet

Figure H-1
Outdoor Air, Indoor Air, Indoor Crawl Space, Background Air, Sub-Slab Soil Vapor, and Soil Vapor Sampling Locations
Remedial Investigation/Feasibility Study Report
Grain Handling Facility at Freeman, Freeman, Washington

JACOBS



LEGEND

☆ Background Air

Grain Handling Facility at Freeman

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

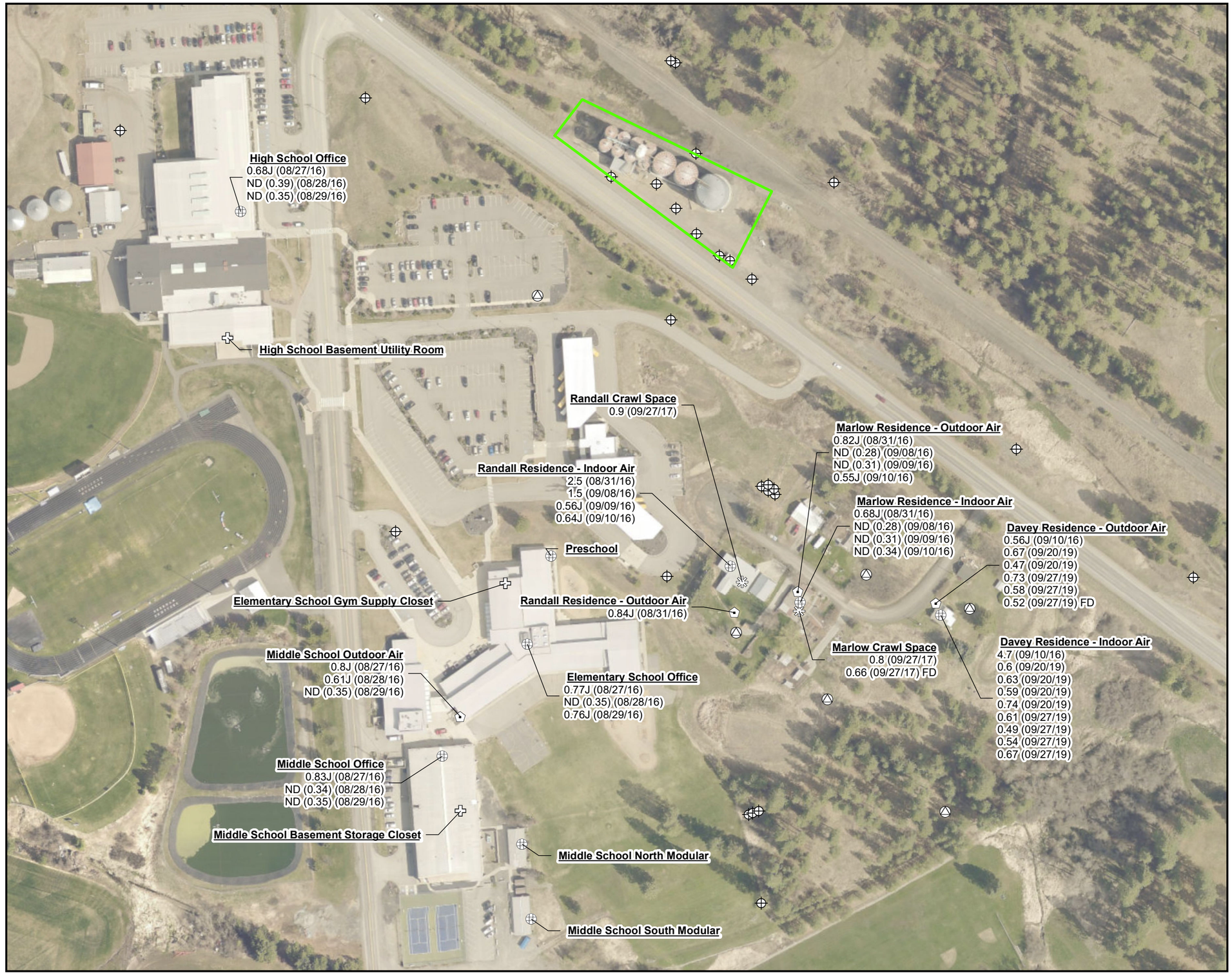
N

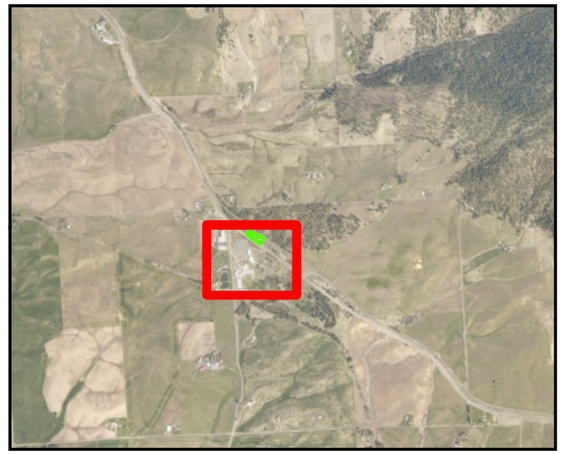
0 650 1,300 2,600 Feet

Figure H-2
Background Air Sampling Locations
Remedial Investigation/Feasibility Study Report
Grain Handling Facility at Freeman,
Freeman, Washington

JACOBS

\\BROOKSIDEFILES\GIS_SHARE\ENBG\00_PROJ\U\UPRR\UPRR_FREEMAN\MAPS\REPORT\2019\RIFS\FIGH-2_BACKGROUNDAIR.MXD GMOON 12/6/2019 7:21:05 AM





LEGEND

- Crawl Space
- Indoor Air
- Outdoor Air
- Sub-slab Soil Vapor
- Grain Handling Facility at Freeman

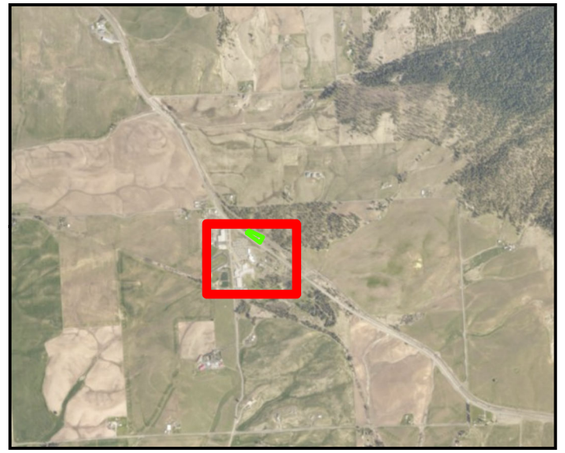
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 105 210 420 Feet

Figure H-3
Carbon Tetrachloride (CT) Concentrations in Indoor and Outdoor Air - August 2016, September 2016 and September 2019
Remedial Investigation/Feasibility Study Report
Grain Handling Facility at Freeman,
Freeman, Washington

JACOBS



LEGEND

- Indoor Air
- Outdoor Air
- Monitoring Well
- Domestic Well
- Grain Handling Facility at Freeman

Marlow Crawl Space ← Location ID
0.66 (09/27/17) FD ← Sample Type Field Duplicate
Sample Date
Concentration (ug/m3)

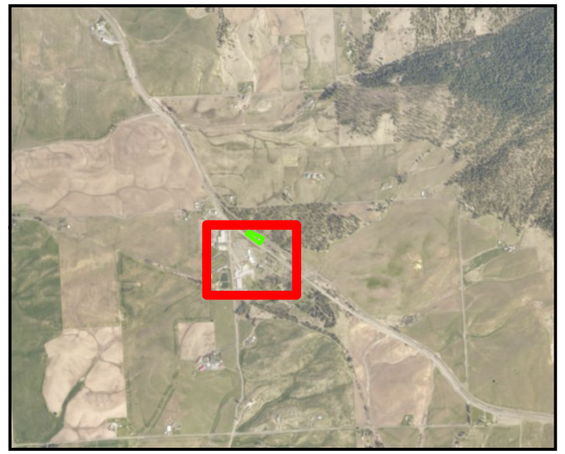
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 105 210 420 Feet

Figure H-4
Carbon Tetrachloride (CT) Concentrations in Indoor and Outdoor Air - October 2016
Remedial Investigation/Feasibility Study Report
Grain Handling Facility at Freeman, Freeman, Washington

JACOBS



LEGEND

- Crawl Space
- Indoor Air
- Outdoor Air
- Grain Handling Facility at Freeman

Marlow Crawl Space ← Location ID
0.66 (09/27/17) FD ← Sample Type Field Duplicate
Sample Date
Concentration (ug/m3)

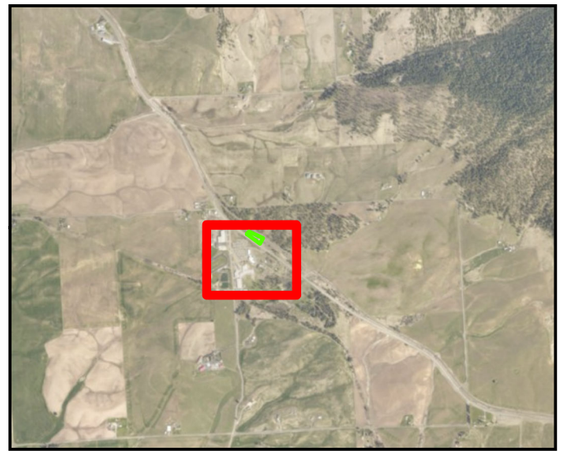
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 105 210 420 Feet

Figure H-5
Chloroform (CF) Concentrations in Indoor and Outdoor Air - August 2016, September 2016 and September 2019
Remedial Investigation/Feasibility Study Report
Grain Handling Facility at Freeman, Freeman, Washington

JACOBS



LEGEND

- Indoor Air
- Outdoor Air
- Monitoring Well
- Domestic Well
- Grain Handling Facility at Freeman

Marlow Crawl Space ← Location ID
0.66 (09/27/17) FD ← Sample Type Field Duplicate
↑ Sample Date
↑ Concentration (ug/m3)

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 105 210 420 Feet

Figure H-6
Chloroform (CF) Concentrations in Indoor and Outdoor Air - October 2016
Remedial Investigation/Feasibility Study Report
Grain Handling Facility at Freeman, Freeman, Washington

JACOBS

Attachment H-1
HAPSITE and Building Survey Forms

Freeman VI Assessment - Draft School HAPSITE Results

August 2016

Date	Time	Sample ID	Location Description	Level	Data Quality Objective	Chloroform ($\mu g/m^3$)	Carbon Tetrachloride ($\mu g/m^3$)	Notes
Elementary School Indoor/Outdoor Air Samples								
8/24/2016	15:04	ELEM-OA1-20160824-011	Outdoor air near north end of elementary school	NA	Outdoor Air	< 0.49	< 0.63	Winds out of the north
8/24/2016	15:10	ELEM-OA2-20160824-012	Outdoor air near west side elementary school	NA	Outdoor Air	< 0.49	< 0.63	Winds out of the north
8/24/2016	15:15	ELEM-OA3-20160824-013	Outdoor air near south side elementary school	NA	Outdoor Air	< 0.49	< 0.63	Winds out of the north
8/24/2016	15:23	ELEM-OA4-20160824-014	Outdoor air near east side elementary school	NA	Outdoor Air	< 0.49	< 0.63	Winds out of the north
8/24/2016	15:30	ELEM-EHAL1-20160824-015	East Wing Hallway near rooms 117 and 162	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	15:38	ELEM-C162-20160824-016	Custodian Room 162 (East wing)	Main	Indoor Air	< 0.49	< 0.63	2.5-foot tube inserted under door
8/24/2016	15:46	ELEM-EHAL2-20160824-017	East Wing Hallway near rooms 112	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	15:53	ELEM-SWHAL1-20160824-018	Southwest Wing Hall near room 132	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	15:59	ELEM-SWHAL2-20160824-019	Southwest Wing Hall near room 135	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	16:08	ELEM-NHAL1-20160824-020	North Wing Hallway near room 125	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	16:16	ELEM-GYM1-20160824-021	Center of Gym	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	16:23	ELEM-LOB1-20160824-022	Entrance lobby	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	16:38	ELEM-C168-20160824-024	Custodian Room 168	Main	Indoor Air	< 0.49	< 0.63	2.5-foot tube inserted under door
8/24/2016	16:47	ELEM-REST1-20160824-025	Men's Main Restroom	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	17:09	ELEM-GLO1-20160824-026	Gym closet	Main	Indoor Air	< 0.49	< 0.63	
8/24/2016	17:55	ELEM-SREST1-20160824-031	Staff Restroom	Main	Indoor Air	< 0.49	< 0.63	Same restroom as run # 023
8/24/2016	18:12	ELEM-OFFICE1-20160824-032	Front Office (Room 101)	Main	Indoor Air	< 0.49	< 0.63	
Elementary School Non-Breathing Space Point Measurements								
8/24/2016	16:30	ELEM-SINK1-20160824-023	Staff Bathroom sink	Main	Sink Headspace	0.59	0.88	Water running during sample collection
8/24/2016	17:17	ELEM-SINK2HC-20160824-027	Gym closet sink hot cold water	Main	Sink Headspace	0.49	0.88	Both cold and hot water running during sample collection
8/24/2016	17:42	ELEM-SINK2H-20160824-028	Gym closet sink hot water	Main	Sink Headspace	< 0.49	< 0.63	Hot water running only
8/24/2016	17:47	ELEM-SINK2C-20160824-029	Gym closet sink cold water	Main	Sink Headspace	< 0.49	0.69	Cold water running only
Middle School Indoor/Outdoor Air Samples								
8/25/2016	8:52	MS-OA1-20160825-003	Outdoor air north side of Middle School	NA	Outdoor air	< 0.49	0.63	Winds out of the east
8/25/2016	9:03	MS-OA2-20160825-004	Outdoor air west side of Middle School	NA	Outdoor air	< 0.49	0.63	Winds out of the east
8/25/2016	9:23	MS-OA3-20160825-006	Outdoor air south side of Middle School	NA	Outdoor air	< 0.49	< 0.63	Winds out of the east
8/25/2016	9:31	MS-OA4-20160825-007	Outdoor air east side of Middle School	NA	Outdoor air	< 0.49	< 0.63	Winds out of the north
8/25/2016	9:45	MS-BLOB1-20160825-008	Basement Lobby Area	Basement/ground level	Indoor Air	< 0.49	0.64	
8/25/2016	9:53	MS-GYM1-20160825-009	Gym (center of) (ground level)	Basement/ground level	Indoor Air	< 0.49	< 0.63	2.5-foot tube inserted under door
8/25/2016	10:02	MS-BLCR1-20160825-010	Boy Locker Room (ground level)	Basement/ground level	Indoor Air	< 0.49	< 0.63	
8/25/2016	10:39	MS-NER1-20160825-015	Northeast Class Room	Basement/ground level	Indoor Air	< 0.49	< 0.63	
8/25/2016	10:52	MS-KIT1-20160825-017	Basement Kitchen	Basement/ground level	Indoor Air	< 0.49	< 0.63	2.5-foot tube inserted under door
8/25/2016	11:34	MS-NST1-20160825-022	Basement North Storage Room	Basement/ground level	Indoor Air	< 0.49	< 0.63	Sample collected near large sump (3-4' diam); sump pumps run at least once per hour
8/25/2016	11:51	MS-ULOB1-20160825-023	Upstairs Lobby Area	Upstairs	Indoor Air	< 0.49	< 0.63	
8/25/2016	12:00	MS-MECH1-20160825-024	Mechanical Room	Upstairs	Indoor Air	< 0.49	< 0.63	Boiler and Air handling units
8/25/2016	12:06	MS-EHAL1-20160825-025	Upstairs East Hall	Upstairs	Indoor Air	< 0.49	< 0.63	
8/25/2016	12:12	MS-WHAL1-20160825-026	Upstairs West Hall	Upstairs	Indoor Air	< 0.49	< 0.63	
8/25/2016	12:20	MS-UCUST1-20160825-027	Upstairs Custodial Closet	Upstairs	Indoor Air	1.07	< 0.63	Bleach located in custodial closet
8/26/2016	9:07	MS-OFFICE2-20160826-006	Middle School Office (east)	Upstairs	Indoor Air	< 0.49	1.13	
8/26/2016	9:15	MS-OFFICE1-20160826-007	Middle School Office (west)	Upstairs	Indoor Air	< 0.49	< 0.63	Bleach located in custodial closet
Middle School Non-Breathing Space Point Measurements								
8/25/2016	10:10	MS-SINK1HC-20160825-011	Boy Locker Room Sink (ground level)	Basement/ground level	Sink Headspace	2.49	3.52	Both cold and hot water running during sample collection
8/25/2016	10:17	MS-SINK1H-20160825-012	Boy Locker Room Sink (ground level)	Basement/ground level	Sink Headspace	4.44	3.40	Only hot water running during sample collection
8/25/2016	10:24	MS-SINK1C-20160825-013	Boy Locker Room Sink (ground level)	Basement/ground level	Sink Headspace	1.12	3.40	Only cold water running during sample collection
8/25/2016	10:46	MS-NWR1-20160825-016	Northwest Class Room	Basement/ground level	Sink headspace	< 0.49	< 0.63	Water running during sample collection
8/25/2016	11:03	MS-SINK2HC-20160825-018	Basement Kitchen Sink	Basement/ground level	Sink Headspace	2.88	3.96	Both cold and hot water running during sample collection
8/25/2016	11:11	MS-SINK2H-20160825-019	Basement Kitchen Sink	Basement/ground level	Sink Headspace	4.54	4.59	Only hot water running during sample collection
8/25/2016	11:19	MS-SINK2C-20160825-020	Basement Kitchen Sink	Basement/ground level	Sink Headspace	0.98	3.58	Only cold water running during sample collection
8/25/2016	11:25	MS-SCAB-20160825-021	Basement Kitchen Sink Cabinet	Basement/ground level	Plumbing Fixture	< 0.49	< 0.63	Probe placed within under-sink cabinet

Freeman VI Assessment - Draft School HAPSITE Results

August 2016

Date	Time	Sample ID	Location Description	Level	Data Quality Objective	Chloroform ($\mu g/m^3$)	Carbon Tetrachloride ($\mu g/m^3$)	Notes
High School Indoor/Outdoor Air Samples								
8/25/2016	13:45	HS-MECH1-20160825-028	Basement Mechanical Room (south end)	Basement	Indoor Air	< 0.49	< 0.63	
8/25/2016	13:56	HS-OA1-20160825-029	Outdoor air south side	NA	Outdoor air	< 0.49	< 0.63	Wind out of south
8/25/2016	14:07	HS-R320-20160825-030	Weight Room (Room 320)	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	14:15	HS-R300-20160825-031	Multipurpose Room (Room 300)	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	14:21	HS-H316-20160825-032	Hallway near Room 316	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	14:29	HS-R307-20160825-033	Custodial Closet (Room 307)	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	15:00	HS-R311-20160825-037	Wood/Metal Shop Classroom (Room 311)	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	15:13	HS-H134-20160825-038	Hallway near Room 134	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	15:20	HS-H114-20160825-039	Hallway near Room 114	Main	Indoor Air	1.22	< 0.63	Fresh paint on the wall
8/25/2016	15:26	HS-H121-20160825-040	Hallway near Room 121	Main	Indoor Air	1.07	< 0.63	Fresh paint on the wall
8/25/2016	15:35	HS-R120-20160825-041	Room 120	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	15:43	HS-NENT1-20160825-042	North Entrance	Main	Indoor Air	1.27	< 0.63	Fresh paint on wall; sampled here to see if the paint is the CL source of sample run # 040
8/25/2016	16:13	HS-OA2-20160825-045	Outdoor air west side	Main	Outdoor air	< 0.49	< 0.63	
8/25/2016	16:46	HS-H210-20160825-048	Hallway near Room 210	2nd Level	Indoor Air	0.78	< 0.63	Located directly above newly painted wall; paint contained chloroform
8/25/2016	16:33	HS-H213-20160825-046	Hallway near Room 213	2nd Level	Indoor Air	1.27	< 0.63	Fresh paint on the wall
8/25/2016	16:39	HS-H200-20160825-047	Hallway near Room 200	2nd Level	Indoor Air	0.63	< 0.63	Fresh paint on the wall
8/25/2016	18:01	HS-GYMS1-20160825-049	South Gym	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	18:10	HS-GYMN1-20160825-050	North Gym	Main	Indoor Air	< 0.49	< 0.63	
8/25/2016	18:18	HS-OFFICE1-20160825-051	Main Office	Main	Indoor Air	0.49	< 0.63	
8/25/2016	18:35	HS-OA3-20160825-052	Outdoor air East side	NA	Outdoor air	< 0.49	< 0.63	
8/25/2016	18:46	HS-OA4053	Outdoor air west side	NA	Outdoor air	< 0.49	< 0.63	
High School Non-Breathing Space Point Measurements								
8/25/2016	14:35	HS-SINK1HC-20160825-034	Custodial Closet Sink (Room 307)	Main	Sink Headspace	0.73	0.94	Hot and cold water running during sampling
8/25/2016	14:40	HS-SINK1H-20160825-035	Custodial Closet Sink (Room 307)	Main	Sink Headspace	0.59	0.75	Hot water running during sampling
8/25/2016	14:49	HS-SINK1C-20160825-036	Custodial Closet Sink (Room 307)	Main	Sink Headspace	0.63	1.26	Cold water running during sampling
8/25/2016	15:50	HS-NENT2-20160825-043	North Entrance Painted Wall	Main	Product Screening	1.12	< 0.63	Probe tip placed near painted wall
8/25/2016	15:57	HS-PAINT-20160825-044	Paint can in hallway near Room 124	Main	Product Screening	1.12	< 0.63	Paint can
8/25/2016	16:07	HS-PAINT--20160825-Survey-001	Survey method used on paint can	Main	Product Screening	Y	N	Instrument in non-quantitative survey mode. Survey identified chloroform to be in paint.
8/25/2016	18:25	HS-OFFICE1-20160825-Survey-002	Survey method used on Clorox Wipes	Main	Product Screening	Y	N	Instrument in non-quantitative survey mode. Wipes located in Main Office were identified to contain chloroform.

NOTES:

$\mu g/m^3$ = Micrograms per cubic meter.

NA = Not applicable.

DATA QUALITY OBJECTIVES:

Indoor and Outdoor Air

The HAPSITE results are short-duration (approximately 1 minute), semi-quantitative, samples collected to develop information to identify potential sources and guide the placement of the 24-hour laboratory samples.

Indoor Air = These samples were collected from areas within the building that are or could be regularly occupied under normal building-use conditions. Their purpose is to help assess whether indoor-air sources are present and to guide placement of TO-15 sampling locations.

Outdoor Air = These samples were collected outside but near the buildings. Their purpose is to help assess whether volatile chemicals are present in outdoor at concentrations that could affect indoor-air concentrations.

Non-Breathing Space Point Measurements

Product Screening = These samples were collected immediately adjacent to chemical products that may contain target chemicals. Their purpose was to help assess whether the chemical products are offgassing chemicals of interest into the indoor air. These samples are not representative of normal breathing space.

Sink Headspace = These samples were collected immediately above sinks while water was running. Their purpose was to help assess whether volatile chemical potentially present in the tap water were affecting the indoor air concentrations. These samples are not representative of normal breathing space.

Plumbing Fixtures = These samples were collected near plumbing drain lines to help assess whether target chemicals could be entering the building through the drain piping. These samples are not representative of normal breathing space.

DRAFT

Elementary School

ELEM-GLO1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-OA1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-NHAL1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

Non-Breathing Space Point Measurements

ELEM-SINK2HC	8/24/2016	
Chloroform	0.49	µg/m^3
Carbon Tetrachloride	0.88	µg/m^3

ELEM-SINK2H	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-SINK2C	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.69	µg/m^3

ELEM-GYM1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-C168	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-LOB1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-SREST1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-OA4	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

N

Electrical/Communication/Firepanel main

Non-Breathing Space Point Measurement

ELEM-SINK1	8/24/2016	
Chloroform	0.59	µg/m^3
Carbon Tetrachloride	0.88	µg/m^3

ELEM-C162	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-EHAL1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

Firepanel

District 8 Knox Box

ELEM-OA2	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-EHAL2	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-OFFICE1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

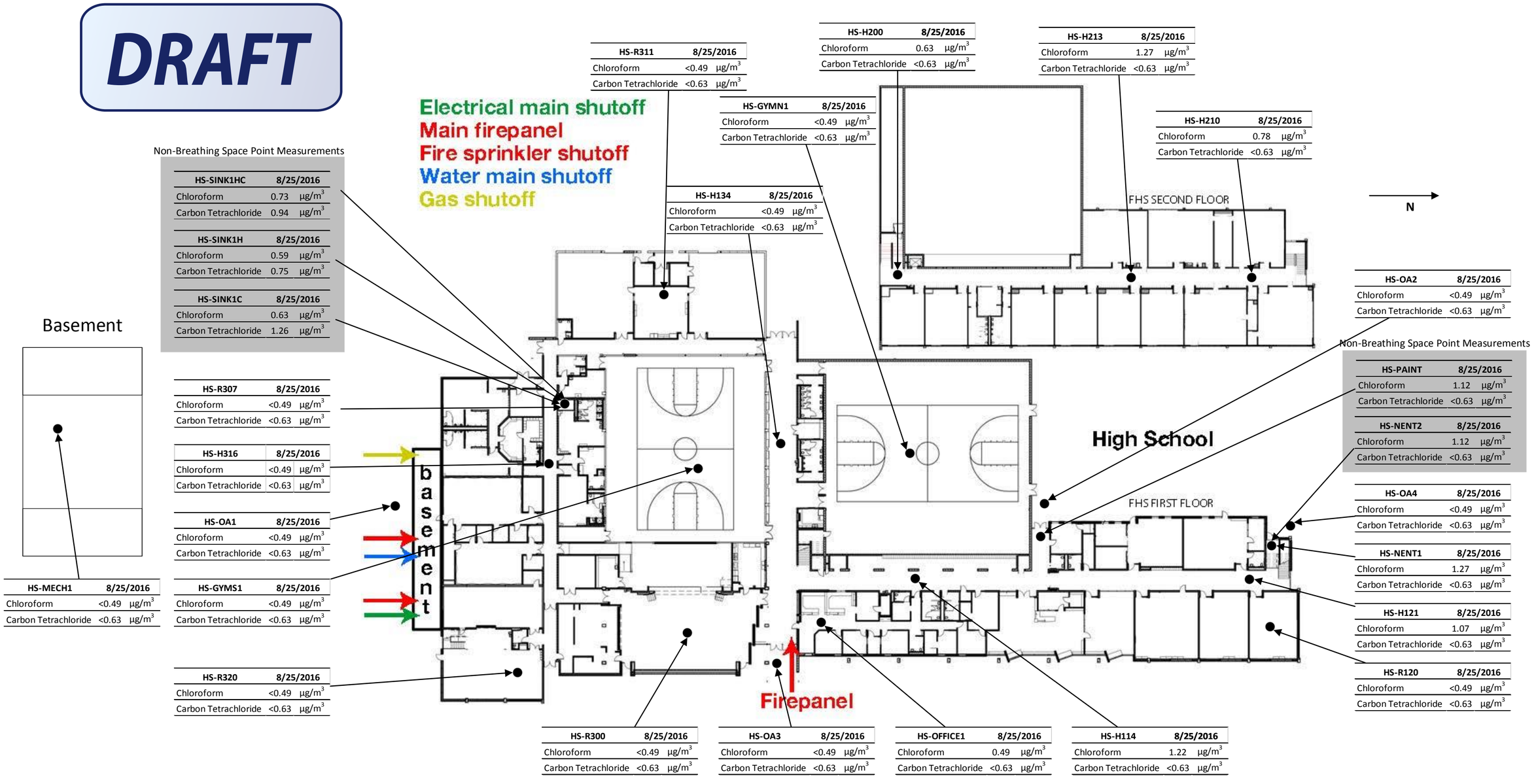
ELEM-REST1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-SWHAL1	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

ELEM-SWHAL2	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

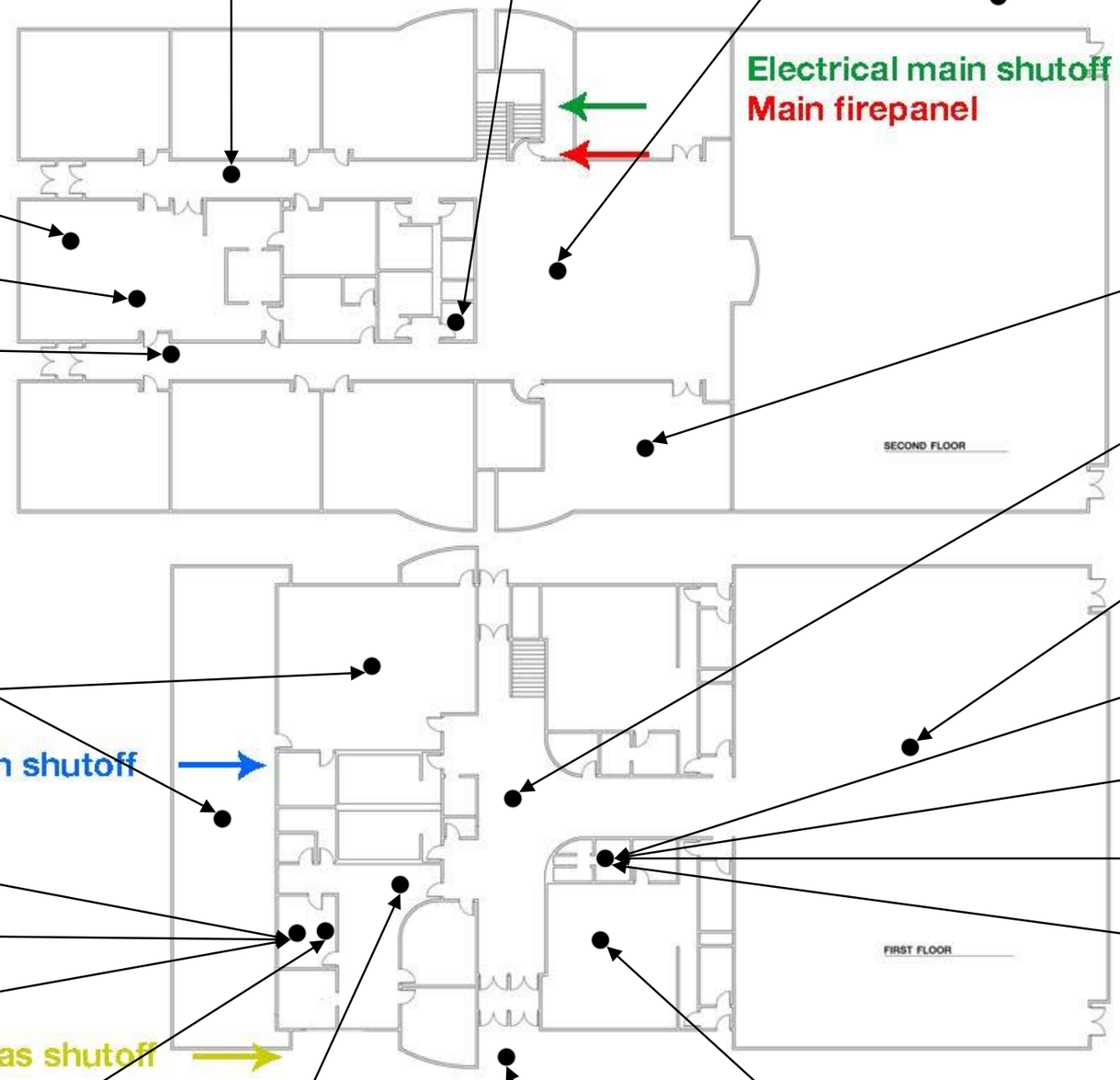
ELEM-OA3	8/24/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

DRAFT


Electrical main shutoff
Main firepanel
Fire sprinkler shutoff
Water main shutoff
Gas shutoff
Non-Breathing Space Point Measurements
HS-SINK1HC 8/25/2016
Chloroform 0.73 µg/m3
Carbon Tetrachloride 0.94 µg/m3
HS-SINK1H 8/25/2016
Chloroform 0.59 µg/m3
Carbon Tetrachloride 0.75 µg/m3
HS-SINK1C 8/25/2016
Chloroform 0.63 µg/m3
Carbon Tetrachloride 1.26 µg/m3
Basement
HS-MECH1 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-R307 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H316 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-OA1 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-GYMS1 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-R320 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
basement
HS-R311 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H200 8/25/2016
Chloroform 0.63 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H213 8/25/2016
Chloroform 1.27 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-GYMN1 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H210 8/25/2016
Chloroform 0.78 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H134 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
FHS SECOND FLOOR
N
High School
FHS FIRST FLOOR
HS-OA2 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
Non-Breathing Space Point Measurements
HS-PAINT 8/25/2016
Chloroform 1.12 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-NENT2 8/25/2016
Chloroform 1.12 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-OA4 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-NENT1 8/25/2016
Chloroform 1.27 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H121 8/25/2016
Chloroform 1.07 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-R120 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
Firepanel
HS-R300 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-OA3 8/25/2016
Chloroform <0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-OFFICE1 8/25/2016
Chloroform 0.49 µg/m3
Carbon Tetrachloride <0.63 µg/m3
HS-H114 8/25/2016
Chloroform 1.22 µg/m3
Carbon Tetrachloride <0.63 µg/m3

DRAFT

Middle School



MS-EHAL1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-UCUST1	8/25/2016
Chloroform	1.07 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-ULOB1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-OA4	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-OFFICE2	8/26/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-OFFICE1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	1.13 µg/m³

MS-WHAL1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-OA1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	0.63 µg/m³

MS-NST1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

Non-Breathing Space Point Measurements

MS-NWR1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-SINK2HC	8/25/2016
Chloroform	2.88 µg/m³
Carbon Tetrachloride	3.96 µg/m³

MS-SINK2H	8/25/2016
Chloroform	4.54 µg/m³
Carbon Tetrachloride	4.59 µg/m³

MS-SINK2C	8/25/2016
Chloroform	0.98 µg/m³
Carbon Tetrachloride	3.58 µg/m³

MS-MECH1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-BLOB1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	0.64 µg/m³

MS-GYM1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

Non-Breathing Space Point Measurements

MS-SINK1HC	8/25/2016
Chloroform	2.49 µg/m³
Carbon Tetrachloride	3.52 µg/m³

MS-SINK1H	8/25/2016
Chloroform	4.44 µg/m³
Carbon Tetrachloride	3.4 µg/m³

MS-SINK1C	8/25/2016
Chloroform	1.12 µg/m³
Carbon Tetrachloride	3.4 µg/m³

MS-SCAB	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-KIT1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-NER1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-OA2	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	0.63 µg/m³

MS-BLCR1	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

MS-OA3	8/25/2016
Chloroform	<0.49 µg/m³
Carbon Tetrachloride	<0.63 µg/m³

Freeman VI Assessment - Draft Residential HAPSITE Results

September 2016

Date	Time	Sample ID	Location Description	Data Quality Objective	Chloroform ($\mu g/m^3$)	Q	Carbon Tetrachloride ($\mu g/m^3$)	Q	Notes
15608 E. Prospect Ave. Indoor/Outdoor Air Samples									
9/7/2016	13:35	15608P-OA1-20160907-6	Outdoor air North of 15608	Outdoor Air	< 0.49		< 0.63		Winds out of the NW
9/7/2016	14:55	15608P-IA1-20160907-10	Living room	Indoor Air	< 0.49		0.88		
9/7/2016	15:05	15608P-IA2-20160907-11	Master bedroom	Indoor Air	< 0.49		0.82		
9/7/2016	15:10	15608P-IA3-20160907-12	North bedroom	Indoor Air	< 0.49		0.82		
9/7/2016	15:17	15608P-IA4-20160907-13	North bathroom	Indoor Air	< 0.49		0.75		
9/7/2016	15:25	15608P-IA5-20160907-14	Kitchen	Indoor Air	< 0.49		0.69		
9/7/2016	16:55	15608P-OA3-20160907-21	Outdoor air east of 15608	Outdoor Air	< 0.49		< 0.63		Winds out of the NW
9/9/2016	15:46	15608P-IA14-20160909-19	Kitchen, by IA2-15608P-20160908	Indoor Air	< 0.49		1.38		Co-located with SUMMA
9/9/2016	15:53	15608P-OA3-20160909-20	East of 15608P	Outdoor Air	< 0.49		0.69		
15608 E. Prospect Ave. Non-Breathing Space Point Measurements									
9/7/2016	15:30	15608P-IA6-20160907-15	Laundry closet	Product screening	< 0.49		0.75		Former indoor potential background source storage location
9/7/2016	15:40	15608P-IA7-20160907-16	Kitchen sink, hot and cold water on	Sink headspace	2.5		126	E	Hot and cold water on
9/7/2016	15:47	15608P-IA7a-20160907-17	Kitchen sink, hot and cold water on	Sink headspace	2.2		75	E	Hot and cold water on
9/9/2016	11:20	15608P-CS1-20160909-14	15608 Prospect crawlspace	Crawlspace	< 0.49		0.75		Under dining room
15710 E. Prospect Ave. Indoor/Outdoor Air Samples									
9/7/2016	13:55	15710P-OA2-20160907-7	Outdoor air West of 15710	Outdoor Air	< 0.49		< 0.63		Winds out of the NW
9/7/2016	17:07	15710P-IA8-20160907-22	Living room	Indoor Air	< 0.49		< 0.63		
9/7/2016	17:13	15710P-IA9-20160907-23	Bedroom storage	Indoor Air	< 0.49		< 0.63		Former indoor potential background source storage location
9/7/2016	17:20	15710P-IA10-20160907-24	Kitchen	Indoor Air	< 0.49		< 0.63		
9/7/2016	17:30	15710P-IA11-20160907-25	Craft room	Indoor Air	< 0.49		< 0.63		
9/9/2016	16:32	15710P-IA15-20160909-21	Kitchen, by IA1-15710P-2016-0908	Indoor Air	< 0.49		0.78		Co-located with SUMMA
15710 E. Prospect Ave. Non-Breathing Space Point Measurements									
9/7/2016	17:35	15710P-IA12-20160907-26	Kitchen sink, hot and cold water on	Sink headspace	< 0.49		4.0		Hot and cold water on
9/7/2016	17:43	15710P-IA13-20160907-27	Under kitchen sink	Product screening	< 0.49		< 0.63		Former indoor potential background source storage location

NOTES:

$\mu g/m^3$ = Micrograms per cubic meter.

NA = Not applicable.

Q = Qualifier

E = Exceeded the HAPSITE calibration range

DATA QUALITY OBJECTIVES:

Indoor and Outdoor Air

The HAPSITE results are short-duration (approximately 1 minute), semi-quantitative, samples collected to develop information to identify potential sources and guide the placement of the 24-hour laboratory samples.

Indoor Air = These samples were collected from areas within the building that are or could be regularly occupied under normal building-use conditions. Their purpose is to help assess whether indoor-air sources are present and to guide placement of TO-15 sampling locations.

Outdoor Air = These samples were collected outside but near the buildings. Their purpose is to help assess whether volatile chemicals are present in outdoor at concentrations that could affect indoor-air concentrations.

Non-Breathing Space Point Measurements

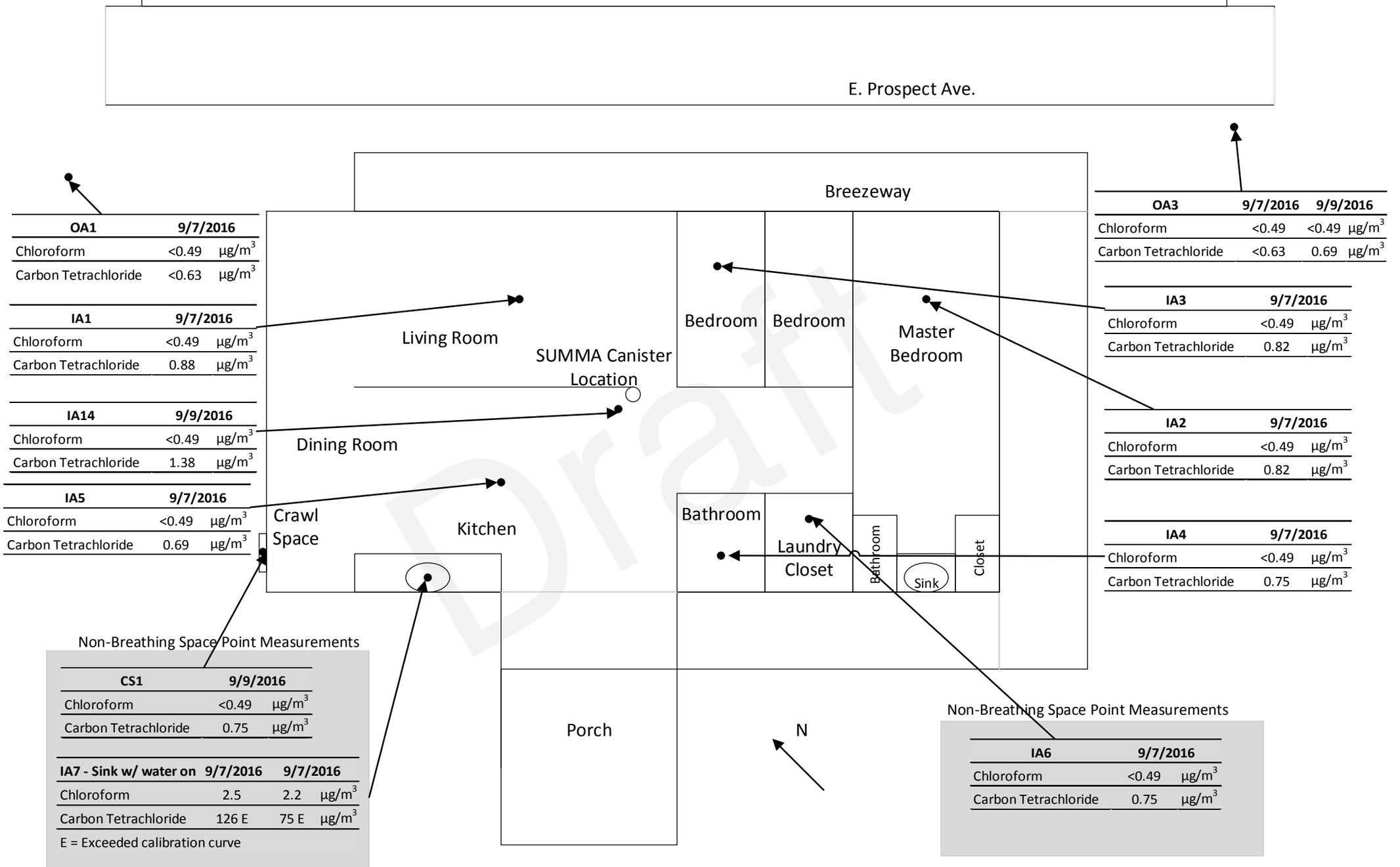
Product Screening = These samples were collected immediately adjacent to chemical products that may contain target chemicals. Their purpose was to help assess whether the chemical products are offgassing chemicals of interest into the indoor air. These samples are not representative of normal breathing space.

Sink Headspace = These samples were collected immediately above sinks while water was running. Their purpose was to help assess whether volatile chemical potentially present in the tap water were affecting the indoor air concentrations. These samples are not representative of normal breathing space.

Plumbing Fixtures = These samples were collected near plumbing drain lines to help assess whether target chemicals could be entering the building through the drain piping. These samples are not representative of normal breathing space.

Crawlspace = These samples were collected from the crawlspace beneath the residence to help assess the VI pathway. These samples are not representative of normal breathing space.

HAPSITE Results for 15608 E. Prospect Ave.



OA1	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	µg/m^3

IA1	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.88	µg/m^3

IA14	9/9/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	1.38	µg/m^3

IA5	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.69	µg/m^3

OA3	9/7/2016	9/9/2016	
Chloroform	<0.49	<0.49	µg/m^3
Carbon Tetrachloride	<0.63	0.69	µg/m^3

IA3	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.82	µg/m^3

IA2	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.82	µg/m^3

IA4	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.75	µg/m^3

Non-Breathing Space Point Measurements

CS1	9/9/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.75	µg/m^3

IA7 - Sink w/ water on	9/7/2016	9/7/2016	
Chloroform	2.5	2.2	µg/m^3
Carbon Tetrachloride	126 E	75 E	µg/m^3

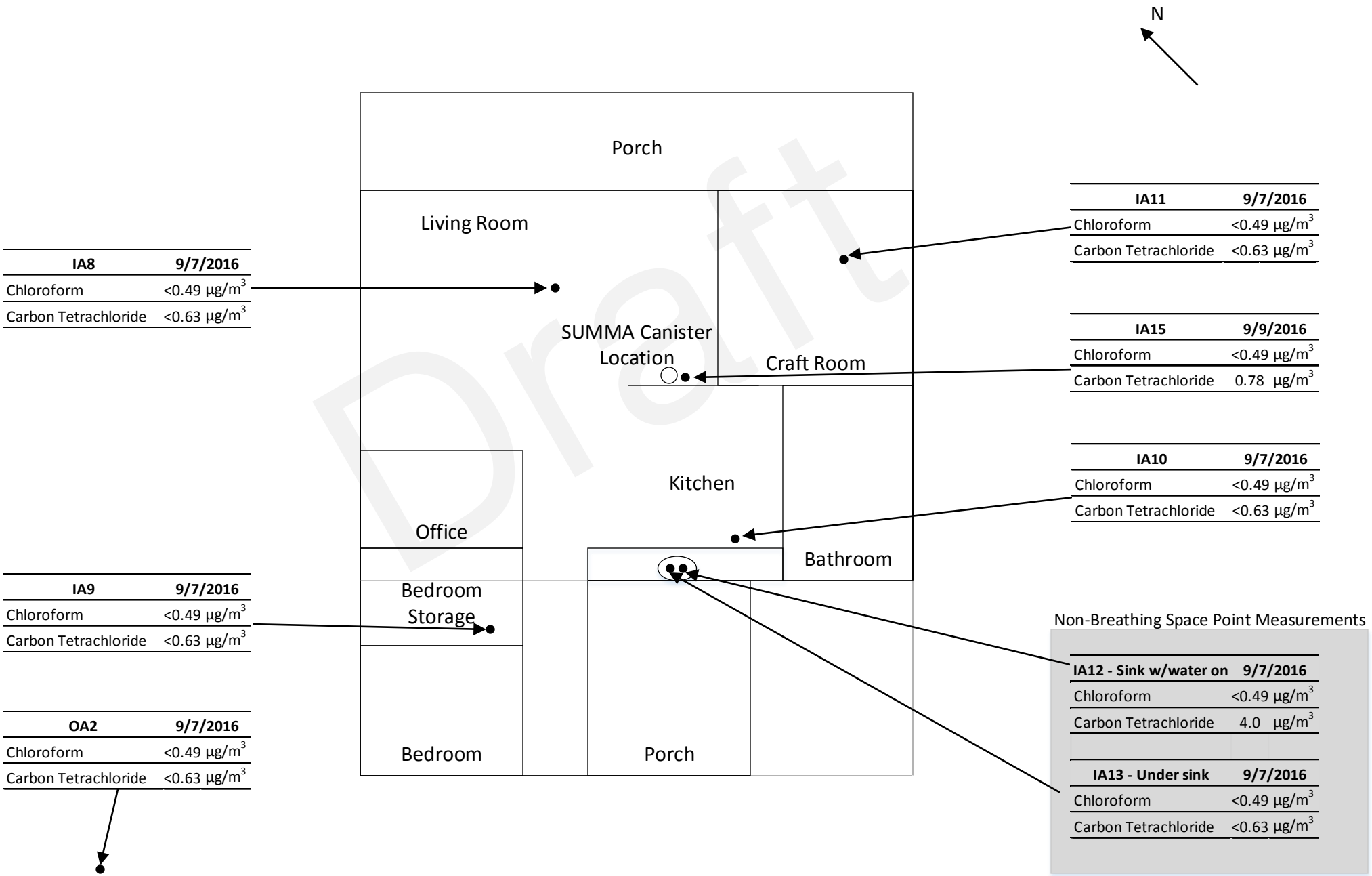
E = Exceeded calibration curve

Non-Breathing Space Point Measurements

IA6	9/7/2016	
Chloroform	<0.49	µg/m^3
Carbon Tetrachloride	0.75	µg/m^3

HAPSITE Results for 15710 E. Prospect Ave.

E. Prospect Ave.



IA8	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	<0.63 µg/m^3

IA11	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	<0.63 µg/m^3

IA15	9/9/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	0.78 µg/m^3

IA10	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	<0.63 µg/m^3

IA9	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	<0.63 µg/m^3

OA2	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	<0.63 µg/m^3

Non-Breathing Space Point Measurements

IA12 - Sink w/water on	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	4.0 µg/m^3

IA13 - Under sink	9/7/2016
Chloroform	<0.49 µg/m^3
Carbon Tetrachloride	<0.63 µg/m^3

Freeman VI Assessment - Draft Background HAPSITE Results

September 2016

Date	Time	Sample ID	Location Description	Data Quality Objective	Chloroform ($\mu g/m^3$)	Q	Carbon Tetrachloride ($\mu g/m^3$)	Q	Notes
Background Outdoor Air Samples									
9/9/2016	9:00	Background-OfficeAir-20160909-7	In SPK Office	Outdoor Background Air	< 0.49		0.82		
9/9/2016	9:30	Background-OutsideOfficeAir-20160909-8	South side of SPK office	Outdoor Background Air	< 0.49		0.82		
9/9/2016	10:15	Background-BA1-20160909-9	By grain depot	Outdoor Background Air	< 0.49		0.69		Wind from south
9/9/2016	10:25	Background-BA2-20160909-10	Jackson Road, South of site	Outdoor Background Air	< 0.49		0.69		Wind from south
9/9/2016	10:42	Background-BA3-20160909-11	North of treatment ponds	Outdoor Background Air	< 0.49		0.69		Wind from south
9/9/2016	11:00	Background-BA4-20160909-12	North of school water treatment building	Outdoor Background Air	< 0.49		0.69		Wind from south
9/9/2016	11:12	Background-BA5-20160909-13	15608 Prospect driveway	Outdoor Background Air	< 0.49		0.69		Wind calm
9/9/2016	11:50	Background-BA6-20160909-17	Elder and Jackson, South of site	Outdoor Background Air	< 0.49		0.69		Wind calm
9/9/2016	12:10	Background-BA7-20160909-18	Hwy 27 & Stroughton, North of site	Outdoor Background Air	< 0.49		0.69		Wind calm
9/9/2016	18:00	Background-BA8-20160909-22	Northside of SPK office	Outdoor Background Air	< 0.49		0.69		

NOTES:

$\mu g/m^3$ = Micrograms per cubic meter.

Q = Qualifier

DATA QUALITY OBJECTIVES:

Outdoor Background Air

The HAPSITE results are short-duration (approximately 1 minute), semi-quantitative, samples collected to develop information to identify potential background sources and guide additional analytical sample collection.

Samples were collected outside but away from investigation location. Their purpose is to help assess whether target chemicals are present in regional ambient air.

Building Survey - Indoor Air Sampling

Project Information

Project Name: UPRR Freeman
Project #: 66/508
Survey Completed By: Becky Bewley
Date: Aug 29, 2016
Building Address: 15608 Prospect, Freeman, WA
Residence ID:

Resident and Contact Information

Name of Occupant: Art Randall (and his adult son)
Owner / Tenant / Other:
Occupant Phone #s: Home: Work: Cell: 509-475-0875
Duration at Current Residence: < 1 yr
Best Time To Call / Visit:
Number of Building Occupants: Children (list ages): Adults: 2
(If Rental) Property Owner Name: Lavern & Lois Randall
Owner Phone #s: Home:
Owner Address: Work:
Name of Interviewee for Building Survey: Art Randall
Notes:

Building Construction Characteristics

Building Type: (Check box for all that apply)

- [X] Single Family Residential
- [ ] Multi Family Residential
- [ ] Commercial
- [ ] Ranch
- [ ] Two-story
- [ ] Other (specify):
- [ ] Split Level
- [ ] Tri Level
- [ ] Duplex (# of other half of duplex):
- [ ] Apartment (# of units in Building):

Describe Building: (General Description, Construction Materials, etc.) Trailer w/added breezeway and roof

Approximate ~~Age~~ Yr built: 1975 years
Approximate Area: Total Living Space: 2,340 sq. ft. First Floor: 2,340 sq. ft.

Floors: # Floors at or above grade: 1

Which floors of the residence are utilized as living space / occupied? 1

Foundation Type:
Crawl Space: (Yes) / No
Slab on Grade: Yes / No
Basement: Yes / No

Foundation Description: (Split Foundation or Multiple Types)
Blocks
Slab & Crawl Space Construction:

Basement or Crawl Space Details: (If applicable)

Finished Basement: Yes / (No)
Basement Finished When:
Approximate Area: sq. ft.

Basement or Crawl Space Floor: (Check box for all that apply)

- [ ] Concrete
- [X] Dirt
- [ ] Floating (built on top of actual floor)
- [ ] Other (specify):

Foundation Walls: (Check box for all that apply)

- [ ] Poured Concrete
- [X] Block
- [ ] Stone
- [ ] Other (specify):

Does the basement or crawl space have a moisture problem - dampness? (Check only one)

- [X] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [ ] No

Is the basement or crawl space ever wet - flooded? (Check only one)

- [ ] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [X] No

Building Address: 15608 Prospect Date: 8/29/16

Basement or Crawl Space Details Continued: (if applicable)

Does the basement have any of the following? (Check all that apply)

☐ Floor cracks ☐ Wall cracks ☐ Floor Drain ☐ Sump pump

☐ Other hole / opening in floor (describe): _____

Is the sump pump used? Yes / (No) Depth of sump? _____ ft Where does the sump pump drain? _____

Describe ventilation of crawl space: vents on sides

Description of ground cover outside of building: ☒ Grass ☐ Concrete ☐ Asphalt ☐ Other: _____

Heating & Ventilation Systems

Heating System - Fuel Type: (Check box for all that apply)

☒ Natural Gas ☐ Electric ☐ Coal ☐ Fuel Oil

☐ Wood ☐ Other (specify): _____

Heating - Conveyance System: (Check box for all that apply)

☒ Forced Hot Air ☐ Electric Baseboard ☐ Wood Stove ☐ Fireplace

☐ Forced Hot Water ☐ Hot Water Radiation ☐ Heat Pump ☐ Kerosene Heater

☐ Other (specify): _____

Type of Ventilation System: (Check box for all that apply)

☐ Central air handler / blower ☐ Mechanical / ceiling fans ☐ Bathroom ventilation fans ☐ Air-to-air heat exchanger

☒ Kitchen range hood fan ☐ Other (specify): _____

Does the Residence have Air Conditioning: (Check box for all that apply)

☐ Central Air Conditioning ☐ Window Air Conditioners ☐ Other (specify): _____

Describe the current operating conditions of the HVAC system: portable fans in use, doors open

Miscellaneous Information

Does the Residence have any of the following?

Septic System? (Yes) Yes (but not used) / No Irrigation / Private Well? Private Well

Existing subsurface depressurization (radon) system in place? Yes / (No) Is it running? Yes / No

Is there standing water outside the residence (pond, ditch, swale)? Yes / (No) If so, describe: _____

Has the residence been retrofitted / weatherized with any of the following? (Check box for all that apply)

☒ Insulation ☐ Storm Windows ☐ Energy-efficient windows ☐ Other (specify): _____

Started to put insulation under floor w/ plastic barrier

Does the building have an attached garage? Yes / (No) If so, is a car usually parked in the garage? Yes / No

Chemicals

Have any pesticides / herbicides been applied around the building foundation or in the yard / gardens? (Yes) No

If so, when - and which chemicals? 2,4-d For weeds

Has the residence had a pesticide treatment inside? Yes / (No) When / by whom? _____

Do the occupants of the building have their clothes dry-cleaned? Yes / (No)

When were dry-cleaned clothes last brought into the building? _____

Have the occupants ever noticed any unusual odors in the building? (Yes) / No

Describe (with location): When he moved in the master bedroom had an odor. He removed / replaced carpet and odor went away.

Building Address: 15608 Prospect Date: 8/29/16

Miscellaneous Information Continued:

Have there been any known spills of a chemical immediately outside or inside the building? Yes / (No)

Describe (with location):

Do any of the occupants smoke inside the building? Yes / (No) How often?

Do any of the occupants use solvents at work? Yes / (No) Are their clothes washed at home? Yes / No

If so, when - and what rooms?

Within the last 6 months, has there been any painting or remodeling in the residence? (Yes) No If so, when

What rooms, and what specifically was done? Painted master bedroom ~~& second bedroom~~

Within the last 6 months, has any new carpeting been installed? (Yes) No Have the carpets or rugs been cleaned? Yes / No

If so, when, what rooms, and what cleaners? New carpet in master bedroom and a 2nd bedroom

Consumer Products Inventory

Check consumer products that are present in the residence.

		Storage Location	Frequency of Usage	Date of Last Use
[X]	Paint or Wood Finishes (spray or can)	laundry closet -	spray paint	
[ ]	Paint stripper / remover / thinner			
[X]	Solvent cleaners (e.g.. spray-on oven cleaner)			
[ ]	Metal degreaser / cleaner			
[ ]	Gasoline / diesel fuel			
[X]	Glues or adhesives (super glue, etc.)	laundry closet - liquid nails		
[X]	Air fresheners & scented candles	candles - various locations		
[X]	Laundry / carpet spot removers	laundry closet - brand = Procyon		
[X]	Pesticides / insecticides			
[ ]	Nail polish remover (acetone)			
[X]	Aerosols (deodorizers, polish, cleaners)	bathroom - lycol		
[ ]	Other:			
[ ]	Other:			
[ ]	Other:			

Describe any products that are containerized during sampling event:

Removed numerous cleaning products from laundry closet and kitchen including (but not limited to) bleach, scrubber scrubbing bubbles, lycol wipes.

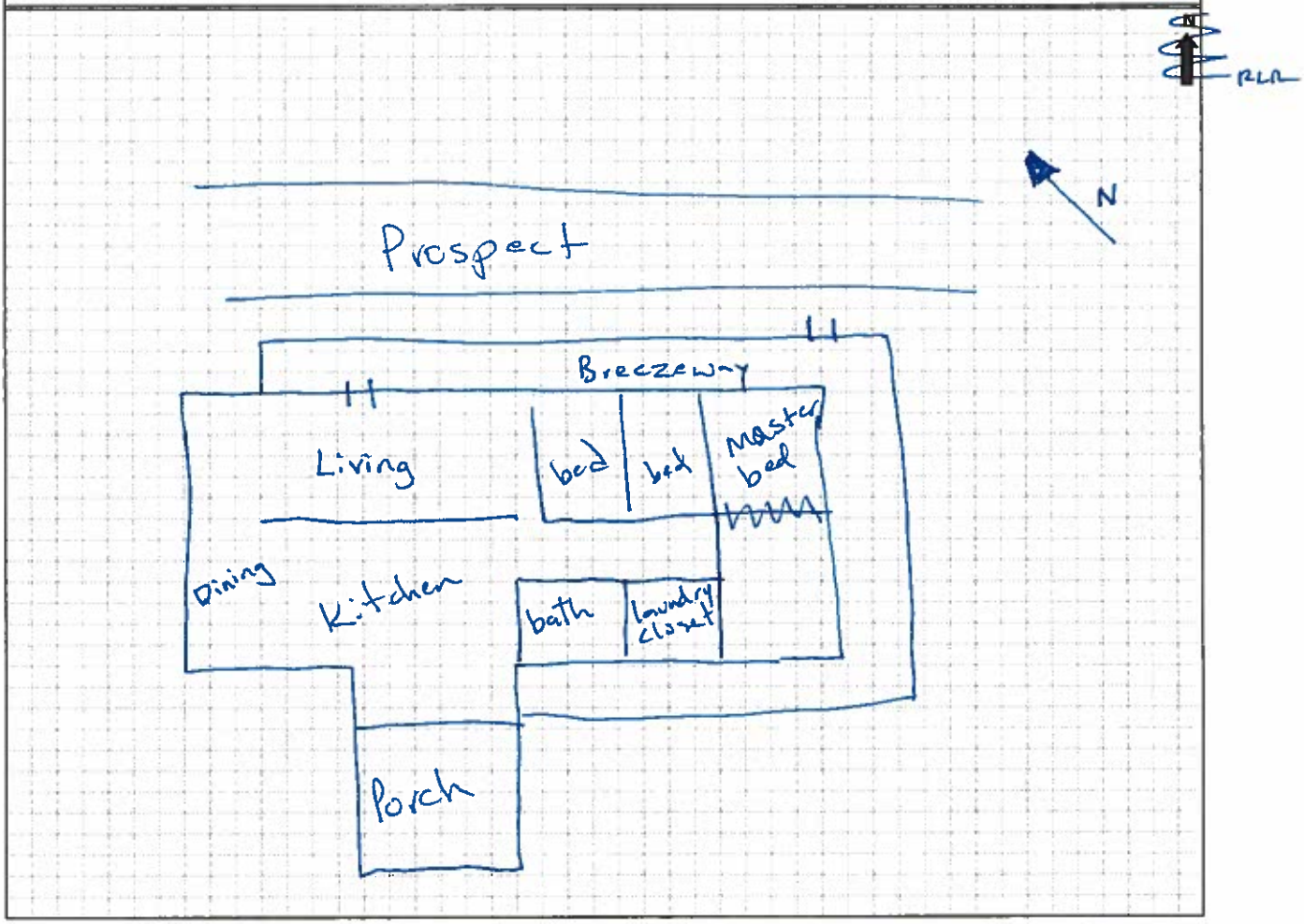
Provide any additional information that is provided by interviewee:

Building Address: 15608 Prospect Date: 8/29/16

Building Sketch

Provide sketch of floors in house, including the following information:

- Street (sidewalk, patios, driveway, distance to house)
- Location of heating and cooling systems, including fireplace
- General location of doors and windows
- Primary chemical storage location(s)
- General orientation of garage and main rooms



Post Sampling Review

Date Noted: _____ Sampling Team: _____

Has any information changed during the sampling event?

Did windows and doors remain closed? _____

Was any dry cleaning brought home? _____

Were any of the consumer products discussed yesterday used in the last 24-hours? _____

Were any of the containerized products opened? _____

Notes / other information observed post-sampling: _____

Building Survey - Indoor Air Sampling

Project Information

Project Name: UPRR Freeman
Project #: 661508
Survey Completed By: Becky Rewey
Date: Aug 29, 2016
Building Address: 15710 Prospect
Residence ID:

Resident and Contact Information

Name of Occupant: Scott Marlow (plus wife & adult son) (Owner) / Tenant / Other: Same
Occupant Phone #s: Home: Work: Cell:
Duration at Current Residence: 29 yrs Best Time To Call / Visit:
Number of Building Occupants: Children (list ages): Adults:
(If Rental) Property Owner Name: *Owner Phone #s:* *Home:*
Owner Address: *Work:*
Name of Interviewee for Building Survey: Scott Marlow Notes:

Building Construction Characteristics

Building Type: (Check box for all that apply)

- [X] Single Family Residential
- [ ] Multi Family Residential
- [ ] Commercial
- [ ] Ranch
- [ ] Two-story
- [ ] Other (specify):
- [ ] Split Level
- [ ] Tri Level
- [ ] Duplex (# of other half of duplex):
- [ ] Apartment (# of units in Building):

Describe Building: (General Description, Construction Materials, etc.)

Approximate Age: Year Built 1906 years **Approximate Area:** Total Living Space: ~1,000 sq. ft. First Floor: ~1,000 sq. ft.

Floors: # Floors at or above grade: 1 + attic

Which floors of the residence are utilized as living space / occupied? 1st / main floor

Foundation Type:

Crawl Space: (Yes) / No
Slab on Grade: Yes / No
Basement: Yes / No

Foundation Description: (Split Foundation or Multiple Types)

Celler - Concrete Blocks

Slab & Crawl Space Construction:

Basement or Crawl Space Details: (if applicable)

Finished Basement: Yes / (No) Basement Finished When: Approximate Area: sq. ft.

Basement or Crawl Space Floor: (Check box for all that apply)

- [ ] Concrete
- [X] Dirt
- [ ] Floating (built on top of actual floor)
- [ ] Other (specify):

Foundation Walls: (Check box for all that apply)

- [ ] Poured Concrete
- [X] Block
- [ ] Stone
- [ ] Other (specify):

Does the basement or crawl space have a moisture problem - dampness? (Check only one)

- [X] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [ ] No

Is the basement or crawl space ever wet - flooded? (Check only one)

- [ ] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [X] Yes, rarely (less than 1 time/year)
- [ ] No

Building Address: 15710 Prospect Date: 8/29/16

Basement or Crawl Space Details Continued: (if applicable)

Does the basement have any of the following? (Check all that apply)

- [ ] Floor cracks
- [ ] Wall cracks
- [ ] Floor Drain
- [X] Sump pump
- [ ] Other hole / opening in floor (describe):

Is the sump pump used? (Yes) / No Depth of sump? ____ ft Where does the sump pump drain? lawn

Describe ventilation of crawl space: ____

Description of ground cover outside of building: [ ] Grass [ ] Concrete [ ] Asphalt [ ] Other: ____

Heating & Ventilation Systems

Heating System - Fuel Type: (Check box for all that apply)

- [ ] Natural Gas
- [ ] Electric
- [ ] Coal
- [ ] Fuel Oil
- [ ] Wood
- [X] Other (specify): pellet stove

Heating - Conveyance System: (Check box for all that apply)

- [ ] Forced Hot Air
- [ ] Electric Baseboard
- [ ] Wood Stove
- [ ] Fireplace
- [ ] Forced Hot Water
- [ ] Hot Water Radiation
- [ ] Heat Pump
- [ ] Kerosene Heater
- [ ] Other (specify): None

Type of Ventilation System: (Check box for all that apply)

- [ ] Central air handler / blower
- [ ] Mechanical / ceiling fans
- [ ] Bathroom ventilation fans
- [ ] Air-to-air heat exchanger
- [ ] Kitchen range hood fan
- [X] Other (specify): Window AC unit and fans

Does the Residence have Air Conditioning: (Check box for all that apply)

- [ ] Central Air Conditioning
- [X] Window Air Conditioners
- [ ] Other (specify): ____

Describe the current operating conditions of the HVAC system: AC is off, fans on, doors open

Miscellaneous Information

Does the Residence have any of the following?

Septic System? (Yes) / Yes (but not used) / No Irrigation / Private Well? Private Well

Existing subsurface depressurization (radon) system in place? Yes / (No) Is it running? Yes / No

Is there standing water outside the residence (pond, ditch, swale)? Yes / (No) If so, describe: ____

Has the residence been retrofitted / weatherized with any of the following? (Check box for all that apply)

- [X] Insulation
- [ ] Storm Windows
- [ ] Energy-efficient windows
- [ ] Other (specify): ____

Does the building have an attached garage? Yes / (No) If so, is a car usually parked in the garage? Yes / No

Chemicals

Have any pesticides / herbicides been applied around the building foundation or in the yard / gardens? (Yes) / No

If so, when - and which chemicals? Bee Spray

Has the residence had a pesticide treatment inside? Yes / (No) When / by whom? ____

Do the occupants of the building have their clothes dry-cleaned? Yes / (No)

When were dry-cleaned clothes last brought into the building? ____

Have the occupants ever noticed any unusual odors in the building? Yes / (No)

Describe (with location): ____

Building Address: 15710 Prospect Date: 8/29/16

Miscellaneous Information Continued:

Have there been any known spills of a chemical immediately outside or inside the building? Yes (No)

Describe (with location):

Do any of the occupants smoke inside the building? Yes (No) How often?

Do any of the occupants use solvents at work? Yes (No) Are their clothes washed at home? Yes / No

If so, when - and what rooms?

Within the last 6 months, has there been any painting or remodeling in the residence? (Yes) / No If so, when 3 weeks ago

What rooms, and what specifically was done? Craft room, paint, walls, insulation

Within the last 6 months, has any new carpeting been installed? Yes (No) Have the carpets or rugs been cleaned? Yes (No)

If so, when, what rooms, and what cleaners?

Consumer Products Inventory

Check consumer products that are present in the residence.

		Storage Location	Frequency of Usage	Date of Last Use
[X]	Paint or Wood Finishes (spray or can)	craft paint in kitchen		
[ ]	Paint stripper / remover / thinner			
[X]	Solvent cleaners (e.g.. spray-on oven cleaner)	bathroom & bedroom		
[X]	Metal degreaser / cleaner	bathroom & bedroom		
[ ]	Gasoline / diesel fuel			
[X]	Glues or adhesives (super glue, etc.)			
[X]	Air fresheners & scented candles	various rooms		
[X]	Laundry / carpet spot removers	bedroom closet		
[X]	Pesticides / insecticides	bedroom closet		
[X]	Nail polish remover (acetone)	bathroom		
[X]	Aerosols (deodorizers, polish, cleaners)			
[ ]	Other:			
[ ]	Other:			
[ ]	Other:			

Describe any products that are containerized during sampling event:

Removed RLR Homeowner agreed to move several cleaning supplies (including chlorox wipes, etc)

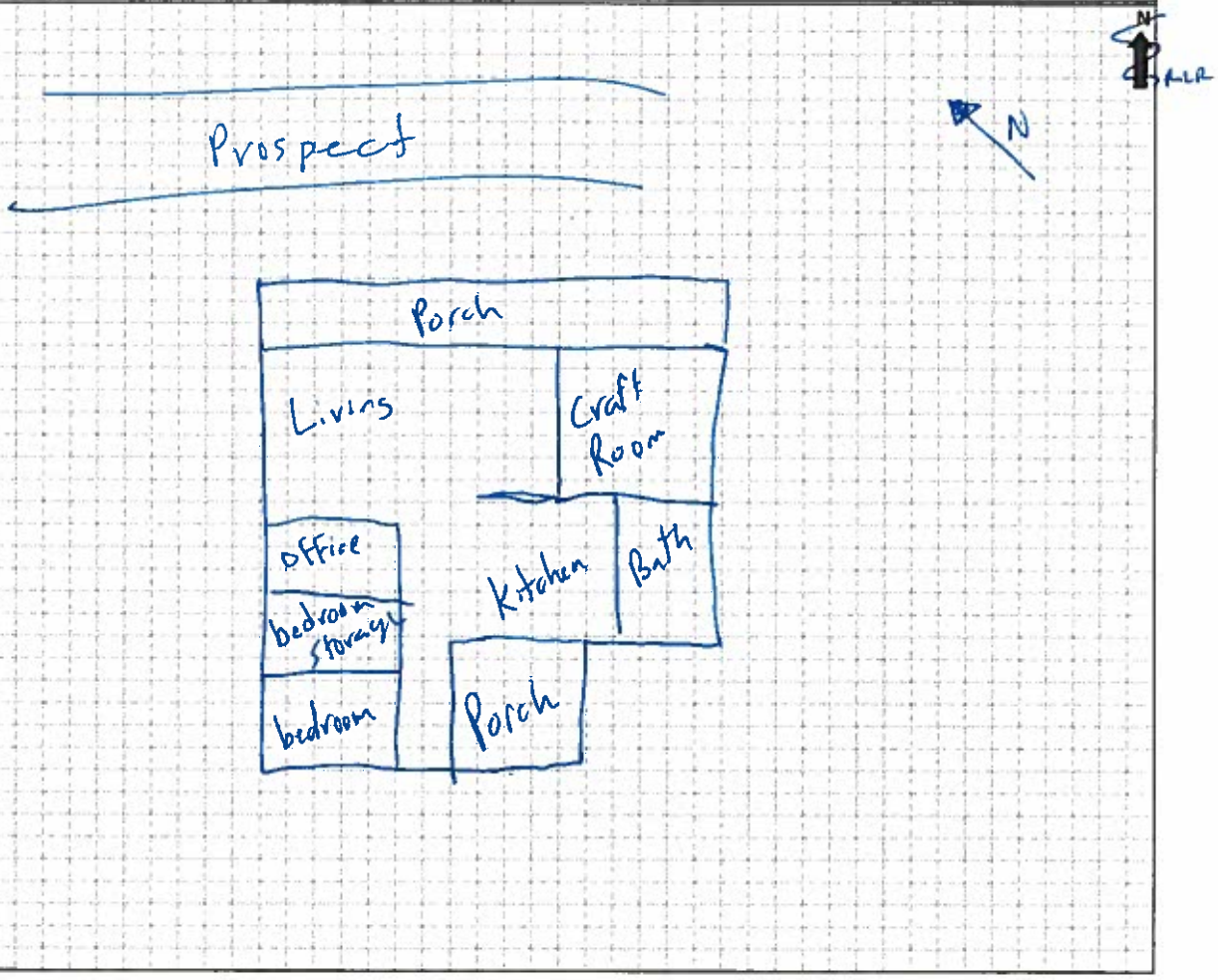
Provide any additional information that is provided by interviewee:

Building Address: 15710 Prospect Date: 8/29/16

Building Sketch

Provide sketch of floors in house, including the following information:

- Street (sidewalk, patios, driveway, distance to house)
- Location of heating and cooling systems, including fireplace
- General location of doors and windows
- Primary chemical storage location(s)
- General orientation of garage and main rooms



Post Sampling Review

Date Noted: _____ **Sampling Team:** _____

Has any information changed during the sampling event?

Did windows and doors remain closed? _____

Was any dry cleaning brought home? _____

Were any of the consumer products discussed yesterday used in the last 24-hours? _____

Were any of the containerized products opened? _____

Notes / other information observed post-sampling: _____

Building Survey - Indoor Air Sampling

Project Information — Page 1 of 4

Project Name: UPRR Freeman
Project #: 661508
Survey Completed By: Ben Thompson
Date: 9/9/2016
Building Address: 15809 Prospect
Residence ID:

Resident and Contact Information

Name of Occupant: Beau Davey
Owner / Tenant / Other:
Occupant Phone #s: Home: Work: Cell: 509-998-7179
Duration at Current Residence: 9 years
Best Time To Call / Visit:
Number of Building Occupants: Children (list ages): 2 → 8, 6 years old Adults: 2
(If Rental) Property Owner Name: *Owner Phone #s:* *Home:*
Owner Address: *Work:*
Name of Interviewee for Building Survey: Jessica
Notes:

Building Construction Characteristics

Building Type: (Check box for all that apply)

- [x] Single Family Residential
- [ ] Multi Family Residential
- [ ] Commercial
- [ ] Ranch
- [ ] Two-story
- [ ] Other (specify):
- [ ] Split Level
- [ ] Tri Level
- [ ] Duplex (# of other half of duplex):
- [ ] Apartment (# of units in Building):

Describe Building: (General Description, Construction Materials, etc.)

Approximate Age: early 1900 years **Approximate Area:** Total Living Space: 800 sq. ft. First Floor: 800 sq. ft.

Floors: # Floors at or above grade: 1

Which floors of the residence are utilized as living space / occupied? Main floor

Foundation Type:

Crawl Space: Yes / (No)
Slab on Grade: Yes / (No)
Basement: (Yes) / No

Foundation Description: (Split Foundation or Multiple Types)

Slab & Crawl Space Construction:

Basement or Crawl Space Details: (if applicable)

Finished Basement: Yes / (No) Basement Finished When: Approximate Area: 300 sq. ft.

Basement or Crawl Space Floor: (Check box for all that apply)

- [x] Concrete
- [ ] Dirt
- [ ] Floating (built on top of actual floor)
- [ ] Other (specify):

Foundation Walls: (Check box for all that apply)

- [ ] Poured Concrete
- [x] Block
- [ ] Stone
- [ ] Other (specify):

Does the basement or crawl space have a moisture problem - dampness? (Check only one)

- [x] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [ ] No

standing water in the corners when it rains

Is the basement or crawl space ever wet - flooded? (Check only one)

- [ ] Yes, frequently (3 or more times/year)
- [ ] Yes, occasionally (1-2 times/year)
- [ ] Yes, rarely (less than 1 time/year)
- [x] No

Building Address: 15809 Prospect Date: 9/9/16

Basement or Crawl Space Details Continued: (if applicable)

Does the basement have any of the following? (Check all that apply)

- [x] Floor cracks
- [ ] Wall cracks
- [ ] Floor Drain
- [ ] Sump pump (No)
- [ ] Other hole / opening in floor (describe): Drain, plumbing penetration

Is the sump pump used? Yes / (No) Depth of sump? ft Where does the sump pump drain?

Describe ventilation of crawl space: cracks in foundation, small window

Description of ground cover outside of building: [x] Grass [ ] Concrete [ ] Asphalt [ ] Other:

Heating & Ventilation Systems

Heating System - Fuel Type: (Check box for all that apply)

- [ ] Natural Gas
- [x] Electric
- [ ] Coal
- [ ] Fuel Oil
- [ ] Wood
- [ ] Other (specify):

Heating - Conveyance System: (Check box for all that apply)

- [ ] Forced Hot Air
- [x] Electric Baseboard
- [ ] Wood Stove
- [ ] Fireplace
- [ ] Forced Hot Water
- [ ] Hot Water Radiation
- [ ] Heat Pump
- [ ] Kerosene Heater
- [ ] Other (specify):

Type of Ventilation System: (Check box for all that apply)

- [ ] Central air handler / blower
- [ ] Mechanical / ceiling fans
- [ ] Bathroom ventilation fans
- [ ] Air-to-air heat exchanger
- [ ] Kitchen range hood fan
- [ ] Other (specify): None

Does the Residence have Air Conditioning: (Check box for all that apply)

- [ ] Central Air Conditioning
- [x] Window Air Conditioners 1 unit
- [ ] Other (specify):

Describe the current operating conditions of the HVAC system:

Miscellaneous Information

Does the Residence have any of the following?

Septic System? (Yes) / Yes (but not used) / No Irrigation / Private Well? Yes

Existing subsurface depressurization (radon) system in place? Yes / (No) Is it running? Yes / (No)

Is there standing water outside the residence (pond, ditch, swale)? Yes / (No) If so, describe:

Has the residence been retrofitted / weatherized with any of the following? (Check box for all that apply) No

- [ ] Insulation
- [ ] Storm Windows
- [ ] Energy-efficient windows
- [ ] Other (specify):

Does the building have an attached garage? Yes / (No) If so, is a car usually parked in the garage? NA Yes / No

Chemicals

Have any pesticides / herbicides been applied around the building foundation or in the yard / gardens? Yes / (No)

If so, when - and which chemicals?

Has the residence had a pesticide treatment inside? Yes / (No) When / by whom?

Do the occupants of the building have their clothes dry-cleaned? Yes / (No)

When were dry-cleaned clothes last brought into the building?

Have the occupants ever noticed any unusual odors in the building? Yes / (No)

Describe (with location):

Building Address: 15809 Prospect Date: 9/9/16

Miscellaneous Information Continued:

Have there been any known spills of a chemical immediately outside or inside the building? Yes / (No)

Describe (with location):

Do any of the occupants smoke inside the building? Yes / (No) How often?

Do any of the occupants use solvents at work? Yes / (No) Are their clothes washed at home? Yes / No

If so, when - and what rooms?

Within the last 6 months, has there been any painting or remodeling in the residence? Yes / (No) If so, when

What rooms, and what specifically was done?

Within the last 6 months, has any new carpeting been installed? Yes / (No) Have the carpets or rugs been cleaned? Yes / (No)

If so, when, what rooms, and what cleaners?

Consumer Products Inventory

Check consumer products that are present in the residence.

		Storage Location	Frequency of Usage	Date of Last Use
☐	Paint or Wood Finishes (spray or can)			
☐	Paint stripper / remover / thinner			
☐	Solvent cleaners (e.g.. spray-on oven cleaner)			
☐	Metal degreaser / cleaner			
☐	Gasoline / diesel fuel			
☐	Glues or adhesives (super glue, etc.)			
☐	Air fresheners & scented candles			
☒	Laundry / carpet spot removers	glade carpet freshner		
☒	Pesticides / Insecticides	raid		
☐	Nail polish remover (acetone)			
☐	Aerosols (deodorizers, polish, cleaners)			
☒	Other: General cleaners	windex	oxiclean	
☐	Other:	Dawn	pine sol	
☐	Other:	ultradelux	glade carpet freshner	

All under kitchen sink used periodically

Describe any products that are containerized during sampling event:

Provide any additional information that is provided by interviewee:

No water useage at all. only bottled water

Building Address: 15809 Prospect Date: 9/9/16

Building Sketch

Provide sketch of floors in house, including the following information:

- Street (sidewalk, patios, driveway, distance to house)
- Location of heating and cooling systems, including fireplace
- General location of doors and windows
- Primary chemical storage location(s)
- General orientation of garage and main rooms

N

See attached

Post Sampling Review

Date Noted: ..... **Sampling Team:** .....

Has any information changed during the sampling event?

Did windows and doors remain closed? .....

Was any dry cleaning brought home? .....

Were any of the consumer products discussed yesterday used in the last 24-hours? .....

Were any of the containerized products opened? .....

Notes / other information observed post-sampling: .....

.....

.....

CH2MHILL

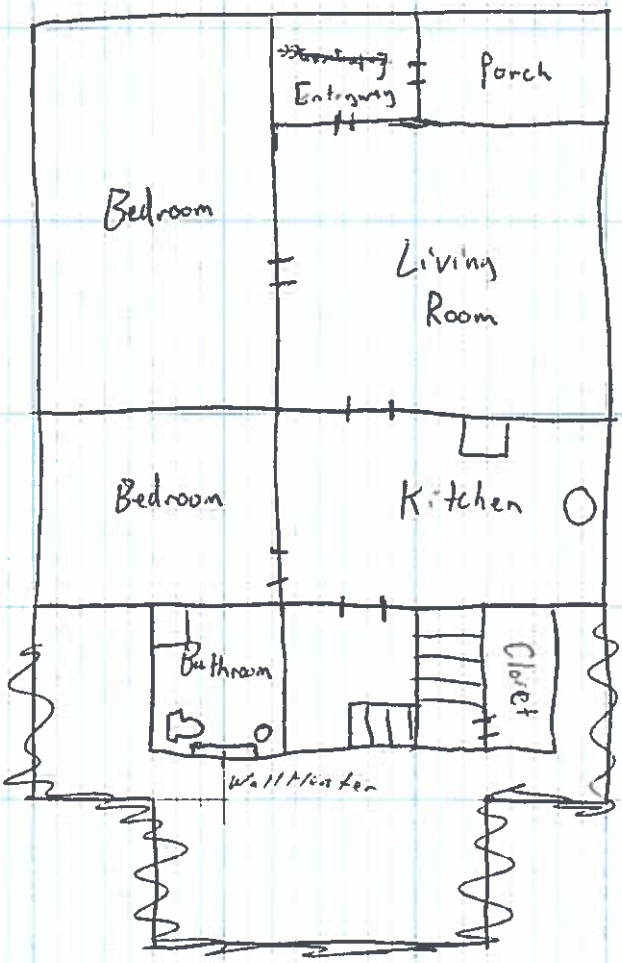
SUBJECT 15809 Prospect

BY

SHEET NO. ____ of ____ DATE 9/9/16

PROJECT NO.

First Floor



O - Sink

⇨ - Toilet

N

CH2MHILL

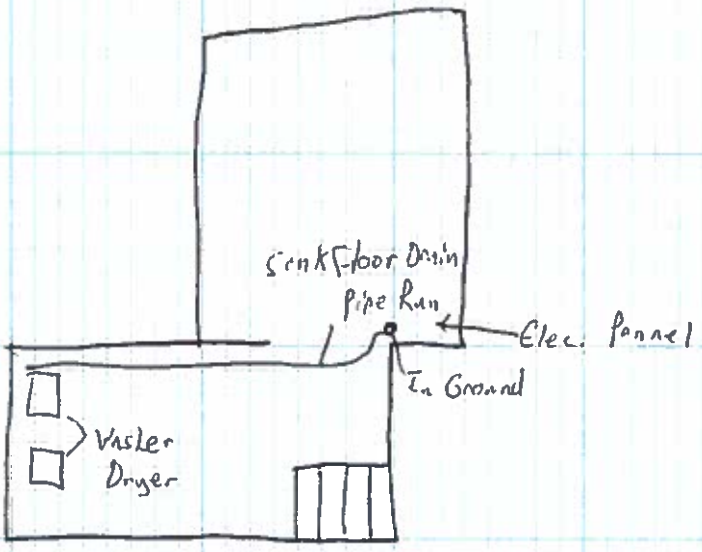
SUBJECT 15809 Prospect

BY

SHEET NO. of DATE 9/9/16

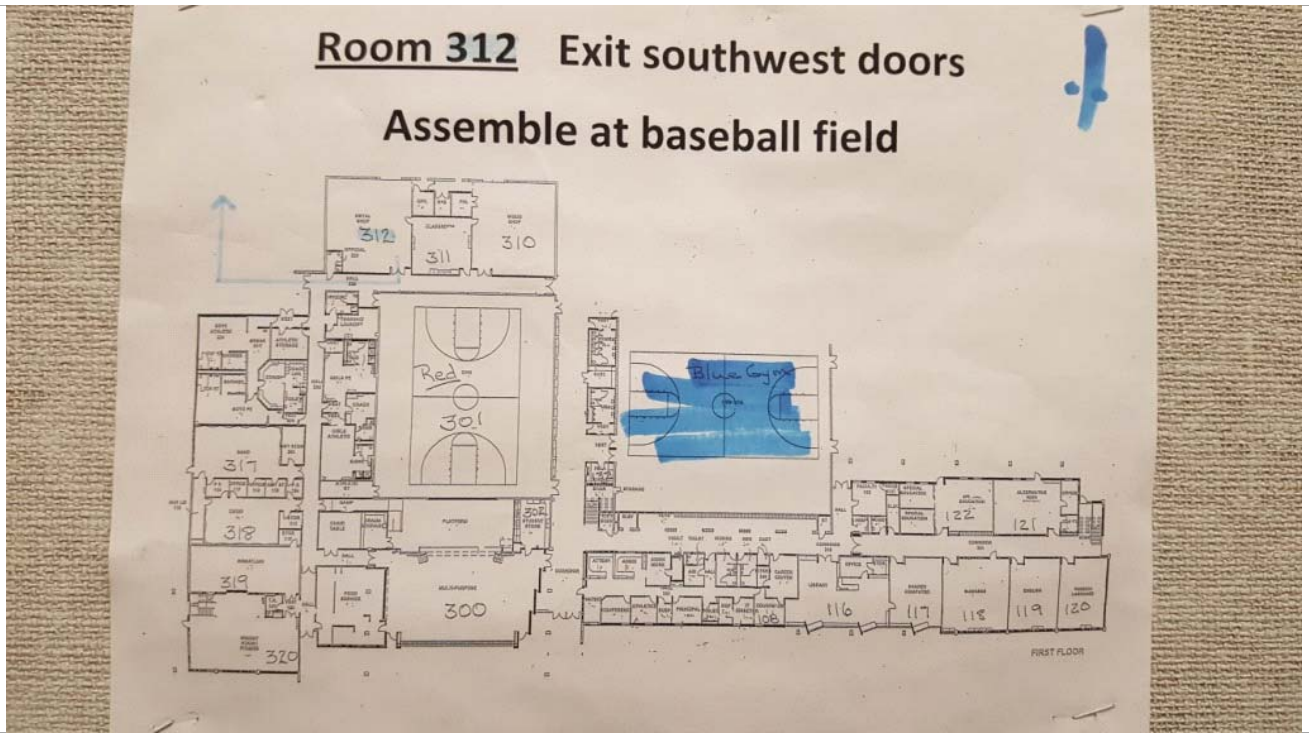
PROJECT NO.

Basemet

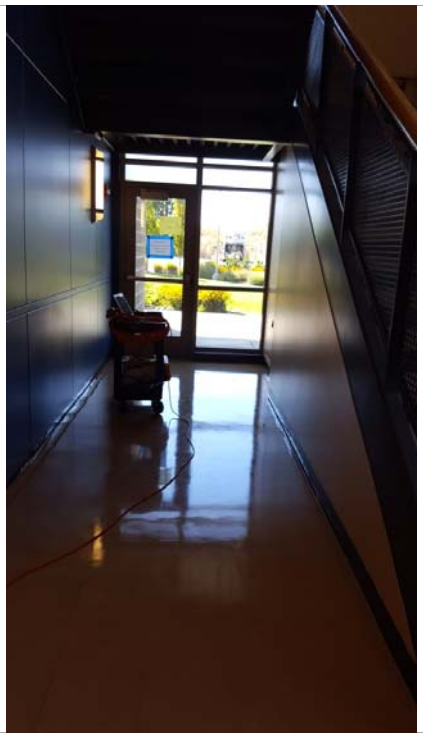


N

File Name:	20160824_173933	Date Taken:	8/24/2016	View Direction:	
Sample Location:	Elementary School Gym Closet				
Comments	Hapsite samples ELEM-Sink2, ELEM-Sink2H, ELEM-Sink2C				



File Name:	20160825_150157	Date Taken:	8/25/2016	View Direction:	
Sample Location:	High School, Room 312				
Comments	Map showing room numbers				



File Name:	20160825_154235	Date Taken:	8/25/2016	View Direction:	west
Sample Location:	High School, North Hallway				
Comments	Hapsite sample HS-NENT1 and HS-NENT2				

File Name:	20160825_155502	Date Taken:	8/25/2016	View Direction:	
Sample Location:	High School, Hallway north of Gym				
Comments	Paint can				

File Name:	20160825_183044	Date Taken:	8/25/2016	View Direction:	
Sample Location:	High School, Office, Southwest cabinet				
Comments	Chlorox Wipes				

File Name:	20160828_095213	Date Taken:	8/28/2016	View Direction:	
Sample Location:	Elementary School, Office				
Comments	Summa canister sample location ELEM-OFFICE1-S				

File Name:	20160828_095613	**Date Taken:**	8/28/2016	**View Direction:**	southwest
Sample Location:	Between Elementary and Middle Shools				
Comments	Summa canister sample location MS-OA1-S				

File Name:	20160828_100106	**Date Taken:**	8/28/2016	**View Direction:**	northwest
Sample Location:	High School, Office				
Comments	Summa canister sample location HS-OFFICE1-S				

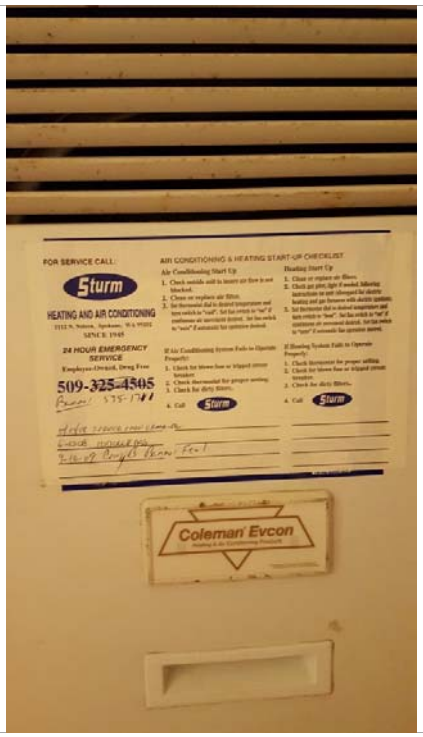
File Name:	20160829_133105	**Date Taken:**	8/29/2016	**View Direction:**	
Sample Location:	15710 Prospect, Metal cabinet in 2nd bedroom				
Comments					

File Name:	20160829_133110	**Date Taken:**	8/29/2016	**View Direction:**	
Sample Location:	15710 Prospect, Metal cabinet in 2nd bedroom				
Comments					

File Name:	20160830_123203	Date Taken:	8/30/2016	View Direction:	west
Sample Location:	15710 Prospect, Yard				
Comments	Summa canister sample location OA1-15710P				

File Name:	20160830_123730	Date Taken:	8/30/2016	View Direction:	south
Sample Location:	15710 Prospect, Living Room				
Comments	Summa canister sample location IA1-15710P				

File Name:	20160830_124435	Date Taken:	8/30/2016	View Direction:	northwest
Sample Location:	15608 Prospect, Yard				
Comments	Summa canister sample location OA1-15608P				



File Name:	20160907_143805	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, HVAC				
Comments	Label				

File Name:	20160907_143829	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Bathroom				
Comments	Shower				

File Name:	20160907_143836	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Bathroom				
Comments	Ceiling Fan				

File Name:	20160907_143907	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Bathroom				
Comments	Hole in Wall; Toilet				

File Name:	20160907_143917	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Bathroom				
Comments	Ceiling Fan				

File Name:	20160907_144128	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Kitchen				
Comments	Floor Vent and Return Air				

File Name:	20160907_144135	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Kitchen				
Comments	Floor Repair				

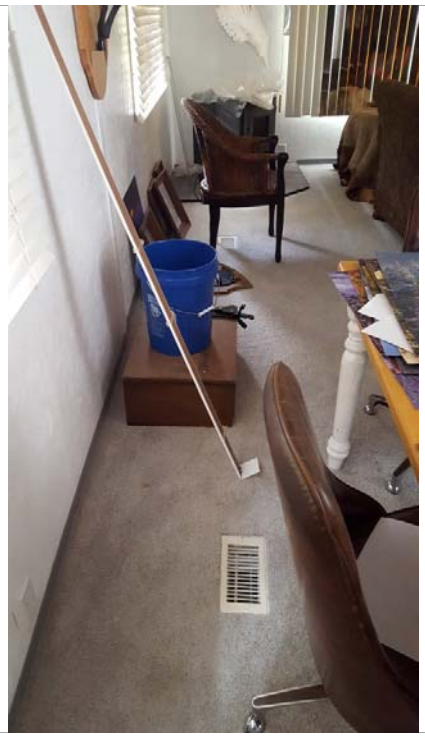
File Name:	20160907_144855	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Living Room				
Comments	Fireplace and Window				

File Name:	20160907_144940	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Bathroom				
Comments	Floor Vent				

File Name:	20160907_145012	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Laundry Closet				
Comments	Water Hookups				

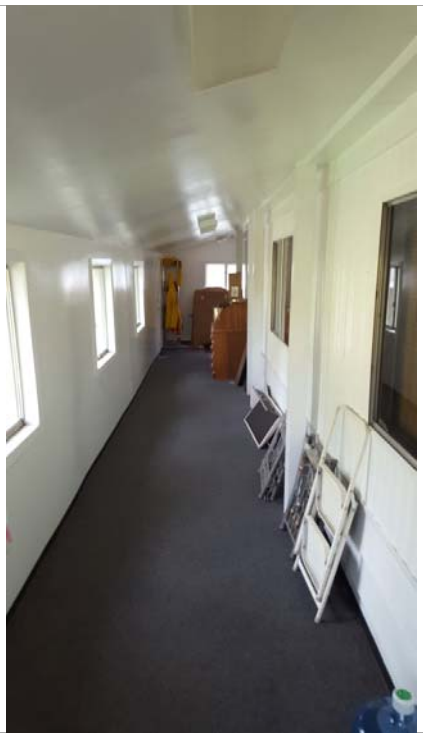
File Name:	20160907_145020	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Laundry Closet				
Comments	Floor Vent				

File Name:	20160907_145031	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Bathroom				
Comments	Hole in Wall; Toilet				



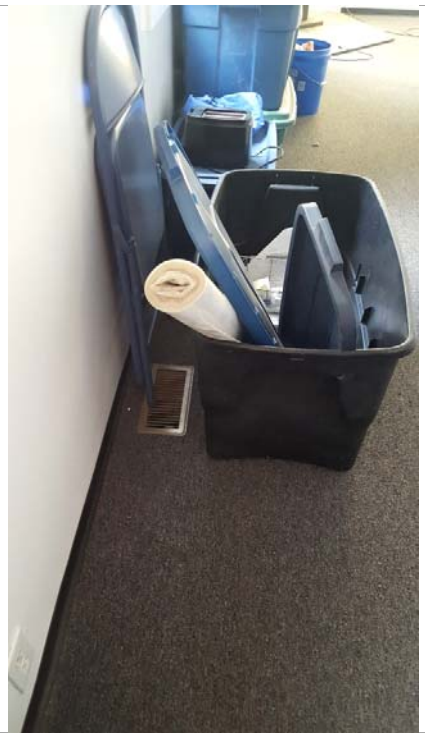
File Name:	20160907_145117	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Living Room				
Comments	Floor Vent				

File Name:	20160907_145132	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Living Room				
Comments	Fireplace and Window				

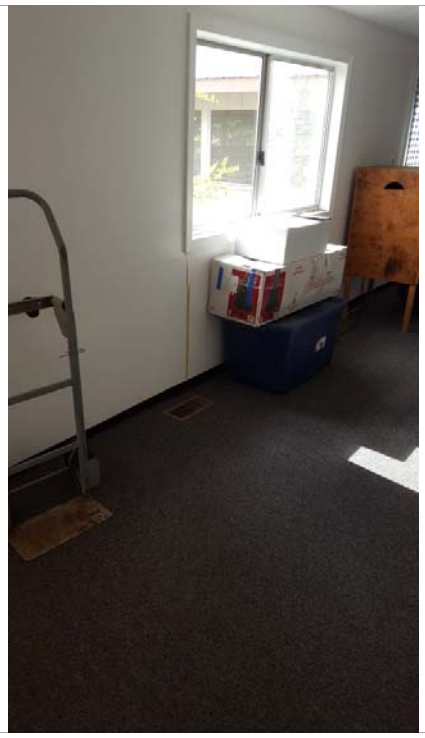


File Name:	20160907_145213	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Breezeway				
Comments	Windows				

File Name:	20160907_145235	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Breezeway				
Comments	Windows				



File Name:	20160907_145243	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Breezeway				
Comments	Floor Vent				



File Name:	20160907_145251	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Breezeway				
Comments	Floor Vent and Window				

File Name:	20160907_145304	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Breezeway				
Comments	Floor Vent and Sliding Glass Door				

File Name:	20160907_145326	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Breezeway				
Comments	Sliding Glass Door to Enclosed Patio				

File Name:	20160907_145329	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Breezeway				
Comments	Sliding Glass Door to Enclosed Patio				

File Name:	20160907_151348	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Laundry Closet				
Comments	Adhesive				

File Name:	20160907_151354	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Laundry Closet				
Comments	Adhesive				

File Name:	20160907_151939	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outside Breezeway				
Comments	Crawlspace Air Mover (Not in Use)				

File Name:	20160907_152016	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outside Breezeway				
Comments	Crawlspace Access Door (Closed)				

File Name:	20160907_152019	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outside Breezeway				
Comments	Enclosed Patio				

File Name:	20160907_152044	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Water Treatment Shed				

File Name:	20160907_152049	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Water Treatment Shed				

File Name:	20160907_152057	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Propane Tank				

File Name:	20160907_152103	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments					

File Name:	20160907_152237	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outside Breezeway				
Comments	Crawlspace Access Door (Open)				

File Name:	20160907_152414	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Kitchen				

File Name:	20160907_152418	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Living Room				

File Name:	20160907_152436	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Living Room				

File Name:	20160907_155959	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Water Treatment Shed				
Comments	Digital Panel				

File Name:	20160907_160002	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Water Treatment Shed				
Comments	Digital Panel				

File Name:	20160907_160008	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Water Treatment Shed				
Comments	Digital Panel				

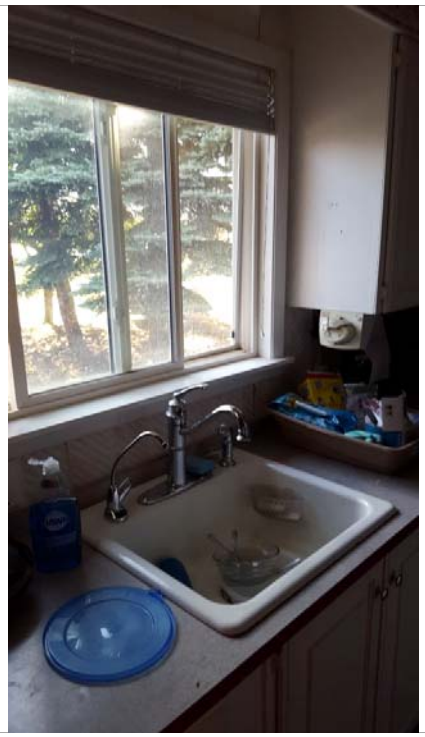
File Name:	20160907_160013	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Water Treatment Shed				
Comments	Water Treatment System				

File Name:	20160907_160032	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Outdoors				
Comments	Water Treatment Shed				

File Name:	20160907_160036	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect Outdoors				
Comments	Water Treatment Shed				

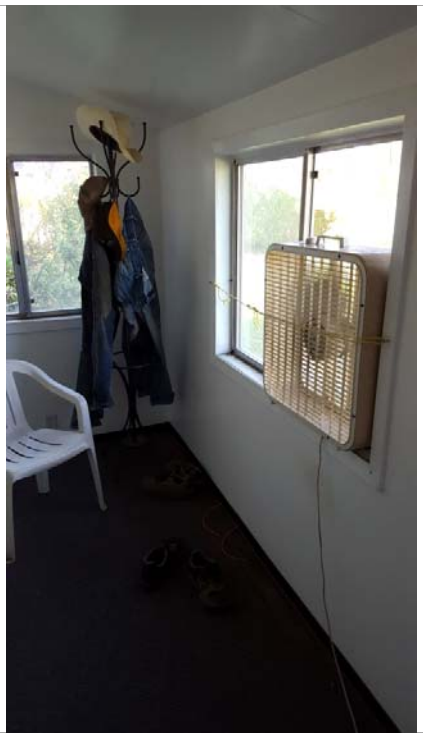
File Name:	20160907_160048	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15608 Prospect, Outdoors				
Comments	Water Treatment Shed; Electrical				

File Name:	20160907_160052	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Outdoors				
Comments	Water Treatment Shed; Electrical				



File Name:	20160907_160849	**Date Taken:**	9/10/2016	**View Direction:**	
Sample Location:	15608 Prospect (Art Randall Residence), Kitchen				
Comments	Sink and Window (Open at End of Sample Duration)				

File Name:	20160907_161432	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15608 Prospect, Outdoors				
Comments	Address				

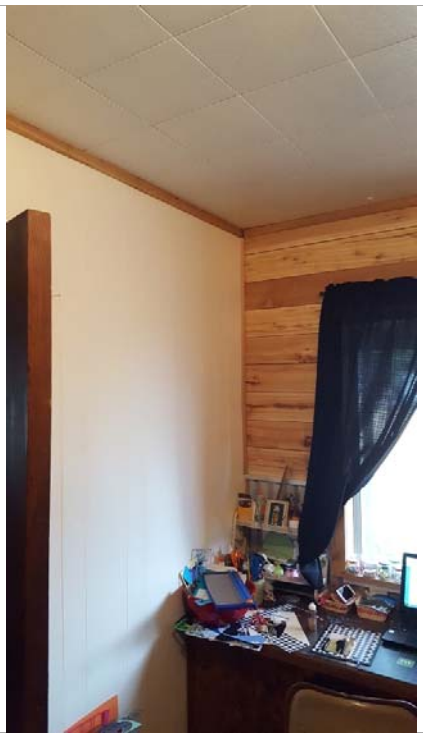


File Name:	20160907_160823	**Date Taken:**	9/10/2016	**View Direction:**	
Sample Location:	15608 Prospect (Art Randall Residence), Breezeway				
Comments	Box Fan in Window (On at End of Sample Duration)				

File Name:	20160907_170350	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Living Room				
Comments	Fireplace				

File Name:	20160907_170403	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Living Room				
Comments	Fireplace and Kitchen				

File Name:	20160907_170419	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15710 Prospect, Office				
Comments	Window and Ceiling				

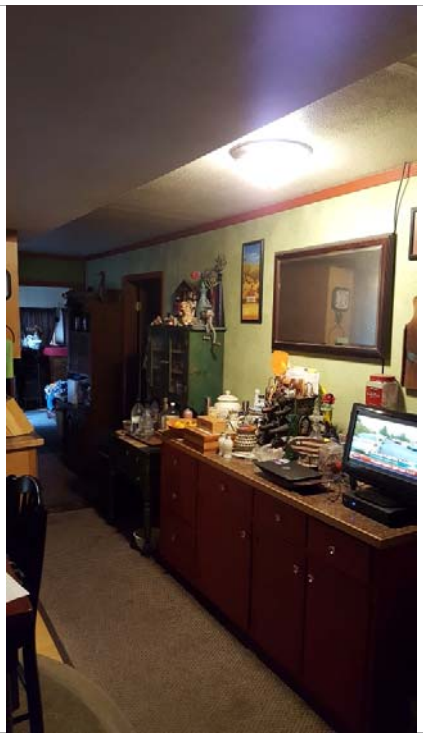


File Name:	20160907_170425	**Date Taken:**	9/7/2016	**View Direction:**	
Sample Location:	15710 Prospect, Office				
Comments	Window and Ceiling				

File Name:	20160907_170433	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Office				
Comments	Closet (Closed)				

File Name:	20160907_170442	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Office				
Comments	Closet (Open)				

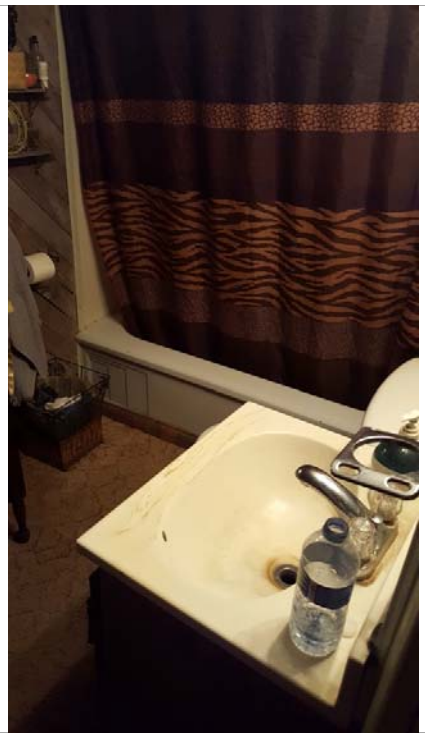
File Name:	20160907_170452	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Office				
Comments	Electrical Panel Cabinet				



File Name:	20160907_170518	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect , Kitchen				
Comments	Hallway				

File Name:	20160907_170525	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect , Kitchen				
Comments	Oven and Fridge				

File Name:	20160907_170538	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Bathroom				
Comments	Shower				



File Name:	20160907_170541	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Bathroom				
Comments	Sink and Shower				

File Name:	20160907_170556	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Bathroom				
Comments	Closet				

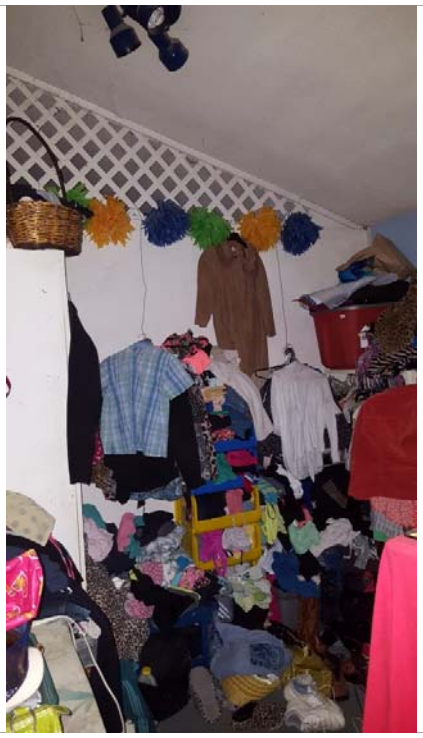
File Name:	20160907_170607	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Bathroom				
Comments	Toilet				

File Name:	20160907_170622	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Kitchen				
Comments	Sink				

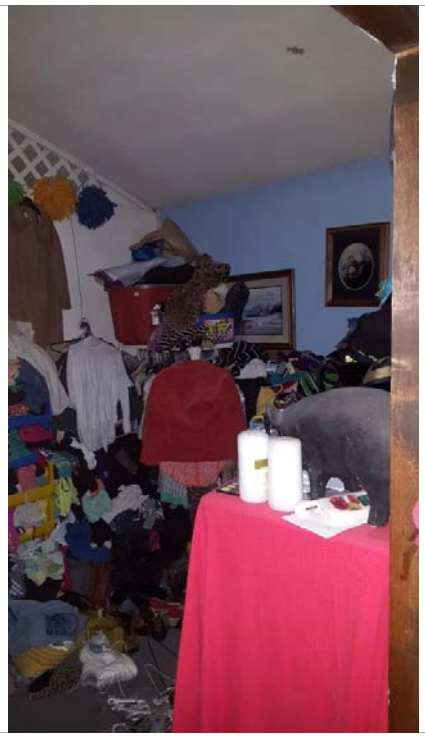
File Name:	20160907_170637	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Ceiling and Window				

File Name:	20160907_170641	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Ceiling				

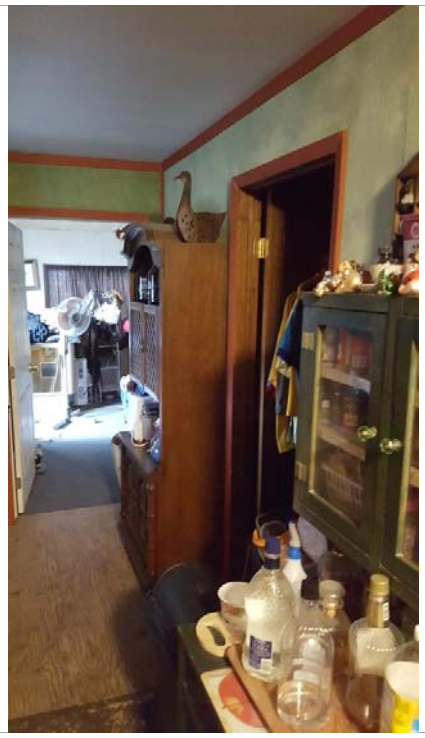
File Name:	20160907_170702	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Doorway				



File Name:	20160907_170713	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Wall/Breezeway and Ceiling				



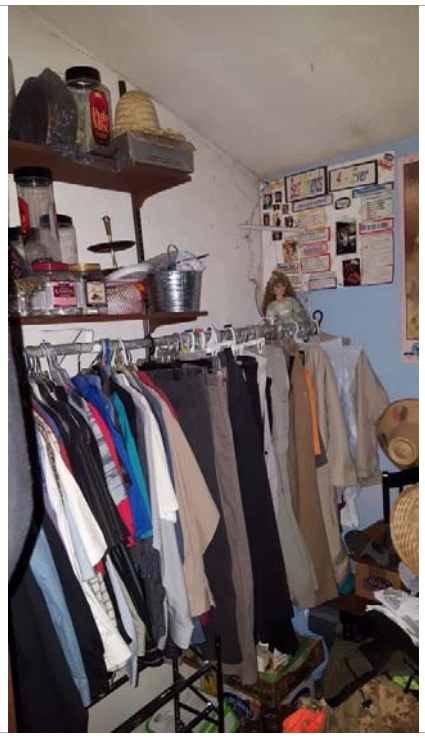
File Name:	20160907_170719	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Wall/Breezeway and Ceiling				



File Name:	20160907_170839	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Hallway				
Comments	Hallway to Laundry and Bedroom				

File Name:	20160907_170900	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Hallway				
Comments	Laundry Room Wall				

File Name:	20160907_170912	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Wall/Breezeway and Ceiling				



File Name:	20160907_170921	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Storage Room				
Comments	Wall and Ceiling				

File Name:	20160907_171340	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Outdoor				
Comments	Front Garden				

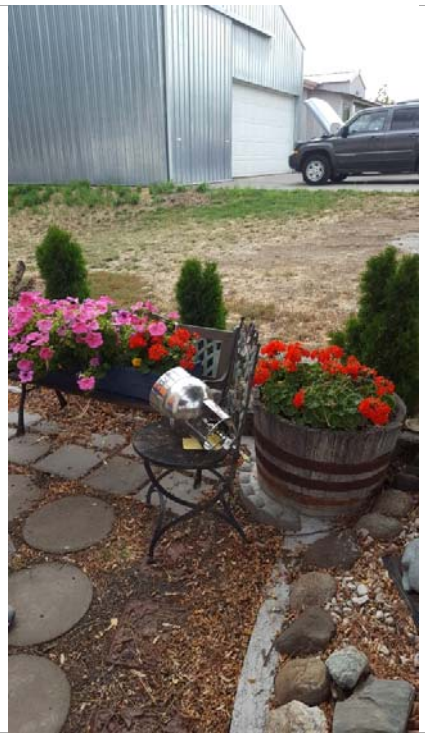
File Name:	20160907_171503	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Outdoor				
Comments	Office				

File Name:	20160907_171518	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Outdoor				
Comments	Storage Shed				

File Name:	20160907_171528	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Outdoor				
Comments	Bedroom				

File Name:	20160907_171538	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Outdoor				
Comments	Bedroom				

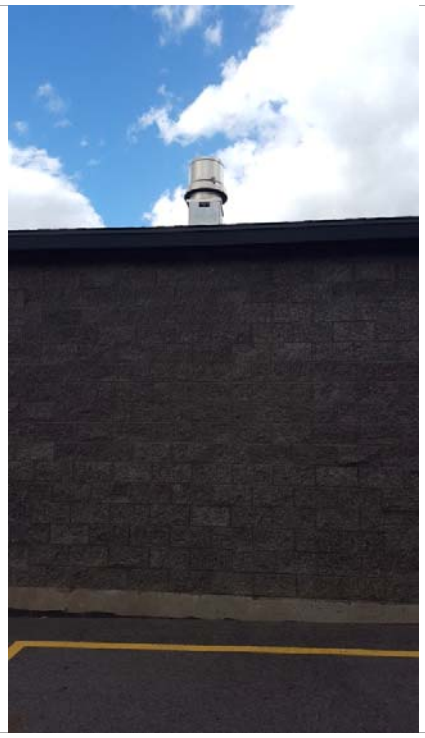
File Name:	20160907_180507	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, SUMMA Canister Location				
Comments	IA1-15710P				



File Name:	20160907_180709	Date Taken:	9/7/2016	View Direction:	
Sample Location:	15710 Prospect, Outdoor				
Comments	OA1-15710P				

File Name:	20160907_154555	Date Taken:	9/8/2016	View Direction:	
Sample Location:	School				
Comments	Air Sparge System Building				

File Name:	20160907_154559	Date Taken:	9/8/2016	View Direction:	
Sample Location:	School				
Comments	Water Holding Tanks				



File Name:	20160907_154700	Date Taken:	9/8/2016	View Direction:	
Sample Location:	School				
Comments	Air Sparge System Building Effluent Stack				

File Name:	20160907_155628	Date Taken:	9/8/2016	View Direction:	
Sample Location:	UPRR Property				
Comments	Storage Silos				

File Name:	20160907_155637	**Date Taken:**	9/8/2016	**View Direction:**	
Sample Location:	UPRR Property				
Comments	Storage Silos				

File Name:	20160907_160430	**Date Taken:**	9/9/2016	**View Direction:**	
Sample Location:	15809 Prospect, Outdoor				
Comments	Living Room				

File Name:	20160907_160432	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Outdoor				
Comments	Living Room				

File Name:	20160907_160439	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Outdoor				
Comments	Living Room				

File Name:	20160907_160459	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Outdoor				
Comments	Kitchen and Bathroom				

File Name:	20160907_160501	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Outdoor				
Comments	Bathroom				

File Name:	20160907_161756	**Date Taken:**	9/9/2016	**View Direction:**	
Sample Location:	15809 Prospect, Partial Basement				
Comments	Sink Drain Pipe Run				

File Name:	20160907_161800	**Date Taken:**	9/9/2016	**View Direction:**	
Sample Location:	15809 Prospect, Partial Basement				
Comments	Sink Drain Pipe Run				

File Name:	20160907_161806	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Partial Basement				
Comments	Sink Drain Pipe Run				

File Name:	20160907_161812	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Partial Basement				
Comments	Under Living Room and Kitchen				

File Name:	20160907_161816	Date Taken:	9/9/2016	View Direction:	
Sample Location:	15809 Prospect, Partial Basement				
Comments	Water Piping				

File Name:	20160907_181711	Date Taken:	9/9/2016	View Direction:	
Sample Location:	Spokane Office Building				
Comments	OA1-BACK				

File Name:	20160907_181716	Date Taken:	9/9/2016	View Direction:	
Sample Location:	Spokane Office Building				
Comments	OA1-BACK				

Attachment H-2
Background Statistics

Carbon Tetrachloride

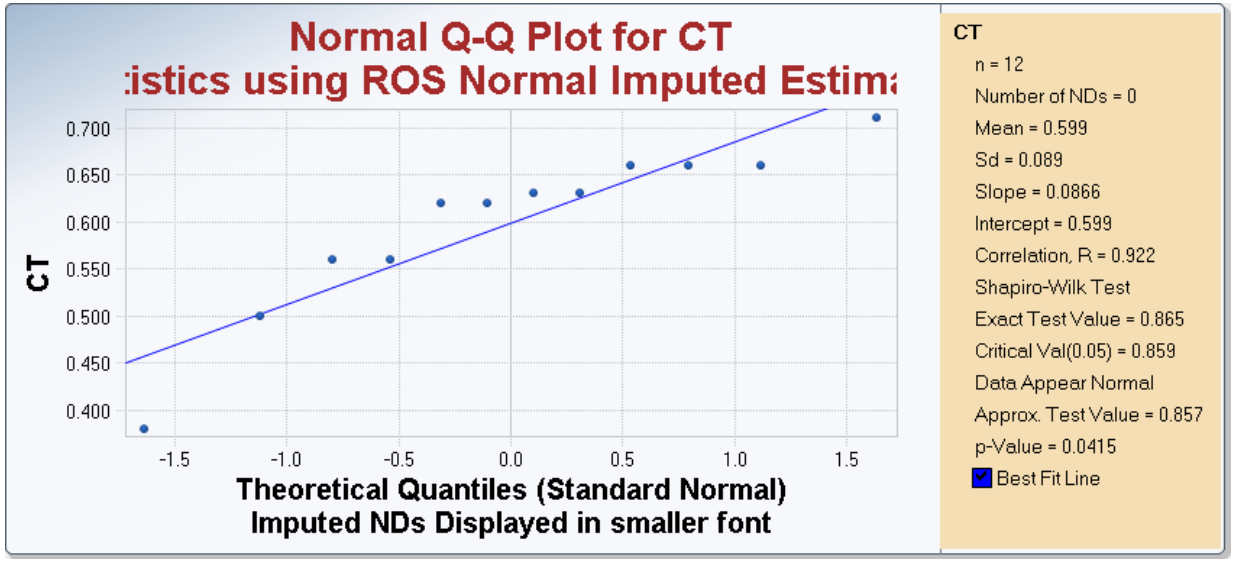
Cleanup Level	Value (ug/m^3)	Notes
Method B (Residential)	0.417	
Ambient Air Background	0.68	Data normally distributed, use 80th percentile per WAC 173-340-709 (3)(d)

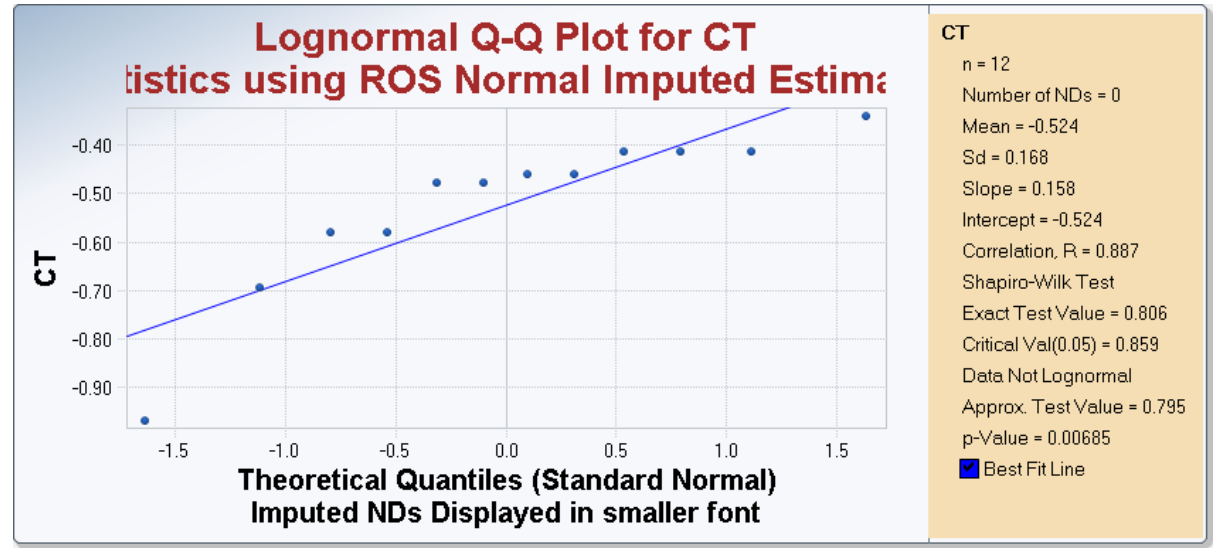
Statistics	
mean	0.599
Standard deviation	0.098
median	0.625
Z value	0.841621
80th percentile	0.681479
4x 50th percentile	2.5

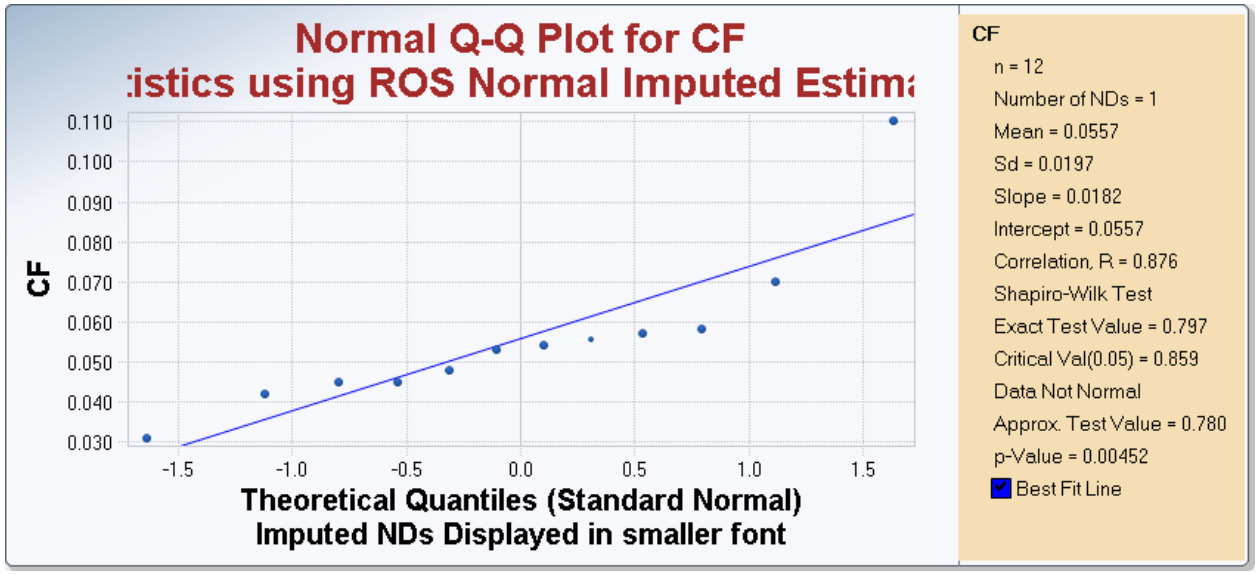
Chloroform

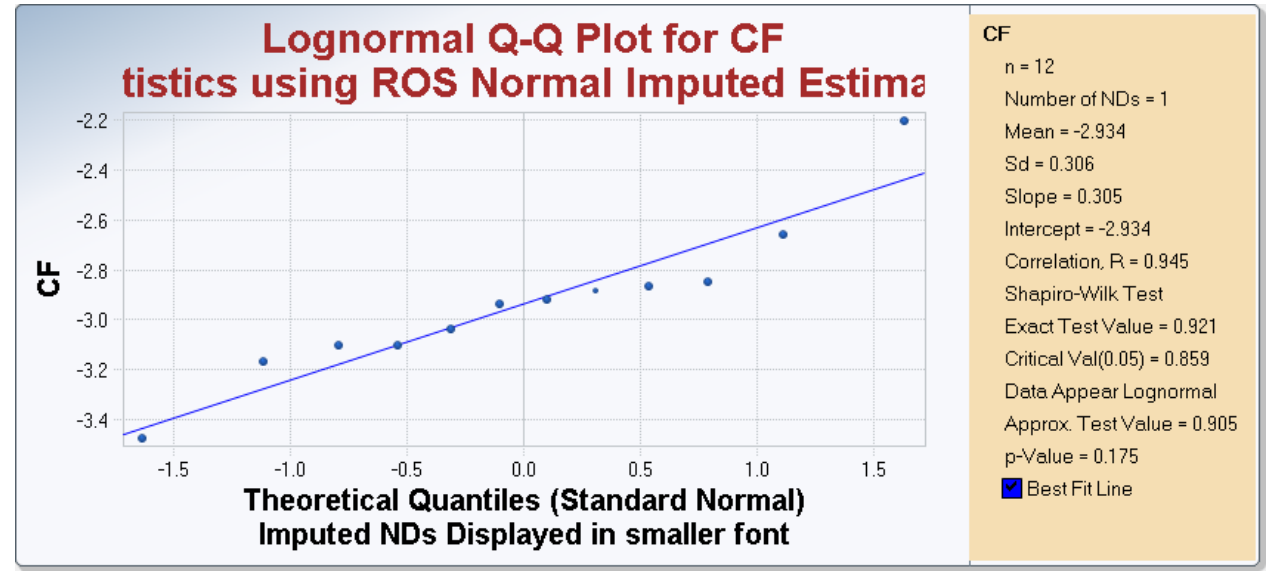
Cleanup Level	Value (ug/m^3)	Notes
Method B (Residential)	0.109	
Ambient Air Background	0.08	Assuming Lognormal Distribution Using Imputed Non-Detects, use 90th percentile

ln mean	-2.938
ln SD	0.306
median	0.053
Z value	1.281552
90th percentile	0.08
4x 50th percentile	0.212


Normal Q-Q Plot for CT
tistics using ROS Normal Imputed Estima
CT
0.700
0.650
0.600
0.550
0.500
0.450
0.400
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Imputed NDs Displayed in smaller font
CT
n = 12
Number of NDs = 0
Mean = 0.599
Sd = 0.089
Slope = 0.0866
Intercept = 0.599
Correlation, R = 0.922
Shapiro-Wilk Test
Exact Test Value = 0.865
Critical Val(0.05) = 0.859
Data Appear Normal
Approx. Test Value = 0.857
p-Value = 0.0415
Best Fit Line


Lognormal Q-Q Plot for CT
tistics using ROS Normal Imputed Estima
CT
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Imputed NDs Displayed in smaller font
CT
n = 12
Number of NDs = 0
Mean = -0.524
Sd = 0.168
Slope = 0.158
Intercept = -0.524
Correlation, R = 0.887
Shapiro-Wilk Test
Exact Test Value = 0.806
Critical Val(0.05) = 0.859
Data Not Lognormal
Approx. Test Value = 0.795
p-Value = 0.00685
Best Fit Line


Normal Q-Q Plot for CF
tistics using ROS Normal Imputed Estima
CF
0.110
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Imputed NDs Displayed in smaller font
CF
n = 12
Number of NDs = 1
Mean = 0.0557
Sd = 0.0197
Slope = 0.0182
Intercept = 0.0557
Correlation, R = 0.876
Shapiro-Wilk Test
Exact Test Value = 0.797
Critical Val(0.05) = 0.859
Data Not Normal
Approx. Test Value = 0.780
p-Value = 0.00452
Best Fit Line


Lognormal Q-Q Plot for CF
tistics using ROS Normal Imputed Estima
CF
-2.2
-2.4
-2.6
-2.8
-3.0
-3.2
-3.4
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
Imputed NDs Displayed in smaller font
CF
n = 12
Number of NDs = 1
Mean = -2.934
Sd = 0.306
Slope = 0.305
Intercept = -2.934
Correlation, R = 0.945
Shapiro-Wilk Test
Exact Test Value = 0.921
Critical Val(0.05) = 0.859
Data Appear Lognormal
Approx. Test Value = 0.905
p-Value = 0.175
Best Fit Line

	A	B	C	D	E	F	G	H	I	J	K	L	M
1				**General Statistics on Uncensored Data**									
2		Date/Time of Computation		6/6/2018 10:49:26 AM									
3		**User Selected Options**											
4		From File		BACKGROUND FOR PROUCL.xls									
5		Full Precision		OFF									
6													
7	**From File: BACKGROUND FOR PROUCL.xls**												
8													
9						**General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method**								
10													
11	**Variable**		**NumObs**	**# Missing**	**Num Ds**	**NumNDs**	**% NDs**	**Min ND**	**Max ND**	**KM Mean**	**KM Var**	**KM SD**	**KM CV**
12	CT		12	0	12	0	0.00%	N/A	N/A	0.599	0.00792	0.089	0.149
13	CF		12	0	11	1	8.33%	0.13	0.13	0.0557	3.8693E-4	0.0197	0.353
14													
15						**General Statistics for Raw Data Sets using Detected Data Only**								
16													
17	**Variable**		**NumObs**	**# Missing**	**Minimum**	**Maximum**	**Mean**	**Median**	**Var**	**SD**	**MAD/0.675**	**Skewness**	**CV**
18	CT		12	0	0.38	0.71	0.599	0.625	0.00792	0.089	0.0519	-1.473	0.149
19	CF		11	0	0.031	0.11	0.0557	0.053	4.2562E-4	0.0206	0.0119	1.978	0.37
20													
21						**Percentiles using all Detects (Ds) and Non-Detects (NDs)**								
22													
23	**Variable**		**NumObs**	**# Missing**	**10%ile**	**20%ile**	**25%ile(Q1)**	**50%ile(Q2)**	**75%ile(Q3)**	**80%ile**	**90%ile**	**95%ile**	**99%ile**
24	CT		12	0	0.506	0.56	0.56	0.625	0.66	0.66	0.66	0.683	0.705
25	CF		12	0	0.0423	0.045	0.045	0.0535	0.061	0.0676	0.106	0.119	0.128

1				Summary Statistics on Censored Log-Transformed Data									
2		Date/Time of Computation		6/6/2018 10:51:52 AM									
3		User Selected Options											
4		From File		BACKGROUND FOR PROUCL.xls									
5		Full Precision		OFF									
6													
7	From File: BACKGROUND FOR PROUCL.xls												
8													
9	General Statistics for Log-Transformed Censored Data Sets (with NDs) using Kaplan Meier Method												
10													
11	Variable		NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
12	CT		12	0	12	0	0.00%	N/A	N/A	0.599	0.00792	0.089	0.149
13	CF		12	0	11	1	8.33%	0.13	0.13	0.0557	3.8693E-4	0.0197	0.353
14													
15	General Statistics for Log-Transformed Data Sets using Detected Data Only												
16													
17	Variable		NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
18	CT		12	0	-0.968	-0.342	-0.524	-0.47	0.0283	0.168	0.0808	-1.872	-0.321
19	CF		11	0	-3.474	-2.207	-2.938	-2.937	0.103	0.321	0.243	0.877	-0.109
20													
21	Percentiles using all Detects (Ds) and Non-Detects (NDs) on Log-Transformed Data												
22													
23	Variable		NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
24	CT		12	0	-0.682	-0.58	-0.58	-0.47	-0.416	-0.416	-0.416	-0.383	-0.351
25	CF		12	0	-3.163	-3.101	-3.101	-2.928	-2.8	-2.697	-2.252	-2.132	-2.059

Attachment H-3
Method B

Sample ID	Sampe Typ	Location	Location Type	Area	Media	Date	Analyte	Result Nati	Concentrat	Qualifier	Detect	D_Concent	Backgroun	Corrected Cc
BKG-NW	N	Northwest background location	background	background	Outdoor air	10/19/2016	Carbon Tetrachloride	0.56	0.56		yes	1	0.68	-0.12
BKG-NE	N	Northeast background location	background	background	Outdoor air	10/19/2016	Carbon Tetrachloride	0.63	0.63		yes	1	0.68	-0.05
BKG-SE	N	Southeast background location	background	background	Outdoor air	10/19/2016	Carbon Tetrachloride	0.62	0.62		yes	1	0.68	-0.06
BKG-SW	N	Southwest background location	background	background	Outdoor air	10/19/2016	Carbon Tetrachloride	0.71	0.71		yes	1	0.68	0.03
BKG-SW (Dup)	FD	Southwest background location	background	background	Outdoor air	10/19/2016	Carbon Tetrachloride						0.68	-0.68
BKG-NW	N	Northwest background location	background	background	Outdoor air	10/19/2016	Chloroform	0.054 J	0.054 J		yes	1	0.08	-0.026
BKG-NE	N	Northeast background location	background	background	Outdoor air	10/19/2016	Chloroform	0.048 J	0.048 J		yes	1	0.08	-0.032
BKG-SE	N	Southeast background location	background	background	Outdoor air	10/19/2016	Chloroform	0.045 J	0.045 J		yes	1	0.08	-0.035
BKG-SW	N	Southwest background location	background	background	Outdoor air	10/19/2016	Chloroform	0.070 J	0.07 J		yes	1	0.08	-0.01
BKG-SW (Dup)	FD	Southwest background location	background	background	Outdoor air	10/19/2016	Chloroform						0.08	-0.08
BKG-NW	N	Northwest background location	background	background	Outdoor air	10/20/2016	Carbon Tetrachloride	0.62	0.62		yes	1	0.68	-0.06
BKG-NE	N	Northeast background location	background	background	Outdoor air	10/20/2016	Carbon Tetrachloride	0.66	0.66		yes	1	0.68	-0.02
BKG-SE	N	Southeast background location	background	background	Outdoor air	10/20/2016	Carbon Tetrachloride	0.66	0.66		yes	1	0.68	-0.02
BKG-SW	N	Southwest background location	background	background	Outdoor air	10/20/2016	Carbon Tetrachloride	0.66	0.66		yes	1	0.68	-0.02
BKG-SW (Dup)	FD	Southwest background location	background	background	Outdoor air	10/20/2016	Carbon Tetrachloride	1	1		yes	1	0.68	0.32
BKG-NW	N	Northwest background location	background	background	Outdoor air	10/20/2016	Chloroform	0.057 J	0.057 J		yes	1	0.08	-0.023
BKG-NE	N	Northeast background location	background	background	Outdoor air	10/20/2016	Chloroform	0.053 J	0.053 J		yes	1	0.08	-0.027
BKG-SE	N	Southeast background location	background	background	Outdoor air	10/20/2016	Chloroform	0.11	0.11		yes	1	0.08	0.03
BKG-SW	N	Southwest background location	background	background	Outdoor air	10/20/2016	Chloroform	0.058 J	0.058 J		yes	1	0.08	-0.022
BKG-SW (Dup)	FD	Southwest background location	background	background	Outdoor air	10/20/2016	Chloroform	0.25	0.25		yes	1	0.08	0.17
BKG-NW	N	Northwest background location	background	background	Outdoor air	10/21/2016	Carbon Tetrachloride	0.38	0.38		yes	1	0.68	-0.3
BKG-NE	N	Northeast background location	background	background	Outdoor air	10/21/2016	Carbon Tetrachloride	0.5	0.5		yes	1	0.68	-0.18
BKG-SE	N	Southeast background location	background	background	Outdoor air	10/21/2016	Carbon Tetrachloride	0.56	0.56		yes	1	0.68	-0.12
BKG-SW	N	Southwest background location	background	background	Outdoor air	10/21/2016	Carbon Tetrachloride	0.63	0.63		yes	1	0.68	-0.05
BKG-SW (Dup)	FD	Southwest background location	background	background	Outdoor air	10/21/2016	Carbon Tetrachloride	0.6	0.6		yes	1	0.68	-0.08
BKG-NW	N	Northwest background location	background	background	Outdoor air	10/21/2016	Chloroform	0.031 J	0.031 J		yes	1	0.08	-0.049
BKG-SE	N	Southeast background location	background	background	Outdoor air	10/21/2016	Chloroform	0.042 J	0.042 J		yes	1	0.08	-0.038
BKG-SW	N	Southwest background location	background	background	Outdoor air	10/21/2016	Chloroform	0.045 J	0.045 J		yes	1	0.08	-0.035
BKG-SW (Dup)	FD	Southwest background location	background	background	Outdoor air	10/21/2016	Chloroform	0.058 J	0.058 J		yes	1	0.08	-0.022
HS-OFFICE1	N	High school office	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	0.68 J	0.68 J		yes	1	0.68	0
ELEM-OFFICE1	N	Elementary school office	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	0.77 J	0.77 J		yes	1	0.68	0.09
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	--					0.68	-0.68
PS	N	Preschool	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	--					0.68	-0.68
PS (Dup)	FD	Preschool	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	--					0.68	-0.68
MS-OFFICE1	N	Middle school office	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	0.83 J	0.83 J		yes	1	0.68	0.15
MS-NMOD	N	Middle school south modular	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	--					0.68	-0.68
MS-SMOD	N	Middle school north modular	school	site	Indoor air	8/26/2016	Carbon Tetrachloride	--					0.68	-0.68

Sample ID	Method B	Above?	Notes
BKG-NW	0.417		
BKG-NE	0.417		
BKG-SE	0.417		
BKG-SW	0.417		
BKG-SW (Dup)	0.417		
BKG-NW	0.109		
BKG-NE	0.109		
BKG-SE	0.109		
BKG-SW	0.109		
BKG-SW (Dup)	0.109		
BKG-NW	0.417		
BKG-NE	0.417		
BKG-SE	0.417		
BKG-SW	0.417		
BKG-SW (Dup)	0.417		
BKG-NW	0.109		
BKG-NE	0.109		
BKG-SE	0.109		
BKG-SW	0.109		
BKG-SW (Dup)	0.109	yes	
BKG-NW	0.417		
BKG-NE	0.417		
BKG-SE	0.417		
BKG-SW	0.417		
BKG-SW (Dup)	0.417		
BKG-NW	0.109		
BKG-SE	0.109		
BKG-SW	0.109		
BKG-SW (Dup)	0.109		
HS-OFFICE1	0.417		
ELEM-OFFICE1	0.417		
ELEM-OFFICE1 (Dup)	0.417		
PS	0.417		
PS (Dup)	0.417		
MS-OFFICE1	0.417		
MS-NMOD	0.417		
MS-SMOD	0.417		

Sample ID	Sampe Typ	Location	Location Type	Area	Media	Date	Analyte	Result	Nati	Concentrat	Qualifier	Detect	D_Concent	Backgroun	Corrected Cc
MS-OA1	N	Middle school outdoor air	school	site	Outdoor air	8/26/2016	Carbon Tetrachloride	0.80	J	0.8	J	yes	1	0.68	0.12
HS-OFFICE1	N	High school office	school	site	Indoor air	8/26/2016	Chloroform	1.7	JP	1.7	J	yes	1	0.08	1.62
ELEM-OFFICE1	N	Elementary school office	school	site	Indoor air	8/26/2016	Chloroform	0.99	J	0.99	J	yes	1	0.08	0.91
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	8/26/2016	Chloroform	--						0.08	-0.08
PS	N	Preschool	school	site	Indoor air	8/26/2016	Chloroform	--						0.08	-0.08
PS (Dup)	FD	Preschool	school	site	Indoor air	8/26/2016	Chloroform	--						0.08	-0.08
MS-NMOD	N	Middle school south modular	school	site	Indoor air	8/26/2016	Chloroform	--						0.08	-0.08
MS-SMOD	N	Middle school north modular	school	site	Indoor air	8/26/2016	Chloroform	--						0.08	-0.08
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	8/27/2016	Carbon Tetrachloride	--						0.68	-0.68
PS	N	Preschool	school	site	Indoor air	8/27/2016	Carbon Tetrachloride	--						0.68	-0.68
PS (Dup)	FD	Preschool	school	site	Indoor air	8/27/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-NMOD	N	Middle school south modular	school	site	Indoor air	8/27/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-SMOD	N	Middle school north modular	school	site	Indoor air	8/27/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-OA1	N	Middle school outdoor air	school	site	Outdoor air	8/27/2016	Carbon Tetrachloride	0.61	J	0.61	J	yes	1	0.68	-0.07
HS-OFFICE1	N	High school office	school	site	Indoor air	8/27/2016	Chloroform	1.2	P	1.2		yes	1	0.08	1.12
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	8/27/2016	Chloroform	--						0.08	-0.08
PS	N	Preschool	school	site	Indoor air	8/27/2016	Chloroform	--						0.08	-0.08
PS (Dup)	FD	Preschool	school	site	Indoor air	8/27/2016	Chloroform	--						0.08	-0.08
MS-NMOD	N	Middle school south modular	school	site	Indoor air	8/27/2016	Chloroform	--						0.08	-0.08
MS-SMOD	N	Middle school north modular	school	site	Indoor air	8/27/2016	Chloroform	--						0.08	-0.08
ELEM-OFFICE1	N	Elementary school office	school	site	Indoor air	8/28/2016	Carbon Tetrachloride	0.76	J	0.76	J	yes	1	0.68	0.08
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	8/28/2016	Carbon Tetrachloride	--						0.68	-0.68
PS	N	Preschool	school	site	Indoor air	8/28/2016	Carbon Tetrachloride	--						0.68	-0.68
PS (Dup)	FD	Preschool	school	site	Indoor air	8/28/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-NMOD	N	Middle school south modular	school	site	Indoor air	8/28/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-SMOD	N	Middle school north modular	school	site	Indoor air	8/28/2016	Carbon Tetrachloride	--						0.68	-0.68
HS-OFFICE1	N	High school office	school	site	Indoor air	8/28/2016	Chloroform	0.75	JP	0.75	J	yes	1	0.08	0.67
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	8/28/2016	Chloroform	--						0.08	-0.08
PS	N	Preschool	school	site	Indoor air	8/28/2016	Chloroform	--						0.08	-0.08
PS (Dup)	FD	Preschool	school	site	Indoor air	8/28/2016	Chloroform	--						0.08	-0.08
MS-NMOD	N	Middle school south modular	school	site	Indoor air	8/28/2016	Chloroform	--						0.08	-0.08
MS-SMOD	N	Middle school north modular	school	site	Indoor air	8/28/2016	Chloroform	--						0.08	-0.08
HS-OFFICE1	N	High school office	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.44		0.44		yes	1	0.68	-0.24
ELEM-OFFICE1	N	Elementary school office	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.54		0.54		yes	1	0.68	-0.14
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	--						0.68	-0.68
PS	N	Preschool	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.48		0.48		yes	1	0.68	-0.2
PS (Dup)	FD	Preschool	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-OFFICE1	N	Middle school office	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.54		0.54		yes	1	0.68	-0.14
MS-NMOD	N	Middle school south modular	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.85		0.85		yes	1	0.68	0.17
MS-SMOD	N	Middle school north modular	school	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.63		0.63		yes	1	0.68	-0.05
MS-OA1	N	Middle school outdoor air	school	site	Outdoor air	10/19/2016	Carbon Tetrachloride	0.51		0.51		yes	1	0.68	-0.17

Sample ID	Method B	Above?	Notes
MS-OA1	0.417		
HS-OFFICE1	0.109	yes	Fresh paint was observed on the walls, which was confirmed to contain CF by the HAPSITE GC/MS
ELEM-OFFICE1	0.109	yes	
ELEM-OFFICE1 (Dup)	0.109		
PS	0.109		
PS (Dup)	0.109		
MS-NMOD	0.109		
MS-SMOD	0.109		
ELEM-OFFICE1 (Dup)	0.417		
PS	0.417		
PS (Dup)	0.417		
MS-NMOD	0.417		
MS-SMOD	0.417		
MS-OA1	0.417		
HS-OFFICE1	0.109	yes	Fresh paint was observed on the walls, which was confirmed to contain CF by the HAPSITE GC/MS
ELEM-OFFICE1 (Dup)	0.109		
PS	0.109		
PS (Dup)	0.109		
MS-NMOD	0.109		
MS-SMOD	0.109		
ELEM-OFFICE1	0.417		
ELEM-OFFICE1 (Dup)	0.417		
PS	0.417		
PS (Dup)	0.417		
MS-NMOD	0.417		
MS-SMOD	0.417		
MS-OA1	0.417		
HS-OFFICE1	0.109	yes	Fresh paint was observed on the walls, which was confirmed to contain CF by the HAPSITE GC/MS
ELEM-OFFICE1 (Dup)	0.109		
PS	0.109		
PS (Dup)	0.109		
MS-NMOD	0.109		
MS-SMOD	0.109		
HS-OFFICE1	0.417		
ELEM-OFFICE1	0.417		
ELEM-OFFICE1 (Dup)	0.417		
PS	0.417		
PS (Dup)	0.417		
MS-OFFICE1	0.417		
MS-NMOD	0.417		
MS-SMOD	0.417		
MS-OA1	0.417		

Sample ID	Sampe Typ	Location	Location Type	Area	Media	Date	Analyte	Result	Nati	Concentra	Qualifier	Detect	D_Concent	Backgroun	Corrected Cc
HS-OFFICE1	N	High school office	school	site	Indoor air	10/19/2016	Chloroform	0.2		0.2		yes	1	0.08	0.12
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	10/19/2016	Chloroform	--						0.08	-0.08
PS (Dup)	FD	Preschool	school	site	Indoor air	10/19/2016	Chloroform	--						0.08	-0.08
MS-NMOD	N	Middle school south modular	school	site	Indoor air	10/19/2016	Chloroform	0.32		0.32		yes	1	0.08	0.24
HS-OFFICE1	N	High school office	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.5		0.5		yes	1	0.68	-0.18
ELEM-OFFICE1	N	Elementary school office	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.6		0.6		yes	1	0.68	-0.08
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	--						0.68	-0.68
PS	N	Preschool	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.45		0.45		yes	1	0.68	-0.23
PS (Dup)	FD	Preschool	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	--						0.68	-0.68
MS-OFFICE1	N	Middle school office	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.56		0.56		yes	1	0.68	-0.12
MS-NMOD	N	Middle school south modular	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.46		0.46		yes	1	0.68	-0.22
MS-SMOD	N	Middle school north modular	school	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.53		0.53		yes	1	0.68	-0.15
MS-OA1	N	Middle school outdoor air	school	site	Outdoor air	10/20/2016	Carbon Tetrachloride	0.51		0.51		yes	1	0.68	-0.17
HS-OFFICE1	N	High school office	school	site	Indoor air	10/20/2016	Chloroform	0.11		0.11		yes	1	0.08	0.03
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	10/20/2016	Chloroform	--						0.08	-0.08
PS	N	Preschool	school	site	Indoor air	10/20/2016	Chloroform	0.1		0.1		yes	1	0.08	0.02
PS (Dup)	FD	Preschool	school	site	Indoor air	10/20/2016	Chloroform	--						0.08	-0.08
HS-OFFICE1	N	High school office	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.47		0.47		yes	1	0.68	-0.21
ELEM-OFFICE1	N	Elementary school office	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.41		0.41		yes	1	0.68	-0.27
ELEM-OFFICE1 (Dup)	N	Elementary school office	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.42		0.42		yes	1	0.68	-0.26
PS	N	Preschool	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.39		0.39		yes	1	0.68	-0.29
PS (Dup)	FD	Preschool	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.44		0.44		yes	1	0.68	-0.24
MS-OFFICE1	N	Middle school office	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.41		0.41		yes	1	0.68	-0.27
MS-NMOD	N	Middle school south modular	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.42		0.42		yes	1	0.68	-0.26
MS-SMOD	N	Middle school north modular	school	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.4		0.4		yes	1	0.68	-0.28
HS-OFFICE1	N	High school office	school	site	Indoor air	10/21/2016	Chloroform	0.25		0.25		yes	1	0.08	0.17
PS	N	Preschool	school	site	Indoor air	10/21/2016	Chloroform	0.13		0.13		yes	1	0.08	0.05
PS (Dup)	FD	Preschool	school	site	Indoor air	10/21/2016	Chloroform	0.14		0.14		yes	1	0.08	0.06
MS-OFFICE1	N	Middle school office	school	site	Indoor air	10/21/2016	Chloroform	0.42		0.42		yes	1	0.08	0.34
OA1-15710	N	Marlow Outdoor Air	residence	site	Outdoor air	8/31/2016	Carbon Tetrachloride	0.82	J	0.82	J	yes	1	0.68	0.14
IA1-15710	N	Marlow Indoor Air	residence	site	Indoor air	8/31/2016	Carbon Tetrachloride	0.68	J	0.68	J	yes	1	0.68	0
OA1-15608	N	Randall Outdoor Air	residence	site	Outdoor air	8/31/2016	Carbon Tetrachloride	0.84	J	0.84	J	yes	1	0.68	0.16
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	8/31/2016	Carbon Tetrachloride	2.5		2.5		yes	1	0.68	1.82
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	8/31/2016	Carbon Tetrachloride	--						0.68	-0.68
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	8/31/2016	Carbon Tetrachloride	--						0.68	-0.68
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	8/31/2016	Carbon Tetrachloride	--						0.68	-0.68

Sample ID	Method B	Above?	Notes
HS-OFFICE1	0.109	yes	
ELEM-OFFICE1 (Dup)	0.109		
PS (Dup)	0.109		
MS-NMOD	0.109	yes	
HS-OFFICE1	0.417		
ELEM-OFFICE1	0.417		
ELEM-OFFICE1 (Dup)	0.417		
PS	0.417		
PS (Dup)	0.417		
MS-OFFICE1	0.417		
MS-NMOD	0.417		
MS-SMOD	0.417		
MS-OA1	0.417		
HS-OFFICE1	0.109		
ELEM-OFFICE1 (Dup)	0.109		
PS	0.109		
PS (Dup)	0.109		
HS-OFFICE1	0.417		
ELEM-OFFICE1	0.417		
ELEM-OFFICE1 (Dup)	0.417		
PS	0.417		
PS (Dup)	0.417		
MS-OFFICE1	0.417		
MS-NMOD	0.417		
MS-SMOD	0.417		
HS-OFFICE1	0.109	yes	
PS	0.109		
PS (Dup)	0.109		
MS-OFFICE1	0.109	yes	
OA1-15710	0.417		
IA1-15710	0.417		
OA1-15608	0.417		
IA1-15608	0.417	yes	Before water treatment
IA1-15608 (Dup)	0.417		
OA1-15809	0.417		No water treatment
IA1-15809	0.417		No water treatment

Sample ID	Sampe Typ	Location	Location Type	Area	Media	Date	Analyte	Result	Nati	Concentrat	Qualifier	Detect	D_Concent	Backgroun	Corrected Cc
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	8/31/2016	Chloroform	0.49	J	0.49	J	yes	1	0.08	0.41
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	8/31/2016	Chloroform	--						0.08	-0.08
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	8/31/2016	Chloroform	--						0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	8/31/2016	Chloroform	--						0.08	-0.08
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	9/8/2016	Carbon Tetrachloride	1.5		1.5		yes	1	0.68	0.82
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	9/8/2016	Carbon Tetrachloride	--						0.68	-0.68
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	9/8/2016	Carbon Tetrachloride	--						0.68	-0.68
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	9/8/2016	Carbon Tetrachloride	--						0.68	-0.68
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	9/8/2016	Chloroform	--						0.08	-0.08
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	9/8/2016	Chloroform	--						0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	9/8/2016	Chloroform	--						0.08	-0.08
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	9/9/2016	Carbon Tetrachloride	0.56	J	0.56	J	yes	1	0.68	-0.12
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	9/9/2016	Carbon Tetrachloride	--						0.68	-0.68
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	9/9/2016	Carbon Tetrachloride	--						0.68	-0.68
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	9/9/2016	Carbon Tetrachloride	--						0.68	-0.68
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	9/9/2016	Chloroform	--						0.08	-0.08
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	9/9/2016	Chloroform	--						0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	9/9/2016	Chloroform	--						0.08	-0.08
OA1-15710	N	Marlow Outdoor Air	residence	site	Outdoor air	9/10/2016	Carbon Tetrachloride	0.55	J	0.55	J	yes	1	0.68	-0.13
OA1-15608	N	Randall Outdoor Air	residence	site	Outdoor air	9/10/2016	Carbon Tetrachloride	0.55	J *	0.55	J	yes	1	0.68	-0.13
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	9/10/2016	Carbon Tetrachloride	0.64	J	0.64	J	yes	1	0.68	-0.04
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	9/10/2016	Carbon Tetrachloride	--						0.68	-0.68
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	9/10/2016	Carbon Tetrachloride	0.56	J	0.56	J	yes	1	0.68	-0.12
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	9/10/2016	Carbon Tetrachloride	4.7		4.7		yes	1	0.68	4.02
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	9/10/2016	Chloroform	--						0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	9/10/2016	Chloroform	1.4		1.4		yes	1	0.08	1.32
OA1-15710	N	Marlow Outdoor Air	residence	site	Outdoor air	10/19/2016	Carbon Tetrachloride	0.8		0.8		yes	1	0.68	0.12
IA1-15710	N	Marlow Indoor Air	residence	site	Indoor air	10/19/2016	Carbon Tetrachloride	0.49		0.49		yes	1	0.68	-0.19
OA1-15608	N	Randall Outdoor Air	residence	site	Outdoor air	10/19/2016	Carbon Tetrachloride	0.80	*	0.8		yes	1	0.68	0.12
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	10/19/2016	Carbon Tetrachloride	1		1		yes	1	0.68	0.32
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	10/19/2016	Carbon Tetrachloride	--						0.68	-0.68
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	10/19/2016	Carbon Tetrachloride	--						0.68	-0.68
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	10/19/2016	Carbon Tetrachloride	--						0.68	-0.68
OA1-15710	N	Marlow Outdoor Air	residence	site	Outdoor air	10/19/2016	Chloroform	0.53		0.53		yes	1	0.08	0.45

Sample ID	Method B	Above?	Notes
IA1-15608	0.109	yes	Before water treatment
IA1-15608 (Dup)	0.109		
OA1-15809	0.109		
IA1-15809	0.109		
IA1-15608	0.417	yes	
IA1-15608 (Dup)	0.417		
OA1-15809	0.417		
IA1-15809	0.417		
IA1-15608 (Dup)	0.109		
OA1-15809	0.109		
IA1-15809	0.109		
IA1-15608	0.417		
IA1-15608 (Dup)	0.417		
OA1-15809	0.417		
IA1-15809	0.417		
IA1-15608 (Dup)	0.109		
OA1-15809	0.109		
IA1-15809	0.109		
OA1-15710	0.417		
OA1-15608	0.417		
IA1-15608	0.417		
IA1-15608 (Dup)	0.417		
OA1-15809	0.417		
IA1-15809	0.417	yes	No water treatment
IA1-15608 (Dup)	0.109		
IA1-15809	0.109	yes	
OA1-15710	0.417		
IA1-15710	0.417		
OA1-15608	0.417		
IA1-15608	0.417		
IA1-15608 (Dup)	0.417		
OA1-15809	0.417		
IA1-15809	0.417		
OA1-15710	0.109	yes	

Sample ID	Sampe Typ	Location	Location Type	Area	Media	Date	Analyte	Result Nati	Concentrat	Qualifier	Detect	D_Concent	Backgroun	Corrected Cc
OA1-15608	N	Randall Outdoor Air	residence	site	Outdoor air	10/19/2016	Chloroform	0.53 *	0.53		yes	1	0.08	0.45
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	10/19/2016	Chloroform	0.53	0.53		yes	1	0.08	0.45
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	10/19/2016	Chloroform	--					0.08	-0.08
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	10/19/2016	Chloroform	--					0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	10/19/2016	Chloroform	--					0.08	-0.08
OA1-15710	N	Marlow Outdoor Air	residence	site	Outdoor air	10/20/2016	Carbon Tetrachloride	0.36	0.36		yes	1	0.68	-0.32
IA1-15710	N	Marlow Indoor Air	residence	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.41	0.41		yes	1	0.68	-0.27
OA1-15608	N	Randall Outdoor Air	residence	site	Outdoor air	10/20/2016	Carbon Tetrachloride	0.36	0.36		yes	1	0.68	-0.32
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.7	0.7		yes	1	0.68	0.02
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	10/20/2016	Carbon Tetrachloride	0.69	0.69		yes	1	0.68	0.01
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	10/20/2016	Carbon Tetrachloride	--					0.68	-0.68
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	10/20/2016	Carbon Tetrachloride	--					0.68	-0.68
IA1-15710	N	Marlow Indoor Air	residence	site	Indoor air	10/20/2016	Chloroform	0.23	0.23		yes	1	0.08	0.15
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	10/20/2016	Chloroform	6.4 C	6.4		yes	1	0.08	6.32
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	10/20/2016	Chloroform	6.0 C	6		yes	1	0.08	5.92
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	10/20/2016	Chloroform	--					0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	10/20/2016	Chloroform	--					0.08	-0.08
OA1-15710	N	Marlow Outdoor Air	residence	site	Outdoor air	10/21/2016	Carbon Tetrachloride	0.41	0.41		yes	1	0.68	-0.27
IA1-15710	N	Marlow Indoor Air	residence	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.34	0.34		yes	1	0.68	-0.34
OA1-15608	N	Randall Outdoor Air	residence	site	Outdoor air	10/21/2016	Carbon Tetrachloride	0.41 *	0.41		yes	1	0.68	-0.27
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	10/21/2016	Carbon Tetrachloride	0.39 C	0.39		yes	1	0.68	-0.29
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	10/21/2016	Carbon Tetrachloride	--					0.68	-0.68
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	10/21/2016	Carbon Tetrachloride	--					0.68	-0.68
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	10/21/2016	Carbon Tetrachloride	--					0.68	-0.68
IA1-15710	N	Marlow Indoor Air	residence	site	Indoor air	10/21/2016	Chloroform	0.27	0.27		yes	1	0.08	0.19
IA1-15608	N	Randall Indoor Air	residence	site	Indoor air	10/21/2016	Chloroform	6.6 C	6.6		yes	1	0.08	6.52
IA1-15608 (Dup)	FD	Randall Indoor Air	residence	site	Indoor air	10/21/2016	Chloroform	--					0.08	-0.08
OA1-15809	N	Davey Outdoor Air	residence	site	Outdoor air	10/21/2016	Chloroform	--					0.08	-0.08
IA1-15809	N	Davey Indoor Air	residence	site	Indoor air	10/21/2016	Chloroform	--					0.08	-0.08
Davey-IA1-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Carbon Tetrachloride	0.6	0.6		yes	1	0.68	-0.08
Davey-IA2-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Carbon Tetrachloride	0.63	0.63		yes	1	0.68	-0.05
Davey-IA3-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Carbon Tetrachloride	0.59	0.59		yes	1	0.68	-0.09
Davey-IA4-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Carbon Tetrachloride	0.74	0.74		yes	1	0.68	0.06

Sample ID	Method B	Above?	Notes
OA1-15608	0.109	yes	
IA1-15608	0.109	yes	
IA1-15608 (Dup)	0.109		
OA1-15809	0.109		
IA1-15809	0.109		
OA1-15710	0.417		
IA1-15710	0.417		
OA1-15608	0.417		
IA1-15608	0.417		Cleaning products containing chlorine were being used at the home, a chlorine odor was noted.
IA1-15608 (Dup)	0.417		Cleaning products containing chlorine were being used at the home, a chlorine odor was noted.
OA1-15809	0.417		
IA1-15809	0.417		
IA1-15710	0.109	yes	
IA1-15608	0.109	yes	Cleaning products containing chlorine were being used at the home, a chlorine odor was noted.
IA1-15608 (Dup)	0.109	yes	Cleaning products containing chlorine were being used at the home, a chlorine odor was noted.
OA1-15809	0.109		
IA1-15809	0.109		
OA1-15710	0.417		
IA1-15710	0.417		
OA1-15608	0.417		
IA1-15608	0.417		Cleaning products containing chlorine were being used at the home, a chlorine odor was noted.
IA1-15608 (Dup)	0.417		
OA1-15809	0.417		
IA1-15809	0.417		
IA1-15710	0.109	yes	
IA1-15608	0.109	yes	Cleaning products containing chlorine were being used at the home, a chlorine odor was noted.
IA1-15608 (Dup)	0.109		
OA1-15809	0.109		
IA1-15809	0.109		
Davey-IA1-091919	0.417		
Davey-IA2-091919	0.417		
Davey-IA3-091919	0.417		
Davey-IA4-091919	0.417		

Sample ID	Sampe Typ	Location	Location Type	Area	Media	Date	Analyte	Result Nati	Concentrat	Qualifier	Detect	D_Concent	Backgroun	Corrected Cc
Davey-IA1-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Chloroform	0.1	0.1		yes	1	0.08	0.02
Davey-IA2-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Chloroform	0.11	0.11		yes	1	0.08	0.03
Davey-IA3-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Chloroform	0.11	0.11		yes	1	0.08	0.03
Davey-IA4-091919	N	Davey Indoor Air	residence	site	Indoor air	9/20/2019	Chloroform	0.18	0.18		yes	1	0.08	0.1
Davey2-IA1-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Carbon Tetrachloride	0.61	0.61		yes	1	0.68	-0.07
Davey2-IA2-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Carbon Tetrachloride	0.49	0.49		yes	1	0.68	-0.19
Davey2-IA3-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Carbon Tetrachloride	0.54	0.54		yes	1	0.68	-0.14
Davey2-IA4-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Carbon Tetrachloride	0.67	0.67		yes	1	0.68	-0.01
Davey2-IA1-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Chloroform	0.13	0.13		yes	1	0.08	0.05
Davey2-IA2-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Chloroform	0.11	0.11		yes	1	0.08	0.03
Davey2-IA3-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Chloroform	0.11	0.11		yes	1	0.08	0.03
Davey2-IA4-092619	N	Davey Indoor Air	residence	site	Indoor air	9/27/2019	Chloroform	0.14	0.14		yes	1	0.08	0.06
Davey-AA1-091919	N	Davey Outdoor Air	residence	site	Outdoor air	9/20/2019	Carbon Tetrachloride	0.67	0.67		yes	1	0.68	-0.01
Davey-AA2-091919	N	Davey Outdoor Air	residence	site	Outdoor air	9/20/2019	Carbon Tetrachloride	0.47	0.47		yes	1	0.68	-0.21
Davey-AA1-091919	N	Davey Outdoor Air	residence	site	Outdoor air	9/20/2019	Chloroform	0.15	0.15		yes	1	0.08	0.07
Davey-AA2-091919	N	Davey Outdoor Air	residence	site	Outdoor air	9/20/2019	Chloroform	0.14	0.14		yes	1	0.08	0.06
Davey2-AA1-092619	N	Davey Outdoor Air	residence	site	Outdoor air	9/27/2019	Carbon Tetrachloride	0.73	0.73		yes	1	0.68	0.05
Davey2-AA2-092619	N	Davey Outdoor Air	residence	site	Outdoor air	9/27/2019	Carbon Tetrachloride	0.58	0.58		yes	1	0.68	-0.1
Davey2-FD-092619	FD	Davey Outdoor Air	residence	site	Outdoor air	9/27/2019	Carbon Tetrachloride	0.52	0.52		yes	1	0.68	-0.16
Davey2-AA1-092619	N	Davey Outdoor Air	residence	site	Outdoor air	9/27/2019	Chloroform	0.13	0.13		yes	1	0.08	0.05
Davey2-AA2-092619	N	Davey Outdoor Air	residence	site	Outdoor air	9/27/2019	Chloroform	0.12	0.12		yes	1	0.08	0.04
Davey2-FD-092619	FD	Davey Outdoor Air	residence	site	Outdoor air	9/27/2019	Chloroform	0.15	0.15		yes	1	0.08	0.07

Sample ID	Method B	Above?	Notes
Davey-IA1-091919	0.109		
Davey-IA2-091919	0.109		
Davey-IA3-091919	0.109		
Davey-IA4-091919	0.109		
Davey2-IA1-092619	0.417		
Davey2-IA2-092619	0.417		
Davey2-IA3-092619	0.417		
Davey2-IA4-092619	0.417		
Davey2-IA1-092619	0.109		
Davey2-IA2-092619	0.109		
Davey2-IA3-092619	0.109		
Davey2-IA4-092619	0.109		
Davey-AA1-091919	0.417		
Davey-AA2-091919	0.417		
Davey-AA1-091919	0.109		
Davey-AA2-091919	0.109		
Davey2-AA1-092619	0.417		
Davey2-AA2-092619	0.417		
Davey2-FD-092619	0.417		
Davey2-AA1-092619	0.109		
Davey2-AA2-092619	0.109		
Davey2-FD-092619	0.109		

Appendix I
Terrestrial Ecological Evaluation

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: Grain Handling Facility at Freeman	
Facility/Site Address: 14603 Highway 27, Freeman, WA	
Facility/Site No: NA	VCP Project No.: NA

Step 2: IDENTIFY EVALUATOR			
Please identify below the person who conducted the evaluation and their contact information.			
Name: David Hodson		Title: Project Manager	
Organization: Jacobs			
Mailing address: 2020 SW 4th Ave			
City: Portland	State: OR	Zip code: 97201	
Phone: 510.316.2323	Fax:	E-mail: david.hodson@jacobs.com	

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☒ Yes *If you answered **"YES,"** then answer **Question 2**.*

☐ No or Unknown *If you answered **"NO" or "UKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a) Note: The site does not contain hazardous substances of ecological concern as identified in WAC 173-340-7494

☒ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☐ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

Undeveloped Land: WAC 173-340-7491(1)(c)

☐ There is less than 0.25 acres of contiguous[#] undeveloped[±] land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☐ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous[#] undeveloped[±] land on or within 500 feet of any area of the Site.

Background Concentrations: WAC 173-340-7491(1)(d)

☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

[±] "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

[#] "Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

B. Simplified evaluation.

1. Does the Site qualify for a simplified evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No or Unknown *If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*

2. Did you conduct a simplified evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 3** below.*

☐ No *If you answered **"NO,"** then skip to **Step 3C** of this form.*

3. Was further evaluation necessary?

☐ Yes *If you answered **"YES,"** then answer **Question 4** below.*

☐ No *If you answered **"NO,"** then answer **Question 5** below.*

4. If further evaluation was necessary, what did you do?

☐ Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*

☐ Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*

5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*

Exposure Analysis: WAC 173-340-7492(2)(a)

☐ Area of soil contamination at the Site is not more than 350 square feet.

☐ Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.

Pathway Analysis: WAC 173-340-7492(2)(b)

☐ No potential exposure pathways from soil contamination to ecological receptors.

Contaminant Analysis: WAC 173-340-7492(2)(c)

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

C. Site-specific evaluation. A site-specific evaluation process consists of two parts: (1) formulating the problem, and (2) selecting the methods for addressing the identified problem. Both steps require consultation with and approval by Ecology. *See* WAC 173-340-7493(1)(c).

1. Was there a problem? *See* WAC 173-340-7493(2).

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No *If you answered **"NO,"** then identify the reason here and then skip to **Question 5** below:*

- ☐ No issues were identified during the problem formulation step.
- ☐ While issues were identified, those issues were addressed by the cleanup actions for protecting human health.

2. What did you do to resolve the problem? *See* WAC 173-340-7493(3).

☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*

☐ Used one or more of the methods listed in WAC 173-340-7493(3) to evaluate and address the identified problem. *If so, then answer **Questions 3 and 4** below.*

3. If you conducted further site-specific evaluations, what methods did you use?
Check all that apply. See WAC 173-340-7493(3).

- ☐ Literature surveys.
- ☐ Soil bioassays.
- ☐ Wildlife exposure model.
- ☐ Biomarkers.
- ☐ Site-specific field studies.
- ☐ Weight of evidence.
- ☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

- ☐ Confirmed there was no problem.
- ☐ Confirmed there was a problem and established site-specific cleanup levels.

5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

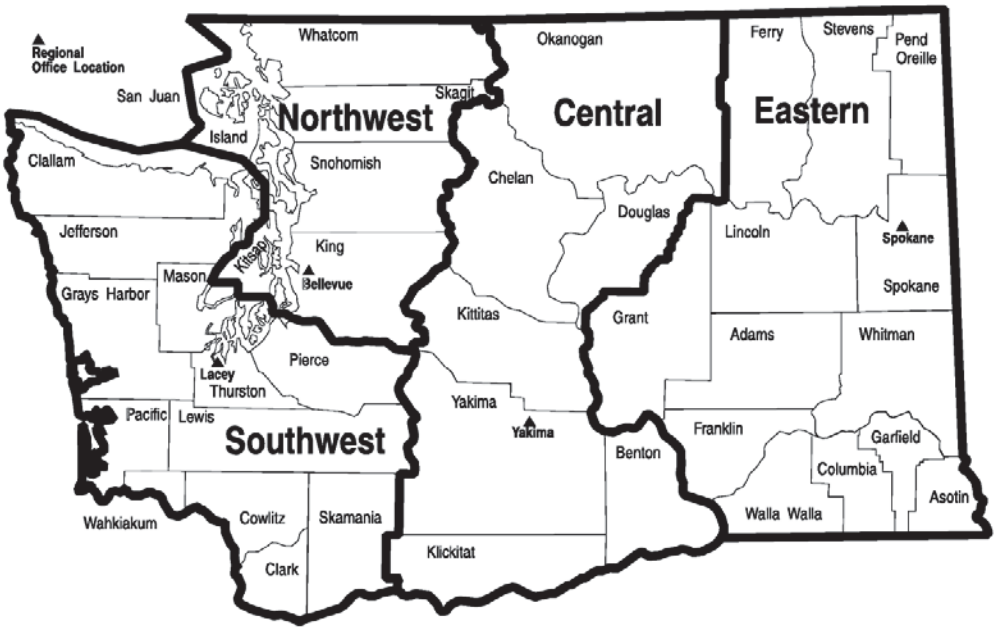
☐ Yes If so, please identify the Ecology staff who approved those steps:

☐ No

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.

Northwest Region: Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	**Central Region:** Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region: Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	**Eastern Region:** Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295



Appendix J
Cost Estimates

Alternative 1: Source Perimeter In-Situ Treatment

Site Name: Grain Handling Facility in Freeman

Location: Freeman, WA

Project Scope:

Install injection transect along 400 ft of southern/eastern Site boundary; inject Plumestop/ZVI; 1/2-strength reinjection after 8 years.

Description	Quantity	Units	Unit Cost	Item Cost	
Preconstruction Activities					
Submittals	1	LS	$ 5,000	$ 30,000	Includes subcontractor Work Plan/Schedule (and updates), H&S Plan/AHAs, Waste Management Plan, Quality Plan
Permitting	1	LS	$ 15,000	$ 16,000	Allowance to cover well permits
Monitoring Well Construction					
Site Work	1	LS	$ 15,000	$ 15,000	Allowance for the installation of erosion controls, temp fencing, setup waste management area, laydown area
Site Survey	2	DY	$ 2,000	$ 4,000	Initial and final site surveys. Includes home office support.
Independent Utility Locate	1	LS	$ 1,500	$ 1,500	Independent utility locate at six new well locations.
Monitoring Well Installation					
Driller Mobilization/Demobilization	1	5	$ 25,000	$ 25,000	Engineer's Estimate based on quote from previous drilling event in Freeman.
MW Construction, 2-in dia., 190-ft deep	1,140	FT	$ 125	$ 142,500	Engineer's Estiamte for construction of six (6), 2-in Sch 80 PVC monitoring wells, to 190 ft bgs
Well Development (per well)	24	HR	$ 225	$ 5,400	Engineer's Estimate based on quote from previous drilling event in Freeman; 4 hours per well @ $225/hr.
Well Surface Completions	6	EA	$ 250	$ 1,500	2-ft square, 6-in thick concrete apron w/ 8-in flush mount cover or 4"-in by 5-ft standup casing.
T&D Soil (non-haz)	2	LD	$ 2,100	$ 4,200	Engineer's Estimate - assumes that approximately 15 bcy (~20 cy - loose) of material will be generated. Max 12-14 cy/rolloff.
T&D Development Water (non-haz)	24	Drum	$ 200	$ 4,800	Allowance for the collection, transport, onsite treatment, and discharge to storm sewer, of development water.
Monitoring Well Destruction					
Driller Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000	
Grout	1,140	FT	$ 15	$ 17,100	
Pilot Testing					
Site work	1	LS	$ 15,000	$ 15,000	
Utility Clearance	1	LS	$ 3,000	$ 3,000	
Drill/Inject Cost	1	LS	$ 300,000	$ 300,000	
Drill/Inject field oversight (2 staff, ea $120/hr, 10-hr days, 10 days; 1 staff @ $80/hr, 10-hr days, 5 days)	1	LS	$ 28,000	$ 28,000	
Flux meter study	1	LS	$ 50,000	$ 50,000	
Work Plan/Reporting	1	LS	$ 60,000	$ 60,000	
Injection Transect Construction					
Site Work	1	LS	$ 15,000	$ 15,000	Allowance for the installation of erosion controls, temp fencing, setup waste management area, laydown area
Site Survey	2	DY	$ 2,000	$ 4,000	Initial and final site surveys. Includes home office support.
Independent Utility Locate	1	DY	$ 1,500	$ 1,500	Independent utility locate at six new well locations.
Injection Well Transect Installation & Injections					
Shallow Direct-Push Injection Temp Points	2,610	FT	$ 30	$ 78,300	Engineer's Estimate for large DP rig (Geoprobe 8000-series) pushing 2-in retractable injection screen; includes grouting
Shallow Direct-Push Injection Event	1	LS	$ 88,320	$ 88,320	Engineer's Estimate based on Regenesis Estimates
Deep Air Rotary 2-inch Injection Wells	4,070	FT	$ 110	$ 447,700	Engineer's Estimate based on previous Site monitoring well costs.
Deep Injection Event	1	LS	$ 549,333	$ 549,333	
T&D Soil (non-haz)	60	TN	$ 150	$ 9,000	Engineer's Estimate; 6-inch air rotary borehole.
T&D Development Water (non-haz)	148	Drum	$ 130	$ 19,240	Assumes 4 drums per deep injection well.
Reinject at 50% original volume after 8 years					
Repeat DP Injection Points	2610	FT	$ 30	$ 78,300	
DP Injection Event (50% original dose)	1	LS	$ 44,160	$ 44,160	
Deep Injection Event (50% original dose)	1	LS	$ 274,667	$ 274,667	
Project Management	5%	of	$ 397,127	$ 19,856	
Construction Management	6%	of	$ 397,127	$ 23,828	
Washington Business & occupation tax (Gros	1.5%	of	$ 440,810	$ 6,612	
Allowances					
Site Restoration	0%	of	$ 2,387,816	$ -	
Utility Allowance	0%	of	$ 2,387,816	$ -	
Safety Allowance	2%	of	$ 2,387,816	$ 47,756	
Undefined Scope	30%	of	$ 1,687,072	$ 506,122	
Subtotal Capital Cost				**$ 2,941,693**	
Project Management	4%	of	$ 2,941,693	$ 117,668	FS, legal support, etc.
Design	9.6%	of	$ 2,941,693	$ 282,991	
Construction Management	8%	of	$ 2,941,693	$ 235,335	
Reporting (Well Completion Report)	1	LS	$ 25,000	$ 25,000	Engineer's Estimate for well completion report
Washington Business & occupation tax (Gross Receipts Tax)	1.5%	of	$ 3,602,688	$ 54,040	
Subtotal Capital Costs				**$ 3,657,000**	**Rounded**
Annual Groundwater Monitoring and Reporting Costs					
Tech 2 Labor	1320	hrs	$ 91	$ 119,460	Quarterly; 15 days; two techs; 10hrs/day
Engineer Labor	176	hrs	$ 114	$ 20,134	Data evaluation and reporting, incl data management and figure production
PM	132	hrs	$ 145	$ 19,140	Client comm., invoicing, BP, etc.
Process Sampling	4	QRT	$ 3,886	$ 15,544	VOCs/MNA parameters; quarterly; 67 samples per event (includes QA/QC samples); $58/sample
Equipment Rental	40	DY	$ 15	$ 600	Water level indicator, Water Quality Monitoring equipment, low flow pump
Shipping - Equipment	12	EA	$ 88	$ 1,056	
T&D IDW	11	DR	$ 200	$ 2,200	
Travel	132	DY	$ 50	$ 6,600	Rental vehicle and fuel
Regulatory Fees	1	YR	$ 2,000	$ 2,000	Regulatory oversight
Total Annual Groundwater Monitoring and Reporting Cost				**$ 186,700**	
Quarterly Groundwater Monitoring and Reporting Cost (2018$$)				**$ 46,675**	
Yr 1 through Yr 5 Quarterly Monitoring	20	EA	$ 46,675	$ 933,500	5 yrs, quarterly monitoring
Yr 6 through Yr 10 Semi-annual Monitoring	10	EA	$ 46,675	$ 466,750	5 yrs, semi-annual monitoring
Yr 11 through Yr 15 Annual Monitoring	5	EA	$ 46,675	$ 233,375	5 yrs, annual monitoring
15-yr Groundwater Monitoring and Reporting Cost				**$ 1,634,000**	**Rounded**
Total Project Cost				**$ 5,291,000**	
Class 5 Estimate Range:			**100%**	**$ 10,582,000**	
			-50%	**$ 2,645,500**	

This estimate is not an offer for construction and/or project execution. These ACEC Classification 5 cost estimates are intended to reflect the actual installed costs within the range of -30% and +50% of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help insure proper project evaluation and adequate funding.

Alternative 2: Groundwater Extraction and Treatment with Infiltration

Site Name: Grain Handling Facility in Freeman

Location: Freeman, WA

Project Scope:

Mid-plume Extraction: Installation of one (1), 6-in extraction well (EW) and four (4), 6-in infiltration wells (IW), groundwater extraction treatment system (GETS). 60 gpm. 500 ug/L carbon tetrachlorid influent concentration. 0.3 ug/L carbon tetrachlorid effluent concentration.

Note: Alternative 2 is the same as the recommended interim remedial action.

	Description	Quantity	Units	Unit Cost	Item Cost	
Preconstruction Activities						
	Additional Hydrogeological Evaluation	1	Units	$ 300,000	$ 300,000	Investigation, 3 aquifer tests, data process, and modeling
	Submittals	1	LS	$ 10,000	$ 10,000	Submittal preparation and revisions, including Work Plan, Site-Specific HASP/AHAs, Schedule.
	Permitting	1	LS	$ 10,000	$ 10,000	Allowance to cover extraction well permits, building permits
	Design Surveys	1	LS	$ 45,000	$ 45,000	Aerial surveys
	Access Agreement Coordination	1	LS	$ 15,000	$ 15,000	Allowance
Monitoring Well Construction						
	Site Work	5	DY	$ 15,000	$ 75,000	Allowance for the installation of erosion controls, temp fencing, setup waste management area, laydown area
	Site Survey	2	DY	$ 2,000	$ 4,000	Initial and final site surveys. Includes home office support.
	Independent Utility Locate	1	LS	$ 1,500	$ 1,500	Independent utility locate at six new well locations.
Monitoring Well Installation						
	Driller Mobilization/Demobilization	1	950	$ 25,000	$ 25,000	Engineer's Estimate based on quote from previous drilling event in Freeman.
	MW Construction, 2-in dia., 190-ft deep	1,140	FT	$ 125	$ 142,500	Engineer's Estiamte for construction of six (6), 2-in Sch 80 PVC monitoring wells, to 190 ft bgs
	Well Development (per well)	24	HR	$ 225	$ 5,400	Engineer's Estimate based on quote from previous drilling event in Freeman; 4 hours per well @ $225/hr.
	Well Surface Completions	6	EA	$ 250	$ 1,500	2-ft square, 6-in thick concrete apron w/ 8-in flush mount cover or 4"-in by 5-ft standup casing.
	T&D Soil (non-haz)	2	LD	$ 2,100	$ 4,200	Engineer's Estimate - assumes that approximately 15 bcy (~20 cy - loose) of material will be generated. Max 12-14 cy/rolloff.
	T&D Development Water (non-haz)	24	Drum	$ 200	$ 4,800	Allowance for the collection, transport, onsite treatment, and discharge to storm sewer, of development water.
Monitoring Well Destruction						
	Driller Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000	
	Grout	1,140	FT	$ 15	$ 17,100	
Construction Activities						
	Mobilization	1	LS	$ 36,266	$ 36,266	Prime contractor mobilization of equipment, labor, and labor. 5% of total capital costs
	Site Work	1	LS	$ 5,000	$ 5,000	Install erosion controls, temp fencing, setup laydown areas, etc.
	Site Survey	4	DY	$ 2,000	$ 8,000	Initial and final site surveys, limits of excavations, and final grades. Includes home office support.
	Independent Utility Locate	2	DY	$ 1,500	$ 3,000	
Groundwater Extraction and Treatment System						
	Well Installation					
	Driller Mobilization	1	LS	$ 2,300	$ 2,300	Driller quote
1	EW Construction, 6-in dia., 280-ft deep	1	EA	$ 110,946	$ 110,946	Driller quote
2	IW Construction, 4-in dia., 40-ft deep	1	EA	$ 14,828	$ 14,828	Driller quote
3	IW Construction, 4-in dia., 40-ft deep	1	EA	$ 14,828	$ 14,828	Driller quote
4	IW Construction, 6-in dia., 230-ft deep	1	EA	$ 84,132	$ 84,132	Driller quote
5	IW Construction, 6-in dia., 230-ft deep	1	EA	$ 84,132	$ 84,132	Driller quote
	EW Development	48	HR	$ 450	$ 21,600	Based on unit rate provided by drilling company that has done work at the site. 8-hr per well @ $450/hr.
	T&D Soil (non-haz)	5	LD	$ 2,100	$ 11,084	Engineer's Estimate based on similar work. Assumes 12-14 tons/roll off.
	T&D Development Water (non-haz)	1	LS	$ 6,000	$ 6,000	Allowance for transportation to onsite tank; vac truck removal and transport to offsite POTW
	Well Destruction					
	Driller Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000	
	Extraction Well Destruction (grouting)	1,180	FT	$ 75	$ 88,500	Well head removal and grouting
	Extraction Well Pumps and Well Head Ancillaries					
	New Extraction Well Systems	1	ea	$ 50,000	$ 50,000	P/D/I pumps, vault, valves, gauges, flow meters/totalizers relief valves, power supply, etc.
	Building					
	P/D/I 800-sf, prefab building	1	LS	$ 15,000	$ 15,000	Allowance for the purchase, delivery, and installation of a pre-fab structure to house the GETS
	Water Pipelines					
	Trenching	4,900	LF	$ 20	$ 98,000	Based on RSMeans unit cost. Assumes 2-ft W x 4-ft D trenches.
	P/D/I Conveyance Line from Wells to Trunk Line	-	LF	$ 25	$ -	2" DR 11 x 4" DR 17 HDPE pipe.
	P/D/I Dual Walled Trunk Line	4,900	LF	$ 30	$ 147,000	4" DR 11 x 8" DR 17 HDPE pipe.
	P/D/I Manifold and Vault	6	EA	$ 12,500	$ 75,000	Engineer's Estimate based on similar project
	Pressure Test (hydralic)	6	EA	$ 2,500	$ 15,000	Nondestructive hydraulic pressure test, isolate and 1 hr hold, max 1500 LF test.
	Jack and Bore					
	Jack and Bore (10" Bore)	40	LF	$ 500	$ 20,000	Assumed LF under the school entrance road and the main roadway. Unit rate based on similar project conducted in 2017 for UPRR.
	Untreated Water Tank					
	P/D/I Carbon Steel, epoxy coated holding Tank--250 gal	1	EA	$ 10,765	$ 10,765	prorated 250 gal/ 15000 gal; 1.172 Escal for 2009-2017; added 6% escal for period 2017 -2019; Typical for all equip costs--includes 20% for labor install, 15% for Contractor Ovhd, General Conditions, Mob/Demob, Temp facilities. Overall Factor is 1.2x1.15x1.08=1.49 factor
	P/D Level Switch	1	EA	$ 1,500	$ 1,500	Rosemont 2120 Liquid Level Switch
	Treatment Plant Feed Pump					
	P/D Feed Pump, 120-ft head, 60 gpm	2	EA	$ 15,000	$ 30,000	PRORATE 200 gpm @ 120 ft head; based on QED quote 12/2017, for 1000 gpm at 50'THD, 25 hp @ $18000
	P/D Flow indicating totalizer, 8-in	1	EA	$ 4,000	$ 4,000	Engineer's estimate
	Bag Filter System					
	P/D Bag Filters/vessel (60 gpm)	2	EA	$ 4,607	$ 9,213	Yardney quote for 2000 gpm units, Yr2000, escalated @ $15,000

Alternative 2: Groundwater Extraction and Treatment with Infiltration

Site Name: Grain Handling Facility in Freeman

Location: Freeman, WA

Project Scope:

Mid-plume Extraction: Installation of one (1), 6-in extraction well (EW) and four (4), 6-in infiltration wells (IW), groundwater extraction treatment system (GETS). 60 gpm. 500 ug/L carbon tetrachlorid influent concentration. 0.3 ug/L carbon tetrachlorid effluent concentration.

Note: Alternative 2 is the same as the recommended interim remedial action.

LGAC System						
P/D LGAC adsorber columns (1 pair, 5000 lbs LGAC/vessel)	1	EA	$ 143,155	$	143,155	Vendor Quote (Calgon), 2003,escalated, for 20,000 lb system Unit cost is per vessel pair
P/D Differential pressure switch, brass	2	EA	$ 600	$	1,200	0-30 psig
P/D Flow indicating totalizer, 8-in	1	EA	$ 4,000	$	4,000	Engineer's estimate
Treated Water Tank						
P/D Holding tank, 500-gal	1	ea	$ 15,981	$	15,981	RS Means 2009, Prorated from 15000 gal tank @ $18,000+ delivery+loading
P/D Level Switch	1	EA	$ 1,500	$	1,500	Rosemont 2120 Liquid Level Switch
Treated Water Pump						
P/D Treated Water Pump, 60 gpm @ 120 ft H2O	2	EA	$ 14,998	$	29,995	PRORATE 200 gpm @ 120 ft head; based on QED quote 12/2017, for 1000 gpm at 50'THD, 25 hp @ $18000
P/D Flow indicating totalizer, 8-in	1	EA	$ 4,000	$	4,000	Engineer's estimate
SCADA System	1	LS	$ 50,000	$	50,000	Allowance to purchase, install and bump SCADA system for the GETS and wells; half-size system for single well version
Deconstruction	1	LS	$ 100,000	$	100,000	Prime Contractor demobilization of labor, equipment, and materials.
Allowances						
Utility Allowance	0%	of	$ 1,686,926	$	-	
Mechanical Allowance	15%	of	$ 1,686,926	$	253,039	Allowance for mechanical work associated with the GETS construction.
Instrumentation and Controls Allowance	10%	of	$ 1,686,926	$	168,693	Allowance for I&C associated with the GETS
Safety Allowance	2%	of	$ 1,686,926	$	33,739	
Electrical Allowance	10%	of	$ 1,686,926	$	168,693	
Common Facilities	8%	of	$ 1,686,926	$	134,954	
Undefined Scope	30%	of	$ 2,746,043	$	823,813	
Subtotal Capital Cost				**$**	**3,570,000**	
Project Management	5%	of	$ 3,570,000	$	192,780	FS, ISRs, Legal, Mtgs
Design	10%	of	$ 3,570,000	$	364,497	
Construction Management	10%	of	$ 3,570,000	$	357,000	
Construction Completion Report	1	LS	$ 75,000	$	75,000	
Washington Business & occupation tax (Gross Receipts Tax)						
	1.5%	**of**	**$ 4,559,277**	**$**	**68,389**	
Subtotal Project Costs				**$**	**4,628,000**	
Annual O&M Costs						
Tech 2 Labor	520	hrs	$ 91	$	47,320	Weekly site visits
Engineer Labor	360	hrs	$ 115	$	41,220	Data evaluation and reporting
PM	132	hrs	$ 145	$	19,140	Client comm., invoicing, BP, etc.
Process Sampling	12	MO	$ 1,200	$	14,400	VOCs/metals; 2x/mo; mid&final effluent pts
Electrical Costs	12	MO	$ 711	$	8,532	O&M LGAC 200 GPM Tab - KW/Hr estimate
Natural Gas	12	MO		$	-	NA
Carbon	12	MO	$ 1,533	$	18,396	O&M LGAC 200 GPM Tab - Carbon use est ($1.40/lb); Includes T&D of spent carbon
Permitting	0	YR	$ 5,000	$	-	NPDES permit renewal allowance; included under discharge alts
Parts	1	YR	$ 20,259	$	20,259	3% of TP & Well Piping Capitol
Travel	52	WK	$ 50	$	2,600	
Injection Maintenance	1	YR	$ 19,792	$	19,792	10% of IW costs
Subtotal Annual O&M Costs				**$**	**192,000**	**Rounded**
Total Operation & Maintenance Cost	15	YR	$ 192,000	$	2,880,000	
Annual Groundwater Monitoring and Reporting Costs						
Tech 2 Labor	1320	hrs	$ 91	$	119,460	Quarterly; 15 days; two techs; 10hrs/day
Engineer Labor	176	hrs	$ 114	$	20,134	Data evaluation and reporting, incl data management and figure production
PM	132	hrs	$ 145	$	19,140	Client comm., invoicing, BP, etc.
Process Sampling	4	QRT	$ 3,886	$	15,544	VOCs/MNA parameters; quarterly; 67 samples per event (includes QA/QC samples); $58/sample
Equipment Rental	40	DY	$ 15	$	600	Water level indicator, Water Quality Monitoring equipment, low flow pump
Shipping - Equipment	12	EA	$ 88	$	1,056	
T&D IDW	11	DR	$ 200	$	2,200	
Travel	132	DY	$ 50	$	6,600	Rental vehicle and fuel
Regulatory Fees	1	YR	$ 2,000	$	2,000	Regulatory oversight
Total Annual Groundwater Monitoring and Reporting Cost				**$**	**186,700**	
Quarterly Groundwater Monitoring and Reporting Cost (2018$$)				**$**	**46,675**	
Yr 1 through Yr 5 Quarterly Monitoring	20	EA	$ 46,675	$	933,500	5 yrs, quarterly monitoring
Yr 6 through Yr 10 Semi-annual Monitoring	10	EA	$ 46,675	$	466,750	5 yrs, semi-annual monitoring
Yr 11 through Yr 15 Annual Monitoring	5	EA	$ 46,675	$	233,375	5 yrs, annual monitoring
15-yr Groundwater Monitoring and Reporting Cost				**$**	**1,634,000**	**Rounded**
Total Project Cost				**$**	**9,142,000**	
Class 5 Estimate Range:			**100%**	**$**	**18,284,000**	
			-50%	**$**	**4,571,000**	

This estimate is not an offer for construction and/or project execution. These AACE Classification 5 cost estimates are intended to reflect the actual installed costs within the range of -50% and +100% of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help insure proper project evaluation and adequate funding.

Appendix K
Restoration Timeframe Estimates

Table 1. Summary of Estimated Remedial Cleanup Time

Aquifer Zone	Alternative 1: Permeable Adsorptive Barrier with Existing Point-of-Entry Treatment	Alternative 2: Groundwater Recirculation with Existing Point-of-Entry Treatment
	Timeframe Estimate in Years	
Zone A	32	17
Zone B	17	8
Zone C	31	16
Plume-wide	32	17

Definitions / Explanations:

Zone A
Zone B
Zone C

Table 2. Alternative 1 Cleanup Time Estimate Based on Estimated Number of Aquifer Flushes

Aquifer Zone	Total Pore/Fracture Volume within Plume (cf)* [1]	% of Total Plume Volume [2]	% of Water Extracted from Each Zone [3]	Extraction Rates Distribution (gpm) [4]	Volume of Water Extracted from Plume (cf/day) [5]	Volume of Water Extracted (cf/year) [6]	Volume of Water Extracted *Within Plume* (cf/year)** [7]	Number of Flushes Required [8]	Cleanup Time Based on Total Plume Volume (years)
Basis/Source	Table 4		Assumed	See Below	[4]*7.48*60*24	[5]*365	[6]*30%	Table 5	[1]*[8]/[7]
Zone A	1,680,000	3%	2%	0.8	8,294	3,027,246	908,174	17	32
Zone B	57,000,000	94%	97%	37.3	402,250	146,821,419	44,046,426	13	17
Zone C	1,800,000	3%	1%	0.4	4,147	1,513,623	454,087	8	31
TOTAL	60,480,000		100%	38.5	414,691	151,362,288	45,408,686		

* The volumes treated with Alternative 1 are less than for Alternative 2 due to the shortened length of the plume (presence of the PAB).
** Conservatively assumes that only 30 percent of the water extracted is from within the plume boundaries.

Definitions / Explanations:

Zone A	Overburden (Loess) / transition zone at the top of basalt. Geotech testing soil classification as sandy silt and clayey silt.
Zone B	Fractured basalt
Zone C	Palagonite/Paleosol/transition from fractured basalt to underlying granite

Extraction Rates (gallons per minute, gpm):

Primary Freeman School well:	38.5	55 gpm capacity operating at 70% run time
Total Extraction Rate:	38.5	Adjusted extraction rates from two wells (extraction in Marlow and Randall wells are insignificant and not included).

Table 3. Alternative 2 Cleanup Time Estimate Based on Estimated Number of Aquifer Flushes

Aquifer Zone	Total Pore/Fracture Volume within Plume (cf) [1]	% of Total Plume Volume [2]	% of Water Extracted from Each Zone [3]	Extraction Rates Distribution (gpm) [4]	Volume of Water Extracted from Plume (cf/day) [5]	Volume of Water Extracted (cf/year) [6]	Volume of Water Extracted *Within Plume* (cf/year)* [7]	Number of Flushes Required [8]	Cleanup Time Based on Total Plume Volume (years)
Basis/Source	Table 4		Assumed	See Below	[4]*7.48*60*24	[5]*365	[6]*30%	Table 5	[1]*[8]/[7]
Zone A	1,920,000	3%	2%	1.7	17,988	6,565,585	1,969,675	17	17
Zone B	60,000,000	94%	97%	81.0	872,413	318,430,871	95,529,261	13	8
Zone C	2,000,000	3%	1%	0.8	8,994	3,282,792	984,838	8	16
TOTAL	63,920,000		100%	83.5	899,395	328,279,248	98,483,774		

* Conservatively assumes that only 30 percent of the water extracted is from within the plume boundaries.

Definitions / Explanations:

Zone A Overburden (Loess) / transition zone at the top of basalt. Geotech testing soil classification as sandy silt and calyey silt.
Zone B Fractured basalt
Zone C Palagonite/Paleosol/transition from fractured basalt to underlying granite

Extraction Rates (gallons per minute, gpm):

New well near MW-19D:	45	50 gpm capacity at 90% run time
Primary Freeman School well:	38.5	55 gpm capacity operating at 70% run time
Total Extraction Rate:	83.5	Adjusted extraction rates from two wells (extraction in Marlow and Randall wells are insignificant and not included).

Table 4. Plume Volume Estimate

Zone	Approximate Plume Length (ft) [1]	Approximate Plume Width (ft) [2]	Approximate Plume Thickness (ft) [3]	Total Formation Volume [4]	Total Porosity (Table 6) [5]	Pore (Fluid) Volume (cf) [6]	% of Total Plume Pore Volume [7]
Basis/Source				[1]*[2]*[3]			
Alternative 1*							
Zone A	700	400	15	4,200,000	40%	1,680,000	3%
Zone B	1900	1000	150	285,000,000	20%	57,000,000	89%
Zone C	900	500	10	4,500,000	40%	1,800,000	3%
TOTAL				293,700,000		60,480,000	
Alternative 2							
Zone A	800	400	15	4,800,000	40%	1,920,000	3%
Zone B	2000	1000	150	300,000,000	20%	60,000,000	94%
Zone C	1000	500	10	5,000,000	40%	2,000,000	3%
TOTAL				309,800,000		63,920,000	

* The plume length in Alternative 1 was reduced by 100 feet due to the PAB bisecting the plume.

Refer to Figures 2-1 and 2-2 of *Third Revised Interim Remedial Action Work Plan, Grain Handling Facility at Freeman, Freeman, Washington, January 2020* for plume dimensions assuming active flushing of plume with carbon tetrachloride concentration greater than 1 ug/L; dilute plume with carbon tetrachloride concentration <1 ug/L will be reduced to below 0.63 ug/L over time due to volatilization, adsorption and mixing.

cf - cubic feet

ft - feet

ug/L - micrograms per liter

Table 5. Number of Pore Volumes

Contaminant of Concern (COC):			Carbon Tetrachloride		
Parameters	Unit	Zone A Value	Zone B Value	Zone C Value
Soil Porosity (Θ) [2,3,4]	--	40%	20%	40%
Bulk Density of the Aquifer (ρ_b) [5,6,7]	g/cm^3	1.6	2.795	2.64
Fraction of Organic Carbon (f_{oc}) [8]	--	0.0025	0.0005	0.0010
Organic Carbon Partitioning Factor (k_{oc}) [9]	L/kg	152	152	152
Initial Contaminant Concentration (C_0) [10]	µg/L	600	400	30
Target Contaminant Concentration (i.e., MTCA Method B - Groundwater) (C_t)	µg/L	0.625	0.625	0.625
Calculated Numbers:				
Number of Pore Volume to achieve Goals (N_{PV})	--	17	13	8

Notes:

(1) Number of pore volume and cleanup time are calculated based on formulas:

$N_{PV}=R_f \ln(C_0/C_t)$ — N_{PV} - Number of Pore Volumes

$R_f=1+(k_d\rho_b/\Theta)$ — R_f - Retardation Factor

$N_{PV}=(1+(k_{oc}f_{oc}\rho_b/\Theta))*\ln(C_0/C_t)$ — k_d - Soil-Groundwater Partitioning Coefficient, liters/kilogram (L/kg)

N_{PV} = Extracted Water Volume/Aquifer Volume — Q - Total Extraction Rate, cubic feet/year (cf/year)

$N_{PV}=Q*t/V$ — t - Duration of Flushing (Extraction), years

$t=N_{PV}*V/Q$ — V - Aquifer Pore Volume, cf

References for pore volume calculations:

Zheng, C., G. D. Bennett, and C. B. Andrews. 1991. Analysis of ground-water remedial alternatives at a Superfund site. Ground Water 29(6):838-848.

Zheng, C., G. D. Bennett, and C. B. Andrews. 1992. Reply to the preceding discussion by Robert D. McCaleb of "Analysis of Ground-Water Remedial Alternatives at a Super-fund Site." Ground Water 30(3):440-442.

(2) Porosity value for Zone A is from Horton et al., USEPA 1988

(3) Porosity Values from Unger et al., Berkeley National Lab, 2003

(4) Porosity Values of average silt particle (Palagonite has large variance in grain size)

(5) Bulk density of Zone A soils is based on literature value typical of silt (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/office/ssr10/tr/?cid=nrcs144p2_074844)

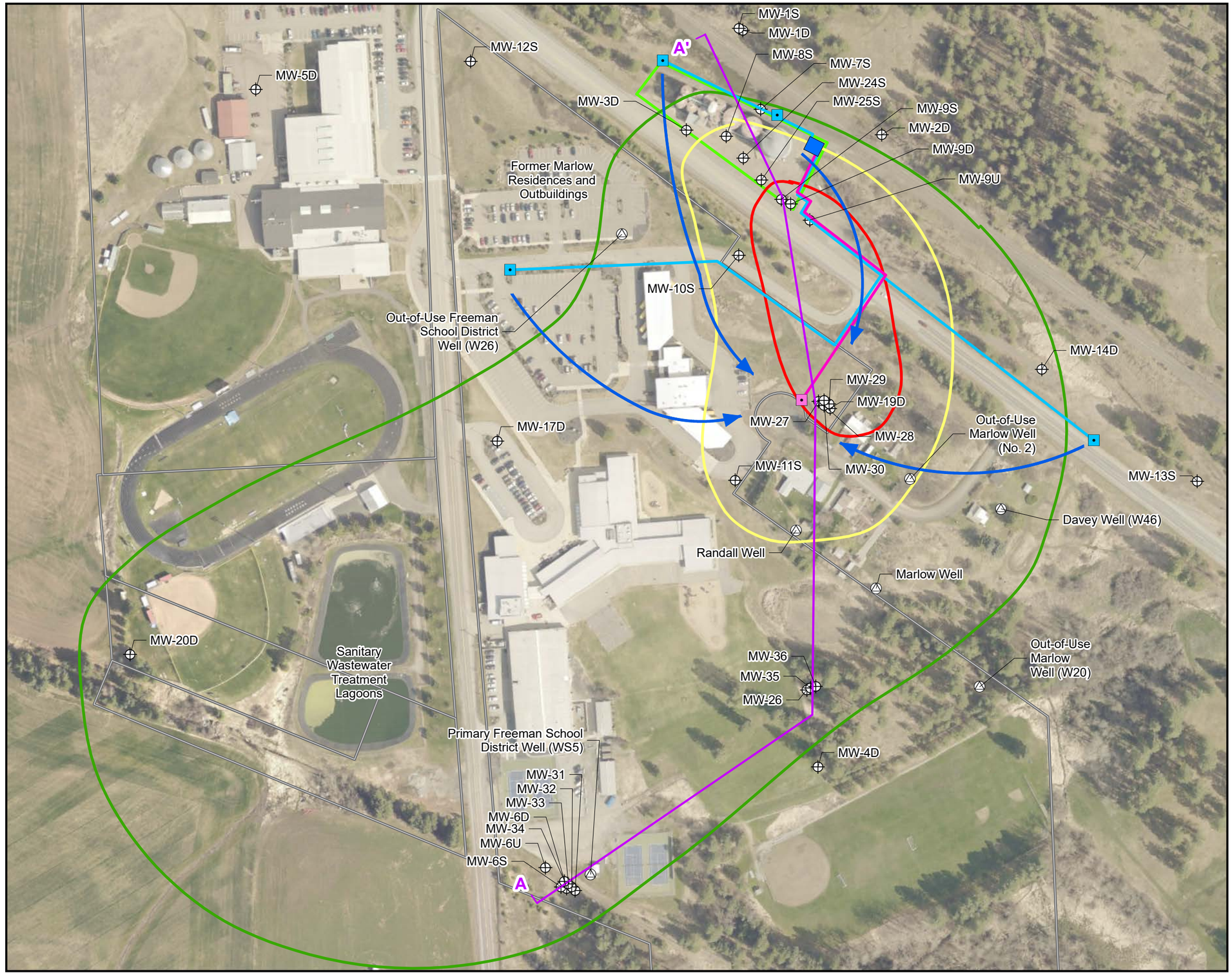
(6) Bulk density of Zone B is based on literature value for basalt (http://deepseadrilling.org/37/Volume/dsdp37_13.pdf)

(7) Bulk density of Zone C is based on literature value for palagonite (https://www.researchgate.net/publication/257436924_Palagonite_-_A_review)

(8) Fraction of Organic Carbon values are based on ranges of literature values comparable to the type of aquifer materials in Zone A, Zone B and Zone C

(9) Organic carbon partitioning factors for organic compounds can be found at: www.epa.gov/superfund/health/conmedia/soil/pdfs/part_5.pdf

(10) Initial contaminant concentration is the estimated average concentration within the zone of active flushing (recirculation) based on available site data as shown on Figures 2-1 and 2-2 in the *Third Revised Interim Remedial Action Work Plan, Grain Handling Facility at Freeman, Freeman, Washington, January 2020*



LEGEND

- Monitoring Well
- Domestic Well
- Grain Handling Facility at Freeman
- Freeman School District
- Proposed Treatment Plant
- Proposed Injection Well
- Proposed Extraction Well
- Proposed Injection Pipeline
- Proposed Extraction Pipeline
- Cross Section Alignment (See Figure 2-2)
- Typical Groundwater Recirculation Flow Lines

Carbon Tetrachloride Concentration (Basalt Aquifer)

- 10 ug/L
- 100 ug/L
- 400 ug/L

Note:
The final location and alignment of interim remedial action infrastructure will be determined as part of final system design, and in consultation with the Freeman School District, and Cenex Harvest States, Inc.

N

0 120 240 480 Feet

Figure 2-1
Interim Remedial Action Site Features and Proposed Infrastructure
Second Revised Interim Remedial Action Work Plan
Grain Handling Facility at Freeman,
Freeman, Washington

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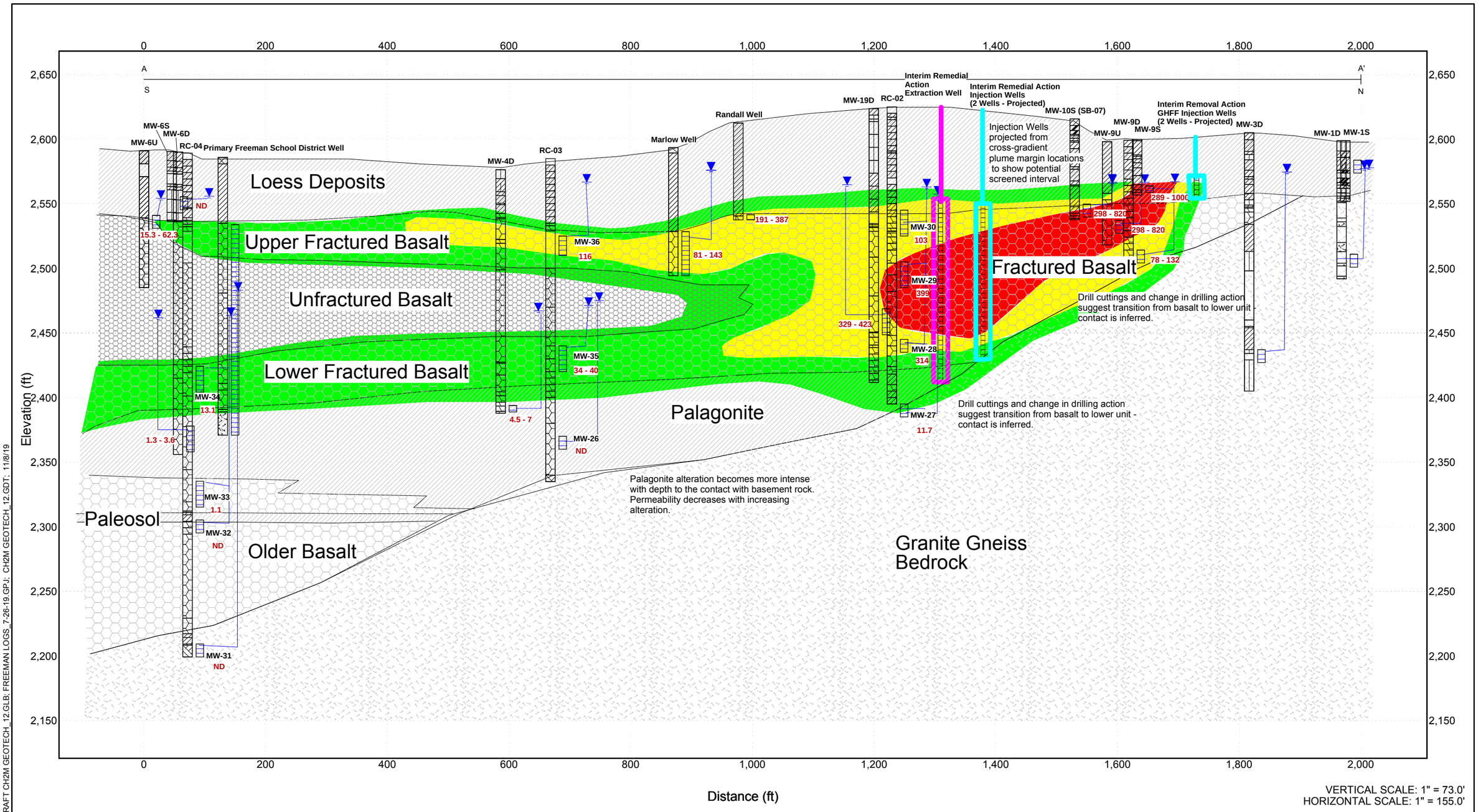


VERTICAL SCALE: 1" = 73.0'
HORIZONTAL SCALE: 1" = 155.0'

11X17 STICK LOG WITH LEGEND; DRAFT CH2M GEOTECH_12.GLB; FREEMAN LOGS_7-26-19.GPJ; CH2M GEOTECH_12.GDT; 11/8/19

JACOBS™

LITHOLOGY GRAPHICS

- Organic Clay or Silt
- BR-Lean Clay
- Well-Graded Sand
- Basalt
- Silt
- Fat Clay
- Well-Graded Sand with Silt
- Poorly Graded Sand with Silt
- BR-Lean Clay
- Clayey Sand
- Clayey Gravel
- Poorly Graded Sand
- Bedrock

LEGEND

- Inferred Geologic Contact

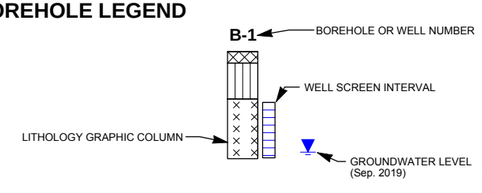
Note:
Ground surface shown is connected between boring logs and does not represent actual surface topography on the section line; refer to Figures 3-1 and 3-2 for surface topography.

NM Not Measured

1.1 Carbon Tetrachloride sampling results in ug/L

Carbon Tetrachloride Concentration
- >400 ug/L
- 100 - 400 ug/L
- 10 - 100 ug/L

BOREHOLE LEGEND



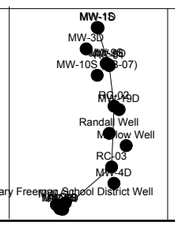


Figure 2-2
Interim Remedial Action Cross Section
Second Revised Interim Remedial Action Work Plan
Grain Handling Facility at Freeman
Freeman, Washington

Project Number: 661508