SITE MANAGEMENT PLAN
EDISON BUILDING FACILITY
933 SOUTH EDISON STREET
SALT LAKE CITY, UTAH

Project No. 1023-042D

To:

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Utah Department of Environmental Quality
Division of Waste Management and Radiation Control
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Prepared for:

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1. INTRODUCTION

Wasatch Environmental, Inc., (Wasatch) has prepared this Site Management Plan (SMP) to present the planned long-term approach for managing residual chlorinated solvent and petroleum impacts to groundwater and indoor air at the Edison Building Facility (herein referred to as the "Facility") located at 933 South Edison Street in Salt Lake City, Utah.

This SMP has been prepared in accordance with the requirements of R315-101 "Cleanup Action and Risk-Based Closure Standards" that establish information requirements to support risk-based cleanup and closure standards at facilities for which remediation or removal of hazardous constituents to background levels is not expected to be achieved. The "Owner" (as defined in the Environmental Covenant [EC]) shall comply with the SMP, including provisions relating to the Activity and Use Limitations pertaining to land use limitations, groundwater limitations, construction limitations, and disturbance limitations.

1.1 Facility Description

The Facility is 0.18 acres (Tax Parcel Numbers: 16-07-180-017 and 16-07-180-003) located at 933 South Edison Street in Salt Lake City, Salt Lake County, Utah (as shown in Attachment 2, Figures 1 through 4). The legal description for the Facility is:

West 4 Corner of SECTION 7, Township 1S, Range 1E, SLB&M.

<u>Parcel Number - 16-07-180-017</u>: Beginning at south 89°59'00", east 14.66 feet from northwest corner of LOT 10, block 2, LINDEN PARK AMENDED PLAT; south 89°59'00", east 128.6 feet; north 00°12'04", west 3.15 feet; south 89°49'16", west 128.6 feet; south 00°13'28", east 2.71 feet to the beginning (9439-1565 9512-74 10284-310).

<u>Parcel Number - 16-07-180-003</u>: Lots 10 & 11, block 2, LINDEN PARK, AMENDED (4586-338 5286-1300 6176-0037 8504-1686 8572-4189 9512-74 10284-3107).

1.2 Facility Background

Several Phase I Environmental Site Assessments (ESAs) have been completed at the Facility by the following environmental consultants: EarthTouch, Inc. (May, 6, 2016), Western Geologic, LLC (September 18, 2014), and Wasatch (March 12, 2019). In general, the Phase I ESAs concluded that the past uses of the Facility represented a recognized environmental condition. Past use of the property included dry cleaning from approximately 1926 to 1980 and printing. It was also documented that poor housekeeping was evident at the time of the printing activities and chemicals were stored near floor drains. See the applicable Phase I ESA reports in the Report References Section at the end of the SMP.

Based on the results of the Phase I ESAs several subsurface investigations have been completed by Wasatch and Partner Engineering and Science, Inc. (Partner). Investigations have included the advancement of numerous soil borings to facilitate the collection and analysis of soil and groundwater samples, the collection of numerous soil gas samples, the collection of indoor and outdoor air samples, and the installation of five groundwater monitoring wells. See the applicable subsurface investigation reports in the Report References Section at the end of the SMP.

Based on the historical soil data collected, no VOCs or SVOCs were detected above applicable United States Environmental Protection Agency (U.S. EPA) Regional Screening Levels (RSLs) for Residential

Soil, except one soil sample collected at 12' bgs (located on the southeast corner of the Facility) that exhibited a naphthalene concentration that exceeded the U.S. EPA RSL for Residential Soil, but was below the U.S. EPA RSL for Industrial Soil.

Based on the historical soil gas data collected, the following analytes were detected at concentrations that exceeds their applicable U.S. EPA Vapor Intrusion Screening Level (VISL) Residential Target Sub-Slab and Near-Source Soil Gas Concentration (TSGGC) in one or more samples: benzene, chloroform, ethylbenzene, naphthalene, PCE, and TCE. Additionally, the following analytes were detected at concentrations that exceeds their applicable U.S. EPA VISL Commercial TSGGC in one or more samples: benzene, ethylbenzene, PCE, and TCE.

Based on the historical groundwater data collected, the following analytes were detected in shallow groundwater at concentrations that exceed their applicable U.S. EPA Maximum Contaminant Level (MCL): tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), cis-1,2-dichloroethene (CIS), and benzene. It was also determined that the general groundwater flow direction at the Facility is to the southwest.

Based on the historical indoor air data collected, the following analytes were detected in indoor air at concentrations that exceeded their applicable U.S. EPA RSL for Residential Air: benzene, PCE, TCE, ethylbenzene, and i-4 dioxane. Additionally, the following analytes were detected at concentrations that exceeds their applicable U.S. EPA RSL for Industrial Air: TCE, benzene, and 1-4 dioxane. However, no analytes detected in the most recent indoor air sample exhibited concentrations that exceeded applicable U.S. EPA RSL for Industrial Air; however, benzene and PCE were detected at concentrations that exceeded applicable U.S. EPA RSL for Residential Air.

In 2019, the current Facility owner requested regulatory oversight from the Utah Department of Environmental Quality, Division of Waste Management and Radiation Control (DWMRC) for guidance to address the known impacts at the Facility. Since 2019, under the regulatory oversight of DWMRC, an environmental response project, as defined at Section 57-25-102(5) of the Utah Code Annotated, approved by the DWMRC for the Facility, has been undertaken to investigate a release of chlorinated solvents, petroleum hydrocarbons, and/or semi-volatile organic compounds (SVOCs) at the Facility.

Under the direction and approval of the DWMRC, Wasatch completed an Additional Investigation Report dated July 17, 2019, and an Additional Investigation Report dated February 26, 2020. Additionally, DWMRC requested that Wasatch research all past environmental investigation reports that had been completed at the Facility. During this research Wasatch found several investigation reports completed by Partner (see the Report Reference Section at the end of the SMP). All known historical environmental investigation reports were obtained and provided to DWMRC.

Based on the most recent indoor air, groundwater, and soil gas data, it appears that VOC-impacted groundwater is migrating onto the Facility; VC and benzene-impacted groundwater may be migrating off-site at concentrations that exceed their applicable U.S. EPA MCLs; PCE and TCE were detected in four soil gas samples at concentrations that exceeded their applicable U.S. EPA VISL Commercial TSSGCs; the passive soil gas sampling data suggest that the greatest impacts are located on the extreme northeast corner of the building where clean soil data has previously been collected indicating VOC migrating onto the Facility, no other significant sources of VOCs were identified by the soil gas analytical data; indoor air concentrations appear to have decreased since the indoor air sample collected by Partner in 2016; and the soil gas concentrations detected along the southern boundary of the facility suggest that even though impacted groundwater is migrating off-site, it is unlikely the groundwater is resulting in soil gas concentrations that exceed U.S. EPA VISL Commercial TSSGCs under the downgradient structures.

Wasatch concluded the following, given the totality of the environmental investigation work that has been completed at the Facility. It appears that VOC-impacts to soil, soil gas, and groundwater are present at the Facility. It also appears, that the majority of the source of the chlorinated solvent impacts is likely originating from an upgradient source. There is a risk for vapor intrusion at the Facility based on the soil gas and groundwater data, it is Wasatch's opinion that the potential exposure risks can be appropriately mitigated through institutional controls. Therefore, Wasatch requested that the Utah DWMRC allow the Facility to obtain site closure through the development of a SMP and EC.

Through this SMP and an EC, including necessary activity and use limitations, the risk posed by residual chlorinated solvent, petroleum hydrocarbon, and/or SVOC contamination in groundwater at the Facility will be mitigated. The management requirements of the SMP and activity and use limitations of the EC will be protective of human health and the environment.

2. RISK ASSESSMENT

At the request of the Utah DWMRC personnel, a cumulative human health and ecological risk assessment was prepared for Facility. A Screening Level Risk Assessment and ecological risk assessment have been performed for the Facility. General human health risks are discussed below. See Attachment 1 for the details of the Screening Level Risk Assessment.

2.1 Chemicals of Concern (COCs)

Based on the historical soil data, only one sample (SB-2@12') exhibited a naphthalene concentration that exceeds the U.S. EPA for Residential Soil. These impacts were located at 12 feet below ground surface which is below most depths typically encountered during construction activities. No other VOCS or SVOCs were detected at concentrations the exceed their applicable U.S. EPA RSL for Residential Soil. See Table 1 of Attachment 1 for a list of all COCs evaluated for soil.

Based on the most recent groundwater analytical data (collected under DWMRC approval): PCE was detected at concentration exceeding the applicable U.S. EPA MCL and U.S. EPA VISL Target Groundwater Concentration (TGC) in groundwater sample MW-3; TCE was detected at concentrations exceeding the applicable U.S. EPA MCL and U.S. EPA VISL TGC in groundwater samples MW-3 and MW-5; VC was detected at concentrations exceeding the applicable U.S. EPA MCL and U.S. EPA VISL TGC in groundwater samples MW-1 and MW-2; *cis-1,2*-dichloroethene (CIS) was detected at a concentration that exceeds the U.S. EPA VISL TGC in groundwater sample MW-2, naphthalene was detected at a concentration that exceeds the U.S. EPA VISL TGC in groundwater sample MW-4, benzene was detected at concentrations exceeding the applicable U.S. EPA MCL in groundwater samples MW-1 and MW-2; and benzene was detected at concentrations exceeding the applicable U.S. EPA VISL TGC in groundwater sample MW-2. No other VOCs or SVOCs were detected at concentrations that exceeded their applicable U.S. EPA MCL or U.S. EPA VISL TGC. See Table 2 of Attachment 1 for a list of all COCs evaluated for groundwater.

Based on the most recent soil gas analytical data, the following analytes were detected at concentrations that exceed their applicable U.S. EPA VISL Residential TSSGCs in one or more samples: chloroform, naphthalene, PCE, and TCE. See Table 3 of Attachment 1 for a list of all COCs evaluated for soil gas.

Based on the most recent indoor air analytical data, PCE and benzene were detected at concentrations that exceeded their applicable U.S. EPA RSL for Residential Air. No other VOCs were detected at concentrations the exceeded their applicable U.S. EPA RSL for Residential Air. Given that only one recent indoor air sample has been collected, risk was not calculated using the indoor air data.

2.2 Exposure Route Potential

Media of concern include bulk soil and groundwater resulting in the following potential exposure pathways being present: direct ingestion, inhalation, and dermal contact with soil, ingestion of groundwater, and inhalation of vapors migrating from groundwater and soil.

2.3 Risk Calculations

2.3.1 Soil

Overall, the soil cancer risk (1.05 E-06) is essentially equal to the UAC R215-101 cancer risk level of 1E-06. The Hazard Index (HI) for the residential receptor is less than the target level of 1.0. Therefore, there is no adverse risk to a potential resident from direct exposure to soil.

As noted in Table 4 in Attachment 1, the total cancer risk to the construction worker is 4.55E-07 and the HI is 7.2E-03. The cancer risk is below the target level of 1E-06 and the HI is below the target level of 1.0. Therefore, there is no adverse risk from direct exposure to soil for the construction worker. See Attachment 1 for risk assessment details. No controls are required for potential exposure to soil at the Facility.

2.3.2 Groundwater

The ingestion of groundwater pathway was evaluated for only the residential scenario. The overall cancer risk to a resident ingesting groundwater was 1.4E-03 while the HI was 2.08E+00. Both of these levels are above the State of Utah target levels of 1E-06 and 1.0, respectively. The risks are shown in Table 5 of Attachment 1. This exposure pathway would be mitigated by restricting use of the shallow groundwater.

2.3.3 Vapor Intrusion

For the vapor intrusion pathway, risks were calculated using two sources: groundwater and sub-slab soil gas data. While both predict indoor air concentrations, combing the risks derived from each data set would result in an overcounting risk. However, both were analyzed, and the resulting risks compared for inclusion in cumulative risk at the Facility.

Table 6 in Attachment 1 summarizes the risks from VOCs in groundwater volatilized into indoor air. The U.S. EPA on-line VISL calculator for groundwater was used to derive VISLs. The predicted indoor air concentrations are independent of exposure parameters; therefore, the VISLs are the same for both a resident and an indoor industrial worker.

As shown in Table 6 in Attachment 1, the residential risks from the vapor intrusion pathway based on volatilization from groundwater is a total cancer risk of 2.24E-04 and a HI of 1.64E-01. The cancer risk is above the State of Utah target level of 1E-06 while the HI is below the target level of 1.0. The indoor industrial worker risks from the vapor intrusion pathway based on volatilization from groundwater is a total cancer risk of 2.4E-05 and a HI of 3.89E-02. The cancer risk is above the State of Utah target level of 1E-06 while the HI is below the target level of 1.0.

Table 7 in Attachment 1 summarizes the risks from VOCs volatilized into indoor air using the sub-slab data. The USEPA on-line VISL calculator for sub-slab soil gas was used to derive VISLs for both a resident and the indoor industrial/commercial worker.

For the resident, the total cancer risk was 1.59E-04 and the HI was 7.89E-02. The cancer risk is above the State of Utah target level of 1E-06 while the HI is below the target level of 1.0. For the indoor industrial worker, the total cancer risk was 3.32E-05 while the HI was 6.22E+00. Both the cancer risk and HI are above the State of Utah target levels.

The inhalation pathway could be mitigated by the one or more of the following methods: installation of a suitable vapor barrier, installation of a passive or active sub-slab or submembrane depressurization system, or construction of occupied structures utilizing positive pressure ventilation systems.

2.3.4 Cumulative Risk

Table 9 in Attachment 1 presents the cumulative risk estimates for the residential scenario. The exposure pathways included ingestion of soil, ingestion of groundwater, and inhalation of vapors in indoor air. For the vapor intrusion pathway, the cancer risk was based on migration of vapors from groundwater while the HI was based on estimations from the sub-slab data. The cumulative risk for the resident is 1.42E-03 and a HI of 2.17E+00. Both of these levels are above the State target levels for non-restricted residential use.

Table 10 in Attachment 1 presents the cumulative risk estimates for the indoor industrial worker scenario. The only complete exposure pathway was inhalation of vapors in indoor air. For the vapor intrusion pathway, the cancer risk was based on migration of vapors from groundwater while the HI was based on estimations from the sub-slab data. The cumulative risk for the indoor industrial worker is 2.26E-05 and a HI of 6.22E+00. Both of these levels are above the State target levels for non-restricted industrial use.

Table 11 in Attachment 1 presents the cumulative risk estimates for the construction worker scenario. The only complete exposure pathway was ingestion and inhalation of bulk soil. The cumulative risk for the construction worker is 4.55E-07 and a HI of 7.2E-03. Both of these levels are below the State target levels. There is no adverse risk to a construction worker.

Residual exposure risk that may exist can be adequately managed through engineering controls and activity and use limitations based on the results of the screening risk assessment that was conducted. The cumulative risks can be mitigated by the above mentioned mitigation controls.

2.3.5 Ecological Risk

Ecological risks for each of the three key indicator species were also below the hazard index target level of 1.0 required for clean closure. See Attachment 1 for details.

3. SITE MANAGEMENT

3.1 Activity and Use Limitations

The EC to be recorded against the Facility imposes the following activity and use limitations:

3.1.1 Site Management Plan

The Owner shall comply with this SMP.

3.1.2 Land Use Limitations

The Facility is suitable for residential, commercial and industrial use consistent with applicable local zoning laws; provided that residential land use and land use involving sensitive populations is restricted to above the ground floor (with a parking structure, commercial, or industrial use on the ground floor). If future data demonstrate an acceptable level of exposure risk relative to the vapor intrusion pathway, future residential land use and land use involving sensitive populations on the ground floor may be permissible upon prior notification to, and approval by, the Director. Planting crops or fruit trees for consumption by humans or livestock is prohibited.

3.1.3 Groundwater Limitations

Groundwater from the shallow unconfined aquifer shall not be used for drinking water, irrigation, or bathing purposes. Other uses of groundwater from the shallow unconfined aquifer on the Facility shall be subject to review and approval by the Director prior to implementation.

3.1.4 Disturbance Limitations

Appropriate care shall be exercised during any construction, remodeling, and maintenance activities related to the Facility so as to prevent damage to any vapor mitigation measures which have been installed, and to ensure appropriate repairs are promptly made in the event damage does occur. Appropriate care shall be exercised to protect groundwater monitoring wells on the Facility, and to ensure appropriate repairs are promptly made, or replacement monitoring wells are promptly installed, in the event damage does occur. Repairs shall be made within a reasonable period of time from the discovery of the damage.

3.1.5 Construction Dewatering Limitation

Dewatering conducted to facilitate construction on the Facility may require that the groundwater be treated to reduce contaminant concentrations prior to discharge. Prior to commencement of dewatering activities, appropriate permit(s) shall be obtained for discharge to either the stormwater system (under a Utah Pollutant Discharge Elimination System permit obtained from the Utah Division of Water Quality) or to the sanitary sewer (under a Wastewater Discharge Permit obtained from the sewer district). Testing and/or treatment of the groundwater may be required by the receiving facility.

3.1.6 Vapor Intrusion Limitations

Although the latest indoor air sampling results exhibited concentrations below applicable U.S. EPA VISL Commercial TSSGCs, the risk assessment justifies the use of controls and DWMRC requires that vapor mitigation controls be in place at the Facility.

For non-residential enclosed structures intended for human occupancy on the ground floor, appropriate vapor intrusion mitigation measures are required (at the request of the Utah DWMRC) to mitigate exposure risks from the vapor intrusion pathway. Appropriate vapor mitigation measures may include, but are not limited to, installation of a suitable vapor barrier, installation of a passive or active sub-slab or submembrane depressurization system, or construction of occupied structures utilizing positive pressure ventilation systems. Vapor mitigation measures shall be subject to review and approval by the Director prior to implementation. If future data demonstrate an acceptable level of exposure risk relative to the vapor intrusion pathway, future residential land use and land use involving sensitive populations on the ground floor may be permissible subject to prior notification to, and approval by, the Director.

Upon installation of the vapor intrusion mitigation measure, one round of indoor air sampling will be completed approximately one month after the installation of the vapor intrusion mitigation measure to verify the indoor air concentrations remain below the applicable U.S. EPA VISL Commercial TSSGCs. Future indoor air monitoring will not be conducted if the detected indoor air concentrations are below the U.S. EPA VISL Commercial TSSGCs and the vapor intrusion mitigation measure is maintained.

Groundwater samples will only be collected from the on-site monitoring wells if the current Owner of the Facility desires to pursue the discontinuation of the vapor intrusion mitigation measure at the Facility. If the Owner desires to remove the vapor intrusion mitigation measure, a work plan for groundwater sampling of the on-site wells will be submitted to the Utah DWMRC for approval prior to sampling. Groundwater sampling shall be performed using low-flow sampling techniques to facilitate the collection of geochemical parameters including temperature, pH, specific conductivity, dissolved oxygen, oxidation reduction potential, and turbidity. Groundwater samples shall be analyzed for a full list of VOCs using U.S. EPA Method 8260D and SVOCs using U.S. EPA Method 8270E. The current owner would coordinate with DWMRC and petition for vapor mitigation termination based upon applicable standards. A groundwater monitoring report would be provided to the Director within a reasonable period following the completion of each groundwater monitoring event. The groundwater sampling results would be evaluated to determine if the current groundwater impacts have decreased sufficiently to warrant the discontinuation of the vapor intrusion mitigation measure.

If future data demonstrate an acceptable level of exposure risk relative to the vapor intrusion pathway, soil impacts, and groundwater impacts, future commercial and residential land use and land use involving sensitive populations on the ground floor may be permissible with or without vapor mitigation measures subject to prior notification to, and approval by, the Director.

3.2 Maintenance, Access, and Inspections

Under the EC, the Owner of the Facility shall be responsible for compliance with the SMP and EC. The Holder under the EC and the Director and their respective authorized agents, employees, and contractors shall have rights of reasonable access to the Facility at any time after the effective date of the EC for inspections and monitoring of the compliance with the EC, and for complying with the terms and conditions of the EC and this SMP. Nothing in this SMP shall be construed as expanding or limiting any access and inspection authorities of the Holder or Director under the law.

3.2.1 Notice

Any party or person desiring to access the Facility under authority of the EC shall provide notice to the then current Owner of the Facility not less than 48 hours in advance of accessing the Facility, except in the event of an emergency condition which reasonably requires immediate access. In the event of any such emergency condition, the party exercising this access right will provide notice to the then current owner of the affected portion of the Facility requiring access as soon thereafter as is reasonably possible.

3.2.2 Compliance Reporting

The Owner (or any Transferee) will verify annually that the engineering controls and activity and use limitations remain in place and are being complied with, and submit written documentation to the Director by March of each year. If engineering controls and activities and use limitations do not remain in place, are not being complied with, or both, the submittal will include an explanation of the circumstances.

3.3 Environmental Covenant

An EC containing the above referenced activity and use limitations will be recorded with the Office of the County Recorder of Salt Lake County, Utah.

3.4 Monitoring Requirements

No long-term monitoring is required at the Facility.

3.5 Site Management Contacts

Inquiries concerning the SMP should be directed to the following:

Austin Lundskog
LOP Properties, LLC
P.O. BOX 50
Hyde Park, Utah 84318
(435) 535-5484

And

Utah Department of Environmental Quality
Division of Waste Management and Radiation Control
Director
P.O. Box 144880
Salt Lake City, Utah 84114-4880
(801) 536-0200

<u>Report References:</u>

Wasatch Environmental, Inc. (March 12, 2019), Phase I Environmental Site Assessment (Report No.: 1023-042A)

Wasatch Environmental, Inc. (October 20, 2014), Phase II Environmental Site Assessment (Report No.: 1023-042)

Wasatch Environmental, Inc. (July 17, 2019), Additional Investigation Report (Report No.: 1023-042B)

Wasatch Environmental, Inc. (February 16, 2020), Additional Investigation Report (Report No.: 1023-042C)

EarthTouch, Inc. (May 6, 2016), Phase I Environmental Site Assessment (Report No.: N/A)

Ellis Environmental (November 25, 2014), Phase II Environmental Site Assessment (Report No.: N/A)

Partner Engineering and Science, Inc. (July 13, 2016), Phase II Subsurface Investigation Report (Report No.: 16-163053.1)

Partner Engineering and Science, Inc. (September 6, 2016), Phase II Subsurface Investigation Report (Report No.: 16-163053.2)

Partner Engineering and Science, Inc. (October 11, 2016), Phase II Subsurface Investigation Report (Report No.: 16-163053.3)

Attachment 1

Screening Level Risk Assessment

ATTACHMENT 1

Final Screening Level Risk Assessment for the
LOP Properties, LLC Edison Building
933 South Edison Street, Salt Lake City, Utah

Final Screening Level Risk Assessment for the
LOP Properties, LLC Edison Building
933 South Edison Street, Salt Lake City, Utah

Preface

This risk assessment has been developed in response to Division of Waste Management and Radiation Control (DWMRC) comments on the Site Management Plan (SMP) for the Edison Building located at 933 South Edison Street in Salt Lake City, Utah. The following risk assessment comments were received concerning risk assessment issues.

- This section needs to address potential risk by identifying COCs recently detected in groundwater, sub-slab, and indoor air samples obtained with Division oversight. Consider using and condensing some narrative from the Facility Background section by identifying critical COCs, by media, and then list the sample concentrations in an accompanying table.

  Concur. This attachment has been developed to address contaminants of concern (COCs) detected in all media, to include groundwater, sub-slab soil gas, bulk soil, and indoor air. Tables summarizing the data by media are included in this attachment.

- Expand upon the COCs to discuss potential risks, and please note, risk is evaluated without institutional controls. The narrative need to correlate risks by discussing the COCs detected in the various media, and discuss the potential exposure routes (i.e., ingestion and inhalation).

  Concur. Residential, industrial and construction worker risks have been quantitatively evaluated in this attachment. The assessment includes narratives discussing impacted media, exposure routes/pathways for all COCs, and all assumptions.

- Although no formal risk assessment was conducted, this section needs to formulate the potential risks. The VISL calculator can be used to determine risk for each COC and added to obtain a calculated sum. Now summarize by specifying that these risks will be mitigated by institutional controls identified in the SMP (vapor extraction, GW use limitations, etc.). Once the risks (both industrial and residential) have been clarified, then this provides the justification for the Divisions' "request" for controls. The SMP documents that the recent indoor air sample did not exceed industrial risk levels, it should also document that the residential risk levels were exceeded since the SMP makes assessments regarding residential risks.

  Concur. This attachment includes a quantitative analysis of risk for each complete exposure pathway along with cumulative risks for each identified receptor. The cumulative risk estimates are used to support a request for controls for future land use and development. In addition, an ecological assessment has been provided demonstrating no adverse ecological impact.

- Note: The Division previously clarified that the recent single indoor air sample was not sufficient evidence for your conclusion regarding current risks with regards to indoor air. This position is further supported by the historical data which documented that both industrial and residential indoor air was exceeded with two (2) samples collected by Partner (which is also noted as omitted in the SMP's data). We also add that two indoor air sample rounds are insufficient to establish a decreasing trend, which is a conclusion in the SMP that the Division does not support. As we have previously stated, the potential of vapor intrusion needs to be addressed by using multiple lines of

evidence. The potential site risks need to incorporate data from groundwater, sub-slab, and indoor air samples. There are potential risks at the site which need to be clearly defined in the SMP. The proposed controls will be evaluated once we feel they are sufficiently outlined.
Concur. In addition to calculation of risk via the vapor intrusion pathway, all potential media have been included in this evaluation. Use of the indoor air data were not included in the analysis, as one to two data points collected years apart are not sufficient to define trends and seasonal fluctuations in indoor air. Further, it is agreed that risk-based decisions can not be made using a data from the most recent sampling event. The attached discussion the indoor air results in further detail.

Human Health Risk Assessment

In accordance with Utah Administrative Code (UAC) R315-101, to determine if site management options are warranted, a human health risk assessment must be conducted using standard exposure scenarios. For the residential exposure scenario, evaluation must include ingestion of groundwater (regardless of water quality), ingestion of soil and dust, and inhalation of contaminants via other transport mechanisms, such as the vapor intrusion pathway. In addition, actual land use conditions or potential land use conditions based upon applicable zoning and future land use planning considerations must also be evaluated assuming that contaminated media will not have undergone any remedial engineering.

The following assumptions were applied in this risk assessment.

Methodology

- The risk assessment was conducted in accordance with U.S. Environmental Protection Agency (USEPA) and DWMRC guidance and assumptions. For purposes of risk, the May 2020 Regional Screening Levels (RSLs) (https://www.epa.gov/risk/regional-screening-levels-rsls) were applied along with 2020 USEPA Vapor Intrusion Screening Levels (VISLs). VISLs were derived using the on-line VISL calculator (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator).

- To evaluate all potential current and future land uses, three receptors were identified for this risk evaluation: a resident, an indoor/industrial worker, and an outdoor construction worker.

- The residential RSLs and VISLs were applied for the residential scenario. For the indoor industrial worker, the industrial RSLs and VISLs were applied. For the construction worker, the RSL on-line calculator for a construction scenario was used, applying all default input parameters. [note: the 2020 RSL for naphthalene has been updated to include oral toxicity.]

- Cancer risk and noncancer risks were calculated following USEPA and DWMRC guidance. Individual and total cancer risks were determined using the approach listed in Equation 1. Hazard quotients and hazard indices were calculated using Equation 2.

Equation 1. Cumulative Risk for Carcinogenic COPCs	
$$Cumulative\ Risk = \left[\left(\frac{C_{\_1}}{RSL_1 or\ VISL_1}\right) + \left(\frac{C_{\_2}}{RSL_2 or\ VISL_2}\right) + \cdots + \left(\frac{C_{\_i}}{RSL_i or\ VISL_i}\right)\right] \times (TR)$$	
Parameter	**Definition (units)**
Cumulative Risk	Sum of individual constituents' risks (unitless; expressed as incremental probability of developing cancer over a lifetime)
$C_{\_1,2\ldots i}$	Maximum detected concentration or 95UCL for constituents 1 through *i* [mg/kg for soil [0-10 ft bgs] or (µg/m^3) for soil gas]
$RSL_{1,2\ldots i}$	US EPA RSL for constituents 1 through *i* (carcinogenic endpoint) (mg/kg for soil)
$VISL_{1,2\ldots i}$	US EPA VISL for constituents 1 through *i* (carcinogenic endpoint) (µg/m^3)
TR	DWMRC target risk level (1 x 10^{-6}) (unitless; incremental probability)
mg/kg – milligrams per kilogram µg/m^3 – micrograms per cubic meter	

Equation 2. Hazard Index for Noncarcinogenic COPCs	
$$HI = [(HQ_1) + (HQ_2) + \cdots + (HQ_i)] \times THQ$$ $$HQ_{1,2\ldots i} = \frac{C}{RSL\ or\ VISL}$$	
Parameter	**Definition (units)**
HI	Hazard index; sum of HQs (unitless)
$HQ_{1,2\ldots i}$	Hazard quotient (unitless)
THQ	DWMRC Target hazard quotient (1.0) (unitless)
C	Maximum detected concentration or 95UCL for constituents 1 through *i* [mg/kg for soil [0-10 ft bgs] or (µg/m^3) for soil gas]
RSL	US EPA RSL (noncarcinogenic endpoint) (mg/kg for soil), based on target level of 1.0
$VISL_{1,2\ldots i}$	US EPA VISL for constituents 1 through *i* (noncarcinogenic endpoint) (µg/m^3)

- The total risk and hazard (cumulative risk) for each receptor was determined by summing the risks across each complete exposure pathway.

<u>Contaminants of Potential Concern (COPCs)</u>

- Contamination at the site consists of volatile organic compounds (VOCs). All VOCs detected at least once in each medium were retained as a contaminants of potential concern (COPC) for the risk evaluation.

- The maximum detected concentration for all COPCs was initially as the exposure point concentration (EPC).

Exposure

- Media of concern include bulk soil and groundwater resulting in the following exposure pathways being present: direct ingestion, inhalation, and dermal contact with soil, ingestion of groundwater, and inhalation of vapors migrating from groundwater and soil.
    - For the soil exposure intervals, data from 0-10 feet below ground surface (ft bgs) were used for the resident and construction worker; 0-1 ft bgs was applied for the indoor worker. As all contamination at the site is subsurface contamination, below a depth of four ft bgs, the soil exposure pathway for the indoor industrial worker was deemed incomplete.
    - While unlikely, potential ingestion of groundwater was evaluated for the hypothetical resident.
    - Potential ingestion of groundwater for an indoor industrial worker was deemed incomplete. The site is within a highly developed urban zone. It is assumed that culinary water will be provided to any structures erected on the site.
    - Vapor intrusion was assessed and discussed for each of these three mechanisms:
        - Evaluation of the potential for VOCs in groundwater to volatilize and migrate vertically into indoor air; assessment included utilization of the USEPA VISLs for groundwater;
        - Evaluation of the sub-slab soil gas data and application of the USEPA VISLs for sub-slab soil gas; and
        - Evaluation of the indoor air data.
    - For the indoor air data, samples were collected once in 2016 and once in 2019. The 2019 data consists of only a single indoor air sample. Use of one sample is not sufficient to characterize any trends in concentrations, account for seasonal fluctuations or to assess an exposure route in a risk assessment. As sufficient data are available for both groundwater and sub-slab soil gas to assess the vapor intrusion pathway, these data were used in the risk assessment in lieu of the indoor air sample.
    - For determining risk via the vapor intrusion pathway, exposure from both vapor migrating from groundwater and from the sub-slab soil gas were calculated. In looking at the bulk soil data, the detections of VOCs are variable with no discernable pattern. Further, the concentrations of VOCs decrease with depth. While VOCs in soil may be contribute to vapor intrusion, the predominant source of VOCs is groundwater. Comparison of risks from the sub-slab data and groundwater data were conducted to evaluate which data provided a better prediction of indoor air concentrations; for cumulative risk, the more conservative estimate of risk was applied.

- In order to comply with R315-101 principles of non-degradation, the maximum detected concentration was compared to the May 2020 RSL soil-to-groundwater screening level (SSL), adjusted to a dilution attenuation factor (DAF) of 20.

Data

Two sampling events have been conducted to define the nature and extent of contamination in bulk soil. The first event, conducted in 2014, consisted of three boreholes (BH-1 through BH-3). Sample depths included aliquots from 9.5, 18, and 20 feet below ground surface (ft bgs). The second event conducted in 2016 included seven subsurface sample locations, SB-1 through SB-7. The depth of the 2016 samples ranged from four to 12 ft bgs. These historical data are summarized in detail in Table 1 of the main text of the SMP.

As noted above, the soil exposure interval is complete for only the residential and construction worker. Soil data from the historical data representing 0-10 ft bgs are provided in Table 1 below.

Table 1. Bulk Soil Data for the Residential and Construction Worker Scenarios

COPC	BH-3 @9.5'	SB-1 @10'	SB-3 @10'	SB-4 @10'	SB-5 @4.5	SB-6 @9-10
TPH-GRO (Low Fractionation)	NA	90	190	160	ND	628
TPH-DRO (High Fractionation)	NA	3600	230	4.3	ND	293
Tetrachloroethene (PCE)	ND	ND	ND	ND	0.0394	ND
Acetone	ND	0.041	ND	ND	ND	1.18
Benzene	0.015	0.025	ND	ND	0.0138	ND
n-Butylbenzene	0.03	0.35	0.54	ND	ND	1.19
sec-Butylbenzene	0.015	ND	ND	ND	ND	0.978
tert-Butylbenzene	ND	ND	ND	ND	ND	0.244
Chlorobenzene	ND	ND	ND	ND	ND	0.143
Ethylbenzene	ND	ND	ND	ND	0.0025	ND
Isopropylbenzene	ND	0.67	ND	ND	ND	1.08
p-Isopropyltoluene	ND	ND	ND	ND	ND	0.158
n-Propylbenzene	ND	2.9	ND	0.39	ND	1.76
Methylcyclohexane	NA	1.5	3.6	2	ND	ND
Napthalene	ND	0.13	0.41	0.3	ND	2.05
Toluene	ND	ND	ND	ND	0.0142	ND
Xylenes, Total	ND	ND	ND	ND	0.00531	ND
Notes:						
Data in units of milligrams per kilogram (mg/kg)						
NA - Not analyzed						
NA - Nondetected						

Groundwater data from the most current sampling event (December 2019) were applied for assessing both direct ingestion of groundwater and migration of vapors from groundwater into indoor air. Data from monitoring wells MW-1 through MW-5 were applied as summarized in Table 2.

Table 2. Groundwater Data for the Residential and Indoor Industrial Scenarios

	MW-1	MW-2	MW-3	MW-4	MW-5
Tetrachloroethene (PCE)	ND	ND	228	ND	4.52
Trichloroethene (TCE)	ND	ND	54.9	ND	22.6
1,1-Dichloroethene (DCE)	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	19.6	72.7	39.5	ND	17.7
trans -1,2-Dichloroethene	ND	3.42	ND	ND	ND
Vinyl chloride	2.84	22.3	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND
Acetone	ND	64.3	ND	135	ND
2-Butanone	ND	ND	ND	ND	ND
n-Butylbenezene	NA	NA	NA	NA	NA
sec-Butylbenzene	NA	NA	NA	NA	NA
tert-Butylbenzene	NA	NA	NA	NA	NA
Carbon Disulfide	ND	ND	ND	ND	ND
Cyclohexane	6.09	54.3	ND	149	ND
2-Hexanone	ND	ND	ND	ND	ND
Methylcyclohexane	ND	10.9	ND	274	ND
Isopropylbenzene	ND	ND	ND	15.6	ND
p-Isopropyltoluene	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA
Benzene	6.55	12.9	ND	ND	ND
Toluene	ND	ND	ND	ND	ND
m,p-Xylenes	ND	ND	ND	ND	ND
o-Xylenes	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	7.51	ND
Ethylbenzene	ND	ND	ND	5.18	ND
TPH-GRO	NA	NA	NA	NA	NA
TPH-DRO	NA	NA	NA	NA	NA
Notes:					
Data in units of µg/L, micrograms per Liter					
NA - not analyzed					
ND - non detected					

Soil gas samples were collected in 2016 and 2019/2020. Only the most current data were applied for the risk assessment. The 2019/2020 data were collected from 16 sample locations. The data are summarized in Table 3.

Table 3. Sub-Slab Soil Gas Data for the Residential and Indoor Industrial Scenarios

	Sub-1	Sub-2	Sub-3	Sub-4	Sub-5	Sub-6	Sub-7	Sub-8	Sub-9	Sub-10	Sub-11	Sub-12	Sub-13	Sub-14	Sub-15	Sub-16
1,1,1,2-Tetrachloroethane	ND	0.749	7.640	14.800	5.270	7.930	2.100	ND	ND	ND	0.523	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	0.198	ND	ND	0.266	20.100	1.490	0.385	ND	ND	ND	0.168	0.226
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	2.190	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.859	0.913	14.800	22.000	6.780	ND	6.300	1.260	17.200	5.730	2.850	ND	0.458	ND	ND	ND
1,2,4-Trimethylbenzene	0.770	1.900	0.205	4.670	0.180	ND	1.470	3.070	35.200	2.360	1.390	54.400	0.134	0.364	31.500	2.840
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.880	ND	ND	ND	ND
1,3,5-Trimethylbenzene	0.338	0.475	ND	1.480	0.229	ND	1.320	0.901	9.520	0.941	1.420	27.000	0.132	0.183	39.300	2.370
2-Methylnaphthalene	0.189	0.433	ND	8.900	0.427	0.217	0.413	0.167	0.151	ND	0.137	3.200	ND	0.450	2.570	0.448
Benzene	0.766	0.551	1.070	1.850	1.130	0.229	1.470	0.485	1.610	2.800	2.310	9.430	0.417	0.667	0.202	0.571
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert-butyl Ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	1.550	4.320	1.470	ND	ND	ND	5.230	1.020	0.765	ND	ND	ND	3.500	2.950
cis-1,2-Dichloroethene	6.590	3.430	6.910	17.800	2.780	ND	6.250	2.050	0.577	ND	2.210	1.040	0.801	3.720	ND	ND
Ethylbenzene	ND	ND	ND	1.900	ND	ND	0.181	ND	0.602	0.769	0.414	5.170	ND	ND	ND	0.164
Isopropylbenzene	ND	ND	ND	0.757	ND	ND	ND	ND	1.940	0.132	ND	1.220	ND	ND	0.472	ND
Naphthalene	0.148	0.425	0.809	32.400	0.642	0.492	0.511	0.250	0.680	ND	0.189	2.570	ND	0.367	2.860	0.451
o-Xylene	0.119	0.175	0.247	0.981	0.219	ND	0.370	0.139	2.220	1.550	1.370	27.400	0.166	0.131	0.859	0.355
m,p-Xylene	0.291	0.425	0.375	1.890	0.331	0.180	0.747	0.355	2.720	1.370	3.080	70.200	0.377	0.384	1.890	0.835
Tetrachloroethene	693.0	466.0	9020.0	34900.0	15500.0	384.0	70.6	541.0	858.0	597.0	1740.0	742.0	62.9	138.0	3.8	15.2
Toluene	1.070	1.410	0.730	3.550	1.200	ND	1.370	0.586	2.970	3.990	5.730	36.000	0.634	1.140	0.383	1.190
trans-1,2-Dichloroethene	2.230	1.100	7.980	6.090	4.280	ND	2.310	0.955	ND	ND	0.779	ND	0.319	0.957	ND	ND
Trichloroethene	99.200	24.700	491.000	728.000	553.000	3.370	165.000	51.500	23.200	22.900	150.000	10.800	11.000	39.700	ND	2.970
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	4.320	ND	ND	ND	ND	ND	ND	ND
Notes:																
Data in units of micrograms per cubic meter (μg/m^3)																
ND - Nondetect																

Risk

Bulk Soil

Table 4 summarizes the risks from exposure to soils at the Edison Building site. The total cancer risk is 1.05 E-06 and the hazard index (HI) is 2.34E-03. The cancer risk is driven by the maximum detected concentration of naphthalene. It is noted that the RSL for naphthalene drives cancer risk. Oral cancer toxicity data for naphthalene has been recently added to the RSL database; hence the change in the screening level for naphthalene between the November 2019 and May 2020 RSL tables. Overall, the cancer risk is essentially equal to the UAC R215-101 cancer risk level of 1E-06. The HI for the residential receptor is less than the target level of 1.0. There is no adverse risk to the resident from direct exposure to soil.

As noted in Table 4, the total cancer risk to the construction worker is 4.55E-07 and the HI is 7.2E-03. The cancer risk is below the target level of 1E-06 and the HI is below the target level of 1.0. There is no adverse risk from direct exposure to soil for the construction worker.

Table 4. Residential and Construction Worker Risks, Soil

COPC	Max (mg/kg)	RSL Res (mg/kg)	C/NC	Res. HQ	Res. Cancer Risk	Constr. RSL* (mg/kg)	C/NC	Constr. HQ	Constr. Cancer Risk
TPH-GRO (Low Fractionation)	6.28E+02	NA	NC			NA			
TPH-DRO (High Fractionation)	3.60E+03	NA	NC			NA			
Tetrachloroethene (PCE)	3.94E-02	2.40E+01	C		1.64E-09		C		
Acetone	1.18E+00	6.10E+04	NC	1.93E-05		6.11E+04	NC	1.93E-05	
Benzene	2.50E-02	1.20E+00	C		2.08E-08	1.95E+01	C		1.28E-09
n-Butylbenzene	1.19E+00	3.90E+03	NC	3.05E-04		3.39E+04	NC	3.51E-05	
sec-Butylbenzene	9.78E-01	7.80E+03	NC	1.25E-04		3.39E+04	NC	2.88E-05	
tert-Butylbenzene	2.44E-01	7.80E+03	NC	3.13E-05		3.39E+04	NC	7.20E-06	
Chlorobenzene	1.43E-01	2.80E+02	NC	5.11E-04		1.04E+03	NC	1.38E-04	
Ethylbenzene	2.50E-03	5.80E+00	C		4.31E-10	6.17E+01	C		4.05E-11
Isopropylbenzene	1.08E+00	1.90E+03	NC	5.68E-04		1.95E+02	NC	5.54E-03	
p-Isopropyltoluene	1.58E-01	NA				NA			
n-Propylbenzene	2.90E+00	3.80E+03	NC	7.63E-04		2.04E+03	NC	1.42E-03	
Methylcyclohexane	3.60E+00	NA				NA			
Napthalene	2.05E+00	2.00E+00	C		1.03E-06	4.52E+00	C		4.54E-07
Toluene	1.42E-02	4.90E+03	NC	2.90E-06		1.04E+04	NC	1.37E-06	
Xylenes, Total	5.31E-03	5.80E+02	NC	9.16E-06		8.64E+02	NC	6.15E-06	
	Total HI or Cancer Risk:			**2.34E-03**	**1.05E-06**			**7.20E-03**	**4.55E-07**

Notes:
C - Carcinogen
NC - Noncarcinogen
HI - Hazard Index
HQ - Hazard Quotient
*RSL on-line calculator used for construction worker RSLs; all defaults applied, with exception of average depth of contamintion (10 feet) (run 7/13/20)

Ingestion of Groundwater

The ingestion of groundwater pathway was evaluated for only the residential scenario. The overall cancer risk to a resident ingesting groundwater was 1.4E-03 while the HI was 2.08E+00. Both of these levels are above the State of Utah target levels of 1E-06 and 1.0, respectively. The risks are shown in Table 5.

Table 5. Residential Risks, Ingestion Groundwater

	Max (µg/L)	Tap Water RSL (µg/L)	C/NC	Tap Water HQ	Tap Water Risk
Tetrachloroethene (PCE)	2.28E+02	1.1E+01	C		2.07E-05
Trichloroethene (TCE)	5.49E+01	4.90E-01	C		1.12E-04
1,1-Dichloroethene (DCE)	0.00E+00	2.80E+02	NC	0.00E+00	
cis-1,2-Dichloroethene	7.27E+01	3.60E+01	NC	2.02E+00	
trans-1,2-Dichloroethene	3.42E+00	3.60E+02	NC	9.50E-03	
Vinyl chloride	2.23E+01	1.90E-02	C		1.17E-03
1,1,2-Trichloroethane					
Acetone	1.35E+02	1.40E+04	NC	9.64E-03	
2-Butanone					
n-Butylbenezene					
sec-Butylbenzene					
tert-Butylbenzene					
Carbon Disulfide					
Cyclohexane	1.49E+02	1.30E+04	NC	1.15E-02	
2-Hexanone					
Methylcyclohexane	2.74E+02	NA			
Isopropylbenzene	1.56E+01	4.50E+02	NC	3.47E-02	
p-Isopropyltoluene					
n-Propylbenzene					
1,2,4-Trimethylbenzene					
1,3,5-Trimethylbenzene					
Benzene	1.29E+01	4.60E-01	C		2.80E-05
Toluene					
m,p-Xylenes					
o-Xylenes					
Naphthalene	7.51E+00	1.20E-01	C		6.26E-05
Ethylbenzene	5.18E+00	1.50E+00	C		3.45E-06
TPH-GRO					
TPH-DRO					
				Total HI or Cancer Risk:	**2.08E+00**	**1.40E-03**

Notes:
µg/L, micrograms per Liter
C/NC - carcinogen/noncarcinogen
NA - Not available

Vapor Intrusion

For the vapor intrusion pathway, risks were calculated using two sources: groundwater and sub-slab soil gas data. While both predict indoor air concentrations, combing the risks derived from each data set would result in an overcounting risk. However, both were analyzed and the resulting risks compared for inclusion in cumulative site risk.

Table 6 summarizes the risks from VOCs in groundwater volatilized into indoor air. The USEPA on-line VISL calculator for groundwater was used to derive VISLs. The results are provided for both a resident and an indoor industrial worker.

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Table 6. Indoor Air Risk from Volatilization from Groundwater

	Max (µg/L)	Res. GW Target VISL (µg/L)	C/NC	Res. GW VISL HQ	Res. GW VISL Risk	Ind. GW Target VISL (µg/L)	C/NC	Ind. GW VISL HQ	Ind. GW VISL Risk
Tetrachloroethene (PCE)	2.28E+02	1.49E+01	C		1.53E-05	6.52E+01	C		3.50E-06
Trichloroethene (TCE)	5.49E+01	1.19E+00	C		4.61E-05	7.43E+00	C		7.39E-06
1,1-Dichloroethene (DCE)									
cis-1,2-Dichloroethene	7.27E+01								
trans-1,2-Dichloroethene	3.42E+00								
Vinyl chloride	2.23E+01	1.47E-01	C		1.52E-04	2.45E+00	C		9.10E-06
1,1,2-Trichloroethane									
Acetone	1.35E+02	2.25E+07	NC	6.00E-06		9.45E+07	NC	1.43E-06	
2-Butanone									
n-Butylbenzene									
sec-Butylbenzene									
tert-Butylbenzene									
Carbon Disulfide									
Cyclohexane	1.49E+02	1.02E+03	NC	1.46E-01		4.29E+03	NC	3.47E-02	
2-Hexanone									
Methylcyclohexane	2.74E+02								
Isopropylbenzene	1.56E+01	8.87E+02	NC	1.76E-02		3.73E+03	NC	4.18E-03	
p-Isopropyltoluene									
n-Propylbenzene									
1,2,4-Trimethylbenzene									
1,3,5-Trimethylbenzene									
Benzene	1.29E+01	1.59E+00	C		8.11E-06	3.93E+00	C		3.28E-06
Toluene									
m,p-Xylenes									
o-Xylenes									
Naphthalene	7.51E+00	4.59E+00	C		1.64E-06	2.01E+01	C		3.74E-07
Ethylbenzene	5.18E+00	3.49E+00	C		1.48E-06	1.52E+01	C		3.41E-07
TPH-GRO									
TPH-DRO									
			l HI or Cancer Risk:	**1.64E-01**	**2.24E-04**			**3.89E-02**	**2.40E-05**

Notes:
µg/L, micrograms per Liter
C/NC - carcinogen/noncarcinogen
NA - Not available
VISL on-line calculator for groundwater run 7/13/20

As shown in Table 6, the risks from the vapor intrusion pathway for a resident based on volatilization from groundwater is a total cancer risk of 2.24E-4 and a HI of 1.64E-01. Both the cancer risk and HI are above the State of Utah target levels of 1E-06 and 1.0, respectively. For the indoor industrial worker, the total cancer risk was 2.4E-05 and the HI was 3.89E-02. The cancer risk for the indoor worker is above the State target level of 1E-06 for no controls. There is no adverse noncancer risk to the indoor worker.

Table 7 summarizes the risks from VOCs volatilized into indoor air using the sub-slab data. The USEPA on-line VISL calculator for sub-slab soil gas was used to derive VISLs for both a resident and the indoor industrial/commercial worker.

For the resident, the total cancer risk was 1.59E-04 and the HI was 7.89E-02. The cancer risk is above the State of Utah target level of 1E-06 while the HI is below the target level of 1.0. For the indoor industrial worker, the total cancer risk was 3.32E-05 while the HI was 6.22E+00. Both the cancer risk and HI are above the State of Utah target levels.

Table 7. Indoor Air Risk, Sub-Slab Data

	Max (μg/m^3)	Res Subslab VISL (μg/m^3)	C/NC	Res Subslab VISL HQ	Res Subslab VISL Risk	Ind/Com Subslab VISL (μg/m^3)	C/NC	Ind/Com Subslab VISL HQ	Ind/Com Subslab VISL Risk
1,1,1,2-Tetrachloroethane	1.48E+01	1.26E+01	C		1.17E-06	5.52E+01	C		2.68E-07
1,1,1-Trichloroethane	2.01E+01	1.74E+05	NC	1.16E-04		7.30E+05	NC	2.75E-05	
1,1-Dichloroethane	2.19E+00	5.85E+01	C		3.74E-08	2.56E+02	C		8.55E-09
1,1-Dichloroethene	2.20E+01	3.95E+03	NC	5.57E-03		2.92E+04	NC	7.53E-04	
1,2,4-Trimethylbenzene	5.44E+01	2.09E+03	NC	2.60E-02		8.76E+00	NC	6.21E+00	
1,2-Dichloroethane	2.88E+00	3.60E+00	C			1.57E+01	C		1.83E-07
1,3,5-Trimethylbenzene	3.93E+01	2.09E+03	NC	1.88E-02		8.76E+03	NC	4.49E-03	
2-Methylnaphthalene	8.90E+00								
Benzene	9.43E+00	1.20E+01	C		7.86E-07	5.24E+01	C		1.80E-07
1,2-Dichlorobenzene									
1,4-Dichlorobenzene									
Methyl Tert-butyl Ether									
Chloroform	5.23E+00	4.07E+00	C		1.29E-06	1.78E+01	C		2.94E-07
cis-1,2-Dichloroethene	1.78E+01								
Ethylbenzene	5.17E+00	3.74E+01	C		1.38E-07	1.64E+02	C		3.15E-08
Isopropylbenzene	1.94E+00	1.39E+04	NC	1.40E-04		5.84E+04	NC	3.32E-05	
Naphthalene	3.24E+01	2.75E+00	C		1.18E-05	1.20E+01	C		2.70E-06
o-Xylene	2.74E+01	3.48E+03	NC	7.87E-03		1.46E+04	NC	1.88E-03	
m,p-Xylene	7.02E+01	3.48E+03	NC	2.02E-02		1.46E+04	NC	4.81E-03	
Tetrachloroethene	3.49E+04	3.60E+02	C		9.69E-05	1.57E+03	C		2.22E-05
Toluene	3.60E+01	1.74E+05	NC	2.07E-04		7.30E+05	NC	4.93E-05	
trans-1,2-Dichloroethene	7.98E+00								
Trichloroethene	7.28E+02	1.59E+01	C		4.58E-05	9.97E+01	C		7.30E-06
Vinyl Chloride	4.32E+00	5.59E+00	C		7.73E-07	9.30E+01	C		4.65E-08
Notes:			**Total HI or Cancer Risk:**	**7.89E-02**	**1.59E-04**			**6.22E+00**	**3.32E-05**
Data in units of micrograms per cubic meter (μg/m^3)									
C/NC - carcinogen/noncarcinogen									

Table 8 shows the comparison of the two sources of data for estimating risk to indoor air, groundwater and sub-slab data. The resulting risks from use of the sub-slab data indicate higher risks. Given the age of the contamination and leakage into groundwater, it is likely that degradation of VOCs in groundwater is occurring. Most of the values are similar, except for the noncancer risk for the resident (difference of an order of magnitude) and the noncancer HI for the indoor worker (difference of two orders of magnitude). For purposes of estimating cumulative risk for each receptor, the more conservative of the two estimates of risk will be applied for each receptor.

Table 8. Comparison of Indoor Air Risk

	Ground-water (Table 6)	Sub-Slab (Table 7)
Resident, Cancer	2.24E-04	1.59E-04
Resident, Noncancer	1.64E-01	7.89E-02
Indoor Industrial Worker, Cancer	2.40E-05	3.32E-05
Indoor Industrial Worker, Noncancer	3.89E-02	6.22E+00

Cumulative Risk

Table 9 presents the cumulative risk estimates for the residential scenario. The exposure pathways included ingestion of soil, ingestion of groundwater, and inhalation of vapors in indoor air. For the vapor intrusion pathway, the cancer risk was based on migration of vapors from groundwater while the HI was based on estimations from the sub-slab data. The cumulative risk for the resident is 1.63E-03 and a HI of 2.25E+00. Both of these levels are above the State target levels for non-restricted residential use.

Table 9. Cumulative Risk, Resident

Medium	HI	Cancer Risk
Soil	2.34E-03	1.05E-06
Ingestion Groundwater	2.08E+00	1.40E-03
Inhalation vapors from groundwater		2.24E-04
Inhalation vapors, subslab soil gas	1.64E-01	
Total Res. HI or Cancer Risk:	**2.25E+00**	**1.63E-03**

Table 10 presents the cumulative risk estimates for the indoor industrial worker scenario. The only complete exposure pathway was inhalation of vapors in indoor air. For the vapor intrusion pathway, the cancer risk was based on migration of vapors from groundwater while the HI was based on estimations from the sub-slab data. The cumulative risk for the indoor industrial worker is 2.40E-05 and a HI of 6.22E+00. Both of these levels are above the State target levels for non-restricted industrial use.

Table 10. Cumulative Risk, Indoor Industrial Worker

Medium	HI	Cancer Risk
Inhalation vapors from groundwater		2.40E-05
Inhalation vapors, subslab soil gas	6.22E+00	
Total Industrial HI or Cancer Risk:	**6.22E+00**	**2.40E-05**

Table 11 presents the cumulative risk estimates for the construction worker scenario. The only complete exposure pathway was ingestion and inhalation of bulk soil. The cumulative risk for the construction worker is 4.55E-07 and a HI of 7.2E-03. Both of these levels are below the State target levels. There is no adverse risk to a construction worker.

Table 11. Cumulative Risk, Outdoor Construction Worker

Medium	HI	Cancer Risk
Bulk Soil	7.20E-03	4.55E-07
Total Construction HI or Cancer Risk:	**7.20E-03**	**4.55E-07**

Soil-to-Groundwater Migration

For evaluation of the potential for COPCs in soil to migrate to groundwater, the detected site concentrations were compared to the RSL soil screening levels based on a dilution attenuation factor of 20. The results are shown in Table 12.

Table 12. Soil-to-Groundwater Migration Assessment

COPC	Max (mg/kg)	SSL (mg/kg)	Max > SSL?
TPH-GRO (Low Fractionation)	6.28E+02	NA	
TPH-DRO (High Fractionation)	3.60E+03	NA	
Tetrachloroethene (PCE)	3.94E-02	1.02E-01	no
Acetone	1.18E+00	5.80E+01	no
Benzene	2.50E-02	5.20E-02	no
n-Butylbenzene	1.19E+00	6.40E+01	no
sec-Butylbenzene	9.78E-01	1.18E+02	no
tert-Butylbenzene	2.44E-01	3.20E+01	no
Chlorobenzene	1.43E-01	1.36E+00	no
Ethylbenzene	2.50E-03	1.56E+01	no
Isopropylbenzene	1.08E+00	1.48E+01	no
p-Isopropyltoluene	1.58E-01	NA	no
n-Propylbenzene	2.90E+00	2.40E+01	no
Methylcyclohexane	3.60E+00	NA	no
Napthalene	2.05E+00	7.60E-03	**yes**
Toluene	1.42E-02	1.52E+01	no
Xylenes, Total	5.31E-03	1.98E+02	no
Notes:			
Data in units of milligrams per kilogram (mg/kg)			
NA - Not analyzed			

The analysis showed that there is potential for naphthalene to migrate to groundwater. However, given there is no continual source and the site is developed and covered in asphalt, infiltration of water that could mobilize any residual naphthalene in soil is minimal. The soil-to-groundwater pathway is likely negligent.

Conclusion – Human Health Risk Assessment

Cumulative risks for both the resident and indoor industrial worker exceeded State target levels for un-restricted land use. It is noted that total petroleum hydrocarbon (TPH) data were excluded from the risk estimations. The fractions of hydrocarbons in the site data do not align with the fractionations for RSL TPH screening levels, and thus risks from potential exposure to TPH in site media were not calculated. Further, it is possible that indicator compounds associated with diesel range organics, such as polycyclic aromatic hydrocarbons (PAHs) that are lower in volatility could be present in site media. Exclusion of these indicator compounds along with exclusion of the TPH data could result in an underestimation of the calculated risks. The land use controls as addressed in the main text of this SMP report are needed to ensure protection of human health. These include limitation of use of shallow groundwater for consumption and use of vapor barriers and ventilation in any buildings constructed on site.

Ecological Risk Assessment

The Edison Building is located at 933 South Edison Street in Salt Lake City. As shown in the below photograph of the site (Google Earth, 2020), the area around the site as well as the site itself is highly development and mostly paved. There is no viable habitat to support ecological receptors.

To further support the conclusion that there is no adverse risk to ecological receptors, an ecological screening assessment was conducted. The only complete exposure pathway for ecological receptors would be direct contact with soil, if the pavement were ever to be removed. While VOCs are present in soil gas, there is little information on the toxicity via inhalation to ecological receptors to complete a quantitative analysis.

The ecological screening levels (ESLs) were derived from the Los Alamos National Laboratory's EcoRisk database. Given the small size of the property, indicator receptors include generic plants, a deer mouse, and a horned lark. Table 11 below summarizes the ecological screening assessment for these indicator receptors. The methodology outlined in Equation 2 was applied in deriving the HQs and HIs.

As noted in the table, the overall HIs are deer mouse 2.34E-03, horned lark 3.3E-02, and plants 4.06E-03. All of these HIs are below a target level of 1.0, indicating no adverse ecological risk is present at the Edison Building site.

Table 11. Ecological Screening Assessment

COPC	BH-3 9.5 ft bgs	SB-1 10 ft bgs	SB-3 10 ft bgs	SB-4 10 ft bgs	SB- 4.5 ft bgs	SB-6 9-10 ft bgs	Max (mg/kg)	Mouse ESL (mg/kg)	Deer Mouse HQ	Horned Lark ESL (mg/kg)	Horned Lark HQ	Plant ESL (mg/kg)	Plant HQ
TPH-GRO (Low Fractionation)	NA	9.00E+01	1.90E+02	1.60E+02	ND	6.28E+02	6.28E+02						
TPH-DRO (High Fractionation)	NA	3.60E+03	2.30E+02	4.30E+00	ND	2.93E+02	3.60E+03						
Tetrachloroethene (PCE)	ND	ND	ND	ND	3.94E-02	ND	3.94E-02	1.82E+01	2.16E-03			1.00E+01	3.94E-03
Acetone	ND	4.10E-02	ND	ND	ND	1.18E+00	1.18E+00	9.09E+01	1.30E-02	2.84E+02	4.15E-03		
Benzene	1.50E-02	2.50E-02	ND	ND	1.38E-02	ND	2.50E-02	2.40E+02	1.04E-04				
n-Butylbenzene	3.00E-02	3.50E-01	5.40E-01	ND	ND	1.19E+00	1.19E+00						
sec-Butylbenzene	1.50E-02	ND	ND	ND	ND	9.78E-01	9.78E-01						
tert-Butylbenzene	ND	ND	ND	ND	ND	2.44E-01	2.44E-01						
Chlorobenzene	ND	ND	ND	ND	ND	1.43E-01	1.43E-01	5.45E+02	2.62E-04				
Ethylbenzene	ND	ND	ND	ND	2.50E-03	ND	2.50E-03						
Isopropylbenzene	ND	6.70E-01	ND	ND	ND	1.08E+00	1.08E+00						
p-Isopropyltoluene	ND	ND	ND	ND	ND	1.58E-01	1.58E-01						
n-Propylbenzene	ND	2.90E+00	ND	3.90E-01	ND	1.76E+00	2.90E+00						
Methylcyclohexane	NA	1.50E+00	3.60E+00	2.00E+00	ND	ND	3.60E+00						
Napthalene	ND	1.30E-01	4.10E-01	3.00E-01	ND	2.05E+00	2.05E+00	1.30E+02	1.58E-02	7.10E+01	2.89E-02		
Toluene	ND	ND	ND	ND	1.42E-02	ND	1.42E-02					2.00E+02	7.10E-05
Xylenes, Total	ND	ND	ND	ND	5.31E-03	ND	5.31E-03	1.91E+01	2.78E-04	5.06E+02		1.00E+02	5.31E-05
								HI:	**3.16E-02**		**3.30E-02**		**4.06E-03**

Data in units of milligrams per kilogram (mg/kg)

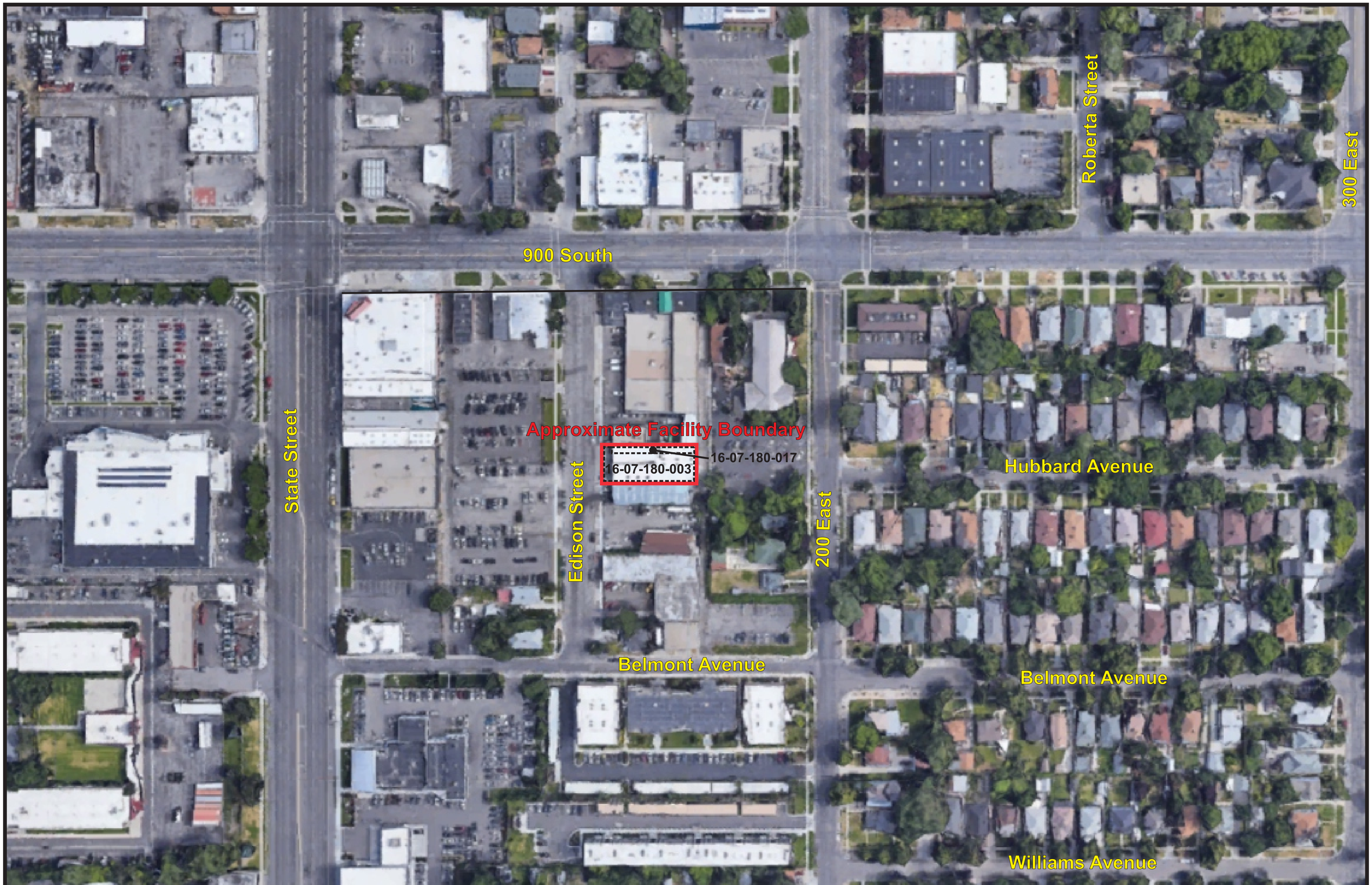
NA - Not analyzed

NA - Nondetected

ESL - Ecological Screening Leve, LANL EcoRisk

Attachment 2

Facility Vicinity and Parcel Map, Facility Feature and Boring and Monitoring Well Location Map, TCE/PCE Concentration in Groundwater Map, and Soil Gas Sample Location and PCE/TCE Concentration Map



N
W E
S

Scale: 1-inch equals approximately 207 feet

Groundwater Flow Direction

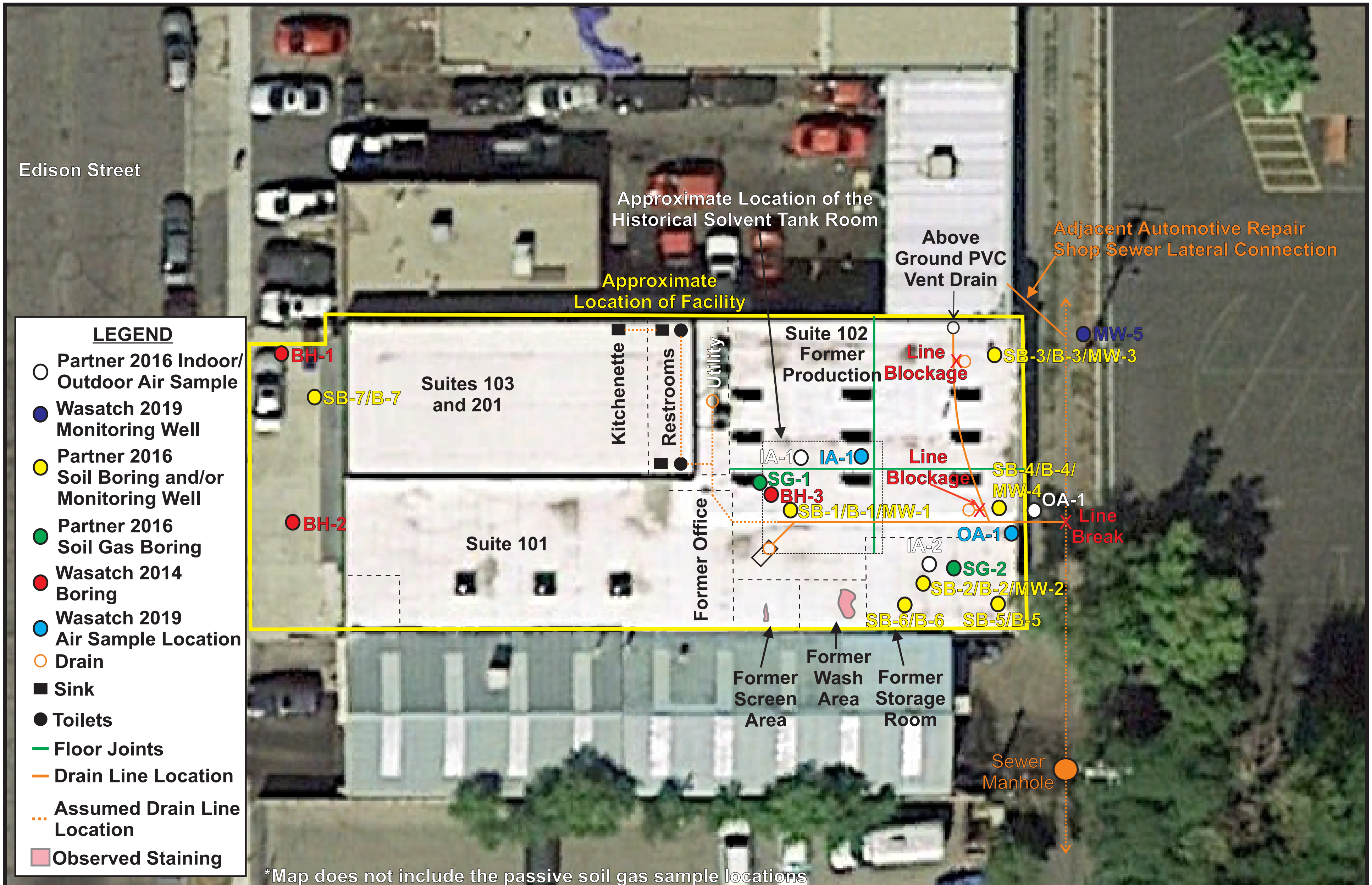
WASATCH ENVIRONMENTAL

Environmental Science and Engineering

Facility Vicinity Map and Parcel Map

Edison Building Facility
933 South Edison Street
Salt Lake City, Utah

PROJECT NO.: 1023-042D | DATE: 4-22-2020 | FIGURE 1



WASATCH ENVIRONMENTAL

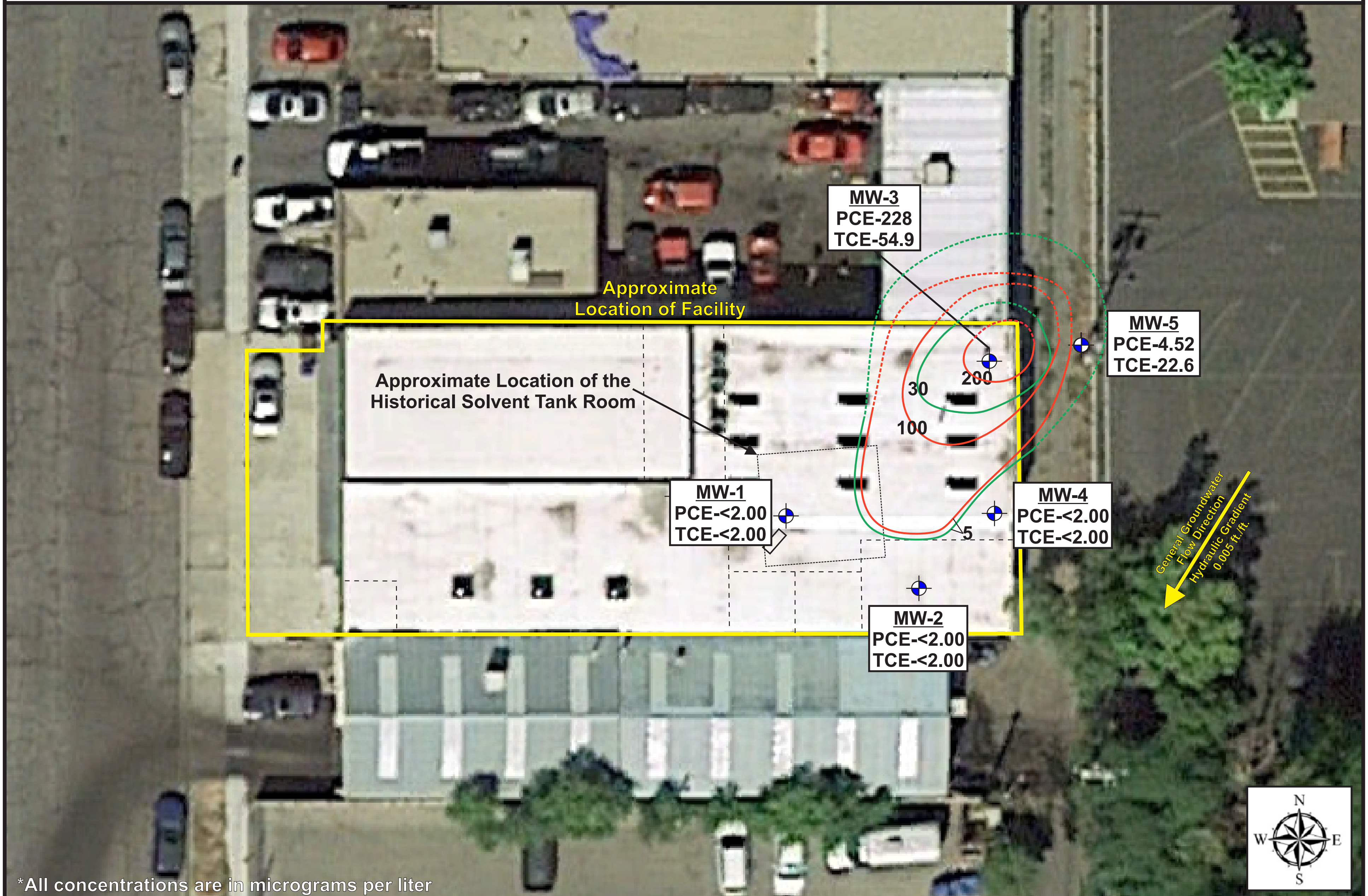
Environmental Science and Engineering

Facility Feature and Boring and Monitoring Well Location Map

Edison Building Facility
933 South Edison Street
Salt Lake City, Utah

PROJECT NO.: 1023-042D	DATE: 1-21-2020	FIGURE 2

EDISON BUILDING FACILITY WEI 1023-042D



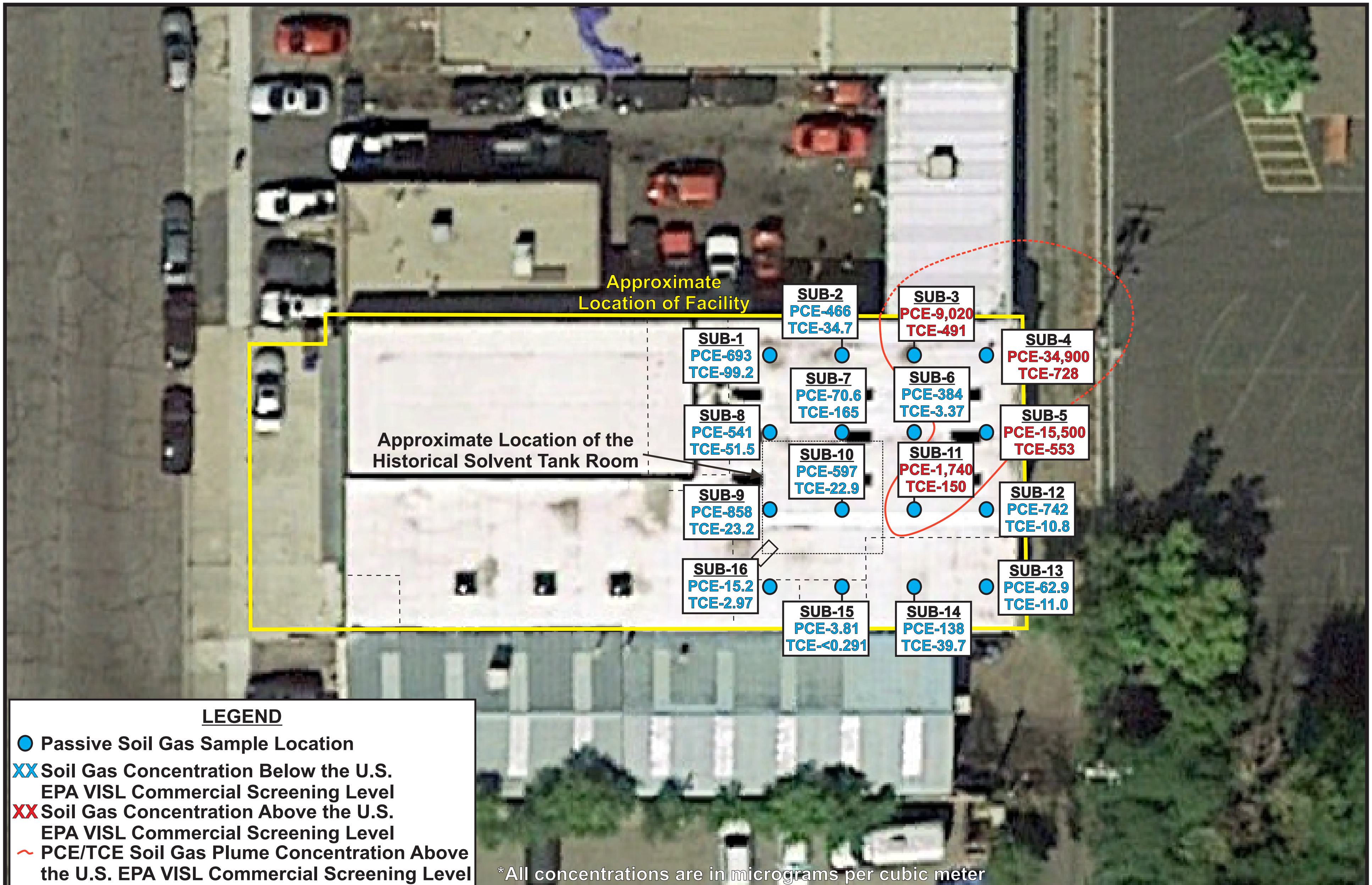
Existing Monitoring Well Location
PCE In Groundwater Contour
TCE In Groundwater Contour

Scale: 1-inch equals approximately 26 feet

TCE/PCE Concentration in Groundwater Map

Figure 3

WASATCH ENVIRONMENTAL



WASATCH ENVIRONMENTAL

Environmental Science and Engineering

Soil Gas Sample Location and PCE/TCE Concentration Map

Edison Building Facility
933 South Edison Street
Salt Lake City, Utah

PROJECT NO.: 1023-042D | DATE: 1-21-2020 | FIGURE 4