

Appendix A

Existing Project Data Review and Design Data Gap Analysis
Technical Memorandum

16 June 2021

Technical Memorandum

To: Mr. Dale Myers, Washington State Department of Ecology
From: Julia Schwarz, Gordon Alexander
Site: Former Circle K 1461, 2350 24th Avenue East, Seattle, Washington
Subject: Existing Project Data Review and Design Data Gap Analysis, Contract C2100069
KJ 2196008.00

This Technical Memorandum provides a summary of Kennedy/Jenks Consultants, Inc.'s (Kennedy Jenks) review of the existing project data referenced in the State of Washington, Department of Ecology (Ecology) Contract C2100069, Appendix C, Statement of Services, Task 1A Pre-Design Services, Item d; and Task 1B, Item a.

The Circle K 1461 Site (site) is a former gasoline service station that operated from 1968 to 1990. The site is located at 2350 24th Avenue East in Seattle, Washington (Figure 1), on the southeastern corner of the intersection of 24th Avenue East and East McGraw Street. Four gasoline underground storage tanks (USTs), one pump island, one waste oil UST, and one heating oil UST were formerly located at the site (Figure 2). The site was redeveloped in 1990 and 1991, and two businesses currently operate at the site. The USTs were removed during redevelopment, and additional remedial and investigation actions were conducted at the site between 1989 and 2017. Residual petroleum hydrocarbons are present at the site in soil and groundwater.

A Cleanup Action Plan (CAP) was prepared for the site by Kennedy Jenks in December 2017. The CAP describes the proposed remedial actions for petroleum hydrocarbons in soil and groundwater at the site. The selected remedial alternative was a combination of *in situ* bioremediation through a groundwater recirculation system for the treatment of groundwater and saturated soils, and a soil vapor extraction (SVE) system to address hydrocarbons in vadose zone soils, as well as the mitigation of potential vapor intrusion (VI).

Under Contract C2100069, Kennedy Jenks will provide engineering design and support for construction of SVE and groundwater recirculation systems. As part of the contracted Predesign Services, Task 1 Pre-Design Services, Task 1A, Item d; and Task 1B, Item a, Kennedy Jenks has reviewed previous reports for the site, listed in Attachment A.

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Pre-Design Data Gaps

Based on a review of the existing project documents, pre-design data gaps have been identified with regards to the extent of impacted media, VI, and designs of the SVE and groundwater recirculation systems.

Extent of Impacted Media

The 2017 Remedial Investigation/Feasibility Study (RI/FS; Kennedy Jenks 2017b) noted the following limitations at the conclusion of the investigation:

- In soil, the gasoline range organic hydrocarbons (GRO) and benzene concentrations exceeding the Model Toxics Control Act (MTCA) Method A cleanup level (CUL) may extend off-property beneath 24th Avenue East in the center of the site.
- The lateral extent of impacted soil is limited on the southern side of the property to a short distance south of boring KJB-13 but may extend to the east of MW-19 beneath the on-property building footprint.
- GRO concentrations in groundwater are highest in the western-central portion of the site and extend off-property to the north beneath East McGraw Street, and may extend off-property to the west beneath 24th Avenue East. The extent of GRO impacts to the north is bounded by wells along the northern side of East McGraw Street and to the west across 24th Avenue East; however, the exact delineation beneath these roadways is not complete due to access restrictions.
- Groundwater hydrology: Although a seasonal fluctuation of 2 feet or less has been observed in most monitoring wells at the site from installation (1989, 2016, or 2017) through completion of RI field activities, a fluctuation of nearly 6 feet has been recorded at northernmost monitoring well MW-11 during this time. The mechanism for this comparatively large fluctuation in groundwater elevation is unknown.

Based on these data gaps, the remediation system(s) will need to be designed conservatively to address contaminant mass beneath buildings and rights-of-way (ROWs) in areas that may not be fully delineated. The groundwater elevation fluctuations on the north of the site at well MW-11 should be addressed through conservative estimates of volumes of water that may be pulled in by an SVE system and will be considered as a site feature during the groundwater recirculation design.

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Vapor Intrusion

Kennedy Jenks conducted an initial (Tier 1) assessment of the potential for VI in the main site structure and adjacent residences following the methods described in the U.S. Environmental Protection Agency's (EPA's) *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites* (EPA 2015). While groundwater concentrations in monitoring wells near on-property commercial structures indicated that potential VI appeared possible, the site groundwater is typically encountered about 10 feet below ground surface (bgs) adjacent to the building, exceeding EPA's vertical separation distance of 6 feet beneath the building slab for dissolved phase hydrocarbon compounds. This suggests that there is adequate vertical distance for biological degradation of petroleum hydrocarbon compounds to prevent VI into on-property buildings.

While not investigated during this assessment, underground utilities could provide preferential pathways for soil vapors into the on-property commercial structures. Consequently, the VI pathway into the on-property structure is considered potentially complete pending further characterization of preferential vapor pathways.

Regarding adjacent residential structures, the RI/FS concluded that it does not appear that VI is a potentially complete exposure pathway for the adjacent residential structures based on EPA's lateral inclusion zone and the vertical separation distance criteria. However, the RI/FS concluded that, in the absence of specific sampling at the residential properties, the VI pathway for off-property residential areas must be regarded as potentially complete.

For off-property utilities, the RI/FS also noted that "due to the high concentrations of volatile petroleum hydrocarbon compounds in groundwater in close proximity to utility corridors (including the 90-inch sanitary sewer along 24th Avenue East), potentially explosive conditions could be created within the sewer line if vapors were able to accumulate and concentrate."

As a result of these data gaps the following is recommended:

- The remedial design should incorporate vapor monitoring locations for the on-property structures.
- If on-property vapor sampling indicates a complete VI pathway, vapor sampling should be conducted during the site remedy to determine whether vapor mitigation is necessary and appropriate for neighboring properties.
- A survey of vapor concentrations should be performed in the nearby off-property area prior to remedial system design to assess the potential for explosive conditions to be created within the nearby sewers.

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- On the basis of the above monitoring, vapor mitigation elements can be assessed and, if necessary, designed under a contract amendment.

Soil Vapor Extraction

The selected remedy for the site includes vapor extraction to address the VI pathway and assist with remediation of vadose zone. A short summary of previous soil extraction systems at the property and potential data gaps for the design of the SVE system are noted below.

A free product recovery, groundwater treatment, and vapor extraction system were installed at the site prior to 6 December 1989 by Chemical Processors, Inc., Environmental Services Division. The SVE component of this system was installed within the former excavation and consisted of horizontal slotted polyvinyl chloride (PVC) vapor extraction piping connected to a blower. Soil vapor was routed through a condensate trap, particulate filter, and a series of granular activated carbon (GAC) filters for treatment. The SVE system reportedly operated from the early 1990s until 1997, at which time it was shut down because no significant hydrocarbons were detected in the extracted soil vapor for 2 consecutive months. GeoEngineers' SVE Schematic Plan (Figure 13) indicates the blower was sized to provide a maximum vacuum of 49 inches water and a maximum extraction flowrate of 98 standard cubic feet per minute (SCFM). GeoEngineers 6 March 1990 report indicates the SVE system was initially set to operate at 15 inches water column vacuum and 80 SCFM. The continued operational details from this system (e.g., flow rates, influent vapor concentrations, radially induced vacuums) were unavailable for review; however, operational details from this system are not expected to be representative of SVE conditions throughout the site as the former SVE system was installed within the UST excavation backfill.

Eco-Vac Services, Inc. of Woodstock, Georgia, tested enhanced or multiphase fluid recovery (MFR) on 9 June 2005. During the testing, vacuum stingers were installed at depths ranging from 15 to 17.5 feet bgs in wells MW-4, MW-8, MW-9, and MW-13 and total fluid extraction was carried out using a vacuum truck. A total of 1,597 gallons of liquid was removed and an estimated 112 pounds of hydrocarbons were removed in the vapor phase, where vapor concentrations were observed ranging from 50,000 parts per million (ppm) down to 7,200 ppm at the end of the 8-hour test. Vapor extraction rates ranged from 29 to 118 cubic feet per minute (cfm) at extraction vacuums ranging from 13 to 19 inches mercury (inches mercury). Vacuum influence was observed out to a distance of 22 feet during testing. The results indicate that the site may be characterized as having very low permeability soils.

The RI/FS and CAP (Kennedy Jenks 2017b; 2017c) depicted a conceptual SVE approach consisting of five (5) SVE wells with radius of influence (ROI) of 30 feet. These documents noted that the SVE system would likely include treatment of off-gas using GAC requiring changeout every 6 to 12 months. The number and configuration of wells are likely to change

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from the RI/FS and CAP based on the design basis for the SVE system, including the design parameters laid out below.

Groundwater is shallow across the site which limits the vacuum that can be applied without removal of significant volumes of water. The site layout will be controlled by:

- Use of vertical, horizontal, or angled wells.
- SVE used alone to extract vapor or the use of multiphase extraction (MPE) to combine the fluid extraction with the vapor removal.
- The cost, effectiveness, and implementability of the system layouts as determined by the points above.

SVE used for VI control will require:

- Special vapor extraction locations configured to provide targeted extraction beneath the existing structures.
- Vapor points used to monitor the subslab vacuums induced.
- A survey of the existing structure is recommended to determine the preferred configuration for the above design elements. This survey will be completed as part of the pre-design.

Based on the system layout described above, the following data gaps will require estimation to inform design.

- Extraction well ROI
- Extraction vacuum and volume
- Vapor mass loading.

Based on previous conversations with Ecology, an SVE pilot study is not able to be performed due to contracting and schedule issues. In lieu of performing a pilot study to accurately estimate the data above, a more conservative approach will be taken. Several options exist, including design of a MPE system, for which a pilot study was conducted, or design of an SVE system using conservative estimates of the information above.

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The completed MPE pilot provides more information compared to designing an SVE system without the inputs noted above. An MPE system could accomplish both groundwater and vapor extraction, similar to the alternative presented in the CAP. The primary difference with MPE, compared to an SVE system combined with a groundwater recirculation system, are that with an MPE system, higher vacuums are induced and both groundwater and vapor are extracted through the same system. If high vacuum MPE with existing wells is to be selected, then the EcoVac data can be used to estimate water production rates.

Alternatively, an SVE system could be designed with the limited existing data but would need to utilize relatively conservative estimates. This may mean additional wells, increased infrastructure such as thermal oxidizer for unknown vapor mass loading, or other; generally resulting in increased system costs.

Bioremediation/Groundwater Recirculation System

The selected remedy for the site also includes a bioremediation approach consisting of a groundwater recirculation system to deliver amendments across the site for *in-situ* treatment of GRO in saturated soils and groundwater. The most critical data gaps were evaluated as part of the pilot testing conducted in March 2017.

A light non-aqueous phase liquid (LNAPL) recovery and groundwater remediation system, consisting of one 30-inch diameter extraction well, recovery trenches, and a treatment system, was operated at the site from late 1989 through 2000. In May 2000, Ecology made the decision to discontinue operation of the system, noting that the remedial options were either to discontinue system operations or to increase the effectiveness of the extraction system with a more expensive, powerful system. The previous system specifications should be evaluated during the design process when considering design components for the groundwater recirculation system.

The RI/FS (Kennedy Jenks 2017b) depicted a conceptual groundwater recirculation approach consisting of seven (7) remediation multi-purpose wells, five (5) proposed multi-purpose wells and two 4-inch monitoring wells that could also be used. The number and configuration of wells is likely to change from the RI/FS based on the design basis for the recirculation system, as well as potential horizontal or slant wells.

The RI/FS noted that the groundwater recovered would require treatment with GAC before adding amendments and being reinjected upgradient. The RI/FS did not specify the carbon change out period, but it was identified as the treatment alternative. However, it is not clear whether increased groundwater concentrations that would result from using surfactants to remove GRO mass from the soil matrix was considered in the selection of treatment alternatives. Use of surfactants is anticipated to significantly increase the GRO concentrations in

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the groundwater and further evaluation of the preferred treatment alternatives (GAC or air stripper) should be completed as part of the of the pre-design.

Based on the pilot testing and data collected to date, the remaining data gaps are primarily about refining the initial evaluation based on known information, rather than actual data gaps. Information that will be evaluated further as part of the pre-design and design process includes:

- Infrastructure layout, which will be controlled by:
 - Access to additional well locations and ability to install infrastructure. Existing infrastructure will be reviewed and used as appropriate.
 - Use of vertical, horizontal, or angled wells.
 - The cost, effectiveness, and implementability of the well configurations and system layouts.
- Based on the system layout, additional data may be necessary to estimate, or conservative estimates can be utilized for extraction and injection well ROI.
- Groundwater Treatment: A complete review of the GRO mass loading in the groundwater will be required to determine the final treatment selection (GAC or air stripping) before adding amendments and reinjecting the treated groundwater.
- Groundwater Analytical Data: Limited information on dissolved iron and hardness was collected as part of the RI/FS; these data may be needed to evaluate fouling in the system due to the addition of oxygen. A Glacier Interim Report (June 1992) noted rust/algae fouling of the 30-inch recovery well requiring cleaning of screen area. In the absence of collecting these data, fouling of the system would need to be evaluated conservatively – i.e., design to allow for periodic cleaning of well screens or other – using existing groundwater geochemical information.

A groundwater recirculation system is not configured as a typical groundwater recovery, treatment, and discharge system. Typically, additional extraction and injection wells are installed to provide the ability to operate in different configurations, providing a variety of flow paths to maximize treatment and reduce concentration rebound. In lieu of conducting additional pilot testing to establish ROIs, conservative ROIs are typically used. Cost savings from not completing the additional pilot testing can be used for additional wells or increased infrastructure, and increased system costs.

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Discrepancies in groundwater elevation at well MW-11 appears to be consistent over the life of the project and is not considered a data gap as much as a site feature that must be evaluated for impact of system operations during the pre-design.

Other General Data Gaps

Other potential data gaps identified for the site include:

- The locations of all utility corridors (which could act as preferential transport pathways) in City ROWs need to be identified. This data gap will be addressed during pre-design activities to locate existing utilities in the adjacent ROWs.
- The route and discharge location of the sanitary sewer lines located in 24th Avenue East and East McGraw Streets need to be identified. The sanitary sewer line in the adjacent roadways will be located and surveyed as part of pre-design activities.
- The power supply at the site should be evaluated to determine whether there is sufficient capacity to run the SVE and groundwater recirculation, and, if not, what would be required to obtain sufficient power. The power supply will be evaluated as part of the pre-design.
- Recirculation systems inevitably require the ability to discharge excess extracted groundwater from time to time. Sanitary Sewer Permit requirements should be investigated to determine schedule, cost, and discharge requirements for treated water, as well as the monitoring requirements from the local Publicly Owned Treatment Works (POTW). This data gap can be addressed through the Permitting task.

Resolution of Data Gaps

The data gaps identified in the previous sections were addressed in a meeting with Ecology and Kennedy Jenks on 9 June 2021. The discussion focused on the preferred solution for each data gap, and Ecology generally concluded that where applicable, utilizing conservative design assumptions was the preferred resolution. Methods agreed upon to address the data gaps, and/or the preferred solutions, are noted in a Data Gaps Table included as Attachment B.

Attachments:


Figure 1: Site Location and Vicinity Map
 Figure 2: Historical Site Features and Monitoring Well Locations
 Attachment A: List of Reviewed Reports
 Attachment B: Data Gaps Table

Figures

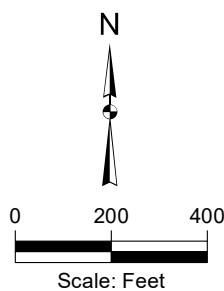


Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors,

Legend

 Site Location

Note:
1. All locations are approximate.

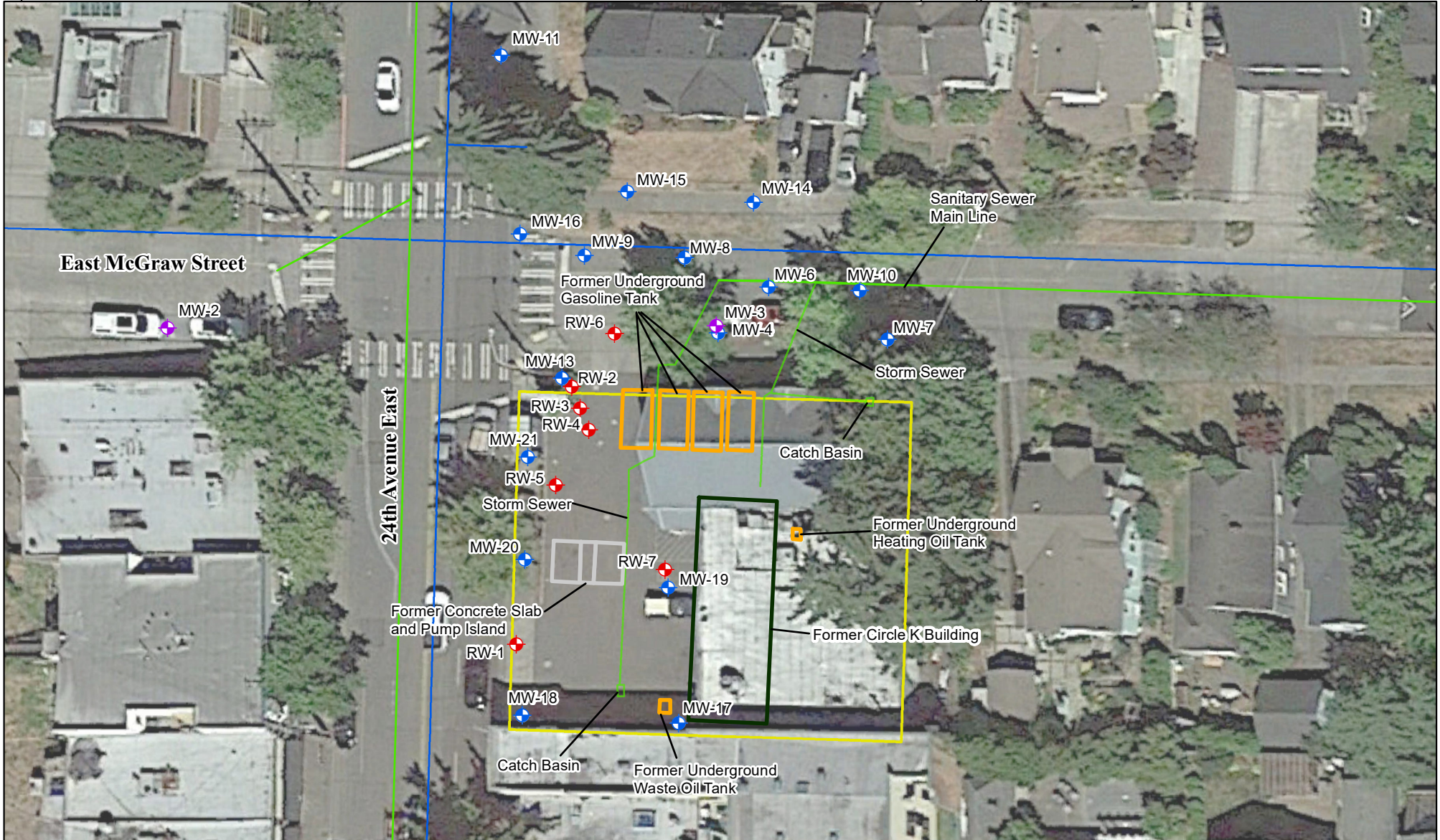


 Kennedy Jenks

Former Circle K Site
Seattle, Washington

Site Location and Vicinity Map

K/J 2196008*00
Figure 1

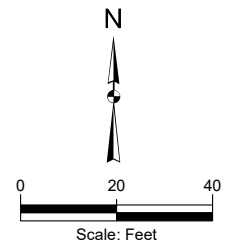


Legend

- Parcel Boundary
- Former Building
- Former Pump Island
- Former Underground Storage Tank
- Sewer Line
- Water Line
- ◆ Monitoring Well
- ◆ Landau Well
- ◆ Remediation Wells

Notes:
 1. All locations are approximate.
 2. Sewer and water line locations are based on available site information and not appropriate for construction purposes.
 3. Former feature locations georeferenced from *Report of Geotechnical Services Subsurface Contamination Study and Remedial Action Monitoring Circle K Facility 1461 Seattle, Washington*, dated 6 March 1990 by GeoEngineers.

KJ Kennedy Jenks
 Former Circle K Site
 Seattle, Washington



Historical Site Features and Monitoring Well Locations

Attachment A

List of Reviewed Reports

Attachment A: List of Reviewed Reports

The following is a list of references used in the preparation of this Data Gap Technical Memorandum.

References

- EA Engineering, Science, and Technology, Inc. 2005. *Investigation Report for Washington State Department of Ecology Mixed Funding LUST Sites*. June 2005.
- EA Engineering, Science, and Technology, Inc. 2006. *Circle K Station #1461, Groundwater Data Summary*. 16 February 2006.
- EA Engineering, Science, and Technology, Inc. 2006. *Circle K Station #1461, Groundwater Monitoring Data Summary*. 11 May 2006.
- EA Engineering, Science, and Technology, Inc. 2006. *Circle K Station #1461, Groundwater Summary for May 2006, Recommendations for Additional Cleanup Action Tests*. 14 August 2006.
- EA Engineering, Science, and Technology, Inc. 2006. *Circle K Station #1461, Groundwater Summary for August 2006, Recommendations for Additional Cleanup Action Tests*. 7 November 2006.
- EA Engineering, Science, and Technology, Inc. 2006. *Circle K Station #1461, Groundwater Summary for October 2006, Recommendations for Additional Cleanup Action Tests*. 21 November 2006.
- EcoVac Services, 2005. *Enhanced Fluid Recovery Results, Event No. 1, Former Circle K (Jay's Cleaners), 2350 24th Avenue E, Seattle, WA*. 13 June 2005.
- GeoEngineers. 1990a. *Report of Geotechnical Services Subsurface Contamination Study and Remedial Action Monitoring Circle K Facility 1461 Seattle, Washington*. 6 March 1990.
- GeoEngineers. 1990b. *Progress Report No. 1 Remedial Monitoring Program Circle K Facility 1461 Seattle, Washington*. 23 August 1990.
- GeoEngineers. 1990c. *Progress Report No. 2 Remedial Monitoring Program Circle K Facility 1461 Seattle, Washington*. 9 November 1990.
- Glacier Environmental Services. 1992. *Report of First Phase Activity at Former Circle K #1461, 2350 24th Avenue East, Seattle, WA*. 1 June 1992.
- Glacier Environmental Services. 1998. *Interim Report Groundwater Treatment System Jay's Cleaners, 2350 24th Avenue East, Seattle, WA*. 28 June 1998.
- Glacier Environmental Services. 2000. *Interim Report Groundwater Treatment System Jay's Cleaners, 2350 24th Avenue East, Seattle, WA*. 11 January 2000.

Attachment A: List of Reviewed Reports

- Glacier Environmental Services. 2001. *Major Discharge Authorization No. 192-01, Jin's Enterprises, 2350 24th Avenue East, Seattle, WA.* 15 January 2001.
- Glacier Environmental Services. 2003. *Field Investigations, 2003, Circle K Station #1461, 2350 24th Avenue East, Seattle, WA.* 15 January 2001.
- Kennedy/Jenks Consultants. 2016a. *Preliminary Summary of Data Gaps, Potential Exposure Pathways, and Proposed Initial Work Tasks Technical Memorandum.* 24 February 2016.
- Kennedy/Jenks Consultants. 2016b. *Remedial Investigation Sampling and Analysis Work Plan, Former Circle K Site, 2350 24th Avenue East, Seattle, WA.* 7 April 2016.
- Kennedy/Jenks Consultants. 2017a. *Pilot Study Work Plan, Former Circle K Site, WA.* 1 February 2017.
- Kennedy/Jenks Consultants. 2017b. *Public Review Draft Remedial Investigation/Feasibility Study, Former Circle K Site, WA.* 14 December 2017.
- Kennedy/Jenks Consultants. 2017c. *Public Review Draft Cleanup Action Plan, Former Circle K Site, WA.* 18 December 2017.
- Washington State Department of Ecology. 2000. *RE: Status of Remediation under Consent Decree with the Department of Ecology at 2350 24th Avenue East, Seattle, WA.* 6 December 2000.
- Washington State Department of Ecology. 2009. *Draft Remedial Investigation/Feasibility Study, Circle K Station #1461, Seattle, WA.* September 2009.
- Washington State Department of Health. 1995. *Health Investigation, Circle K Station #1461.* 9 June 1995.

Attachment B

Data Gaps Table

Circle K 1461

Category	Data Gap	Options for Resolution (initial preferred solution bolded)	Pros/Cons	Decision
Extent of Impacted Media	Extent of soil impacts beneath 24th Avenue East	- Additional investigation in adjacent roadways - Design system based on conservative estimates of soil mass and extent	Additional investigation would require contract amendment. Additional subsurface work within roadways would require extensive permitting and logistics to complete. Extents are bounded on the far side of 24th Avenue East and conservative estimates can be effectively utilized to design the system.	Design system based on conservative estimates of soil mass and extent
Extent of Impacted Media	Extent of soil impacts beneath the on-property building	- Collect additional soil data within building footprint - Design system based on conservative estimates of soil mass and extent	Additional investigation would require contract amendment. Additional subsurface work beneath the building would be intrusive to property operations and would not yield a significant benefit as concentrations near the building are known to attenuate and are bounded on the east side of the building. Conservative estimates can be effectively utilized to design the system.	Design system based on conservative estimates of soil mass and extent
Extent of Impacted Media	Extent of groundwater beneath adjacent roadways	- Collect additional subsurface data from beneath adjacent roadways - Design system based on conservative estimates of contaminant mass and extent	Additional investigation would require contract amendment. Additional subsurface work within roadways would require extensive permitting and logistics to complete. Extents are bounded on the far side of 24th Avenue East and conservative estimates can be effectively utilized to design the system.	Design system based on conservative estimates of contaminant mass and extent
Groundwater	Groundwater elevation fluctuations in MW-11	- Design system based on known groundwater elevation fluctuations in MW-11	Groundwater elevations at MW-11 have been well characterized, and while the mechanism for the relatively larger groundwater elevation fluctuation is unknown, the groundwater elevations at this well can be utilized as a design parameter.	Design system based on known groundwater elevation fluctuations in MW-11
Vapor Intrusion	Potentially complete VI pathway in onsite building due to preferential pathways	- Collect subslab vapor data within building footprint during pre-design - Design system based on conservative estimates of VI in on-property building	Additional information would be valuable to evaluate VI for system design but may require a contract amendment. VI work may be mildly intrusive to property operations. VI design may be accomplished without additional data, and conditions may be assessed during and after remediation to determine if vapor mitigation needs to be extended in time or modified.	Design system based on conservative estimates of VI in on-property building
Vapor Intrusion	Potentially complete VI pathway in neighboring buildings/residences	- Design system using conservative estimates of off-property VI - Gather additional data pre-design to assess on-property VI issues; if on-property VI is an issue, assess VI pathway in neighboring residences - Gather additional data pre-design to assess VI issues in adjacent buildings residences regardless of onsite VI issues - Assume VI issues in neighboring buildings/residences are incomplete and reassess VI in neighboring buildings/residences using remedial system data and VI monitoring infrastructure installed during remedial installation (e.g. wellhead data, groundwater data, soil vapor probe installation, indoor air monitoring, subslab probe installation). Include updated and ongoing VI assessment as part of O&M contractor scope. If updated VI assessment indicates an issue, design mitigation measures as part of a contract amendment.	Additional information would be valuable to close data gaps and potential exposure pathways for system design but is not required to design the system. Additional characterization would require a contract amendment. VI investigation activities including access agreements can be time consuming.	Design system based on conservative estimates of VI in off-property buildings/residences. Reassess VI in off-property buildings/residences using remedial system data and monitoring infrastructure installed during remedial installation. Include updated and ongoing VI assessment as part of O&M contractor scope. If necessary, design mitigation measures as a contract amendment.
Vapor Intrusion	Potential for explosive conditions in adjacent sewer lines	- Gather additional data pre-design to assess conditions in adjacent sewer lines - Gather additional data pre- and post-system installation/startup to evaluate the effect of system operations on potential explosive conditions in adjacent utilities - Design system using conservative estimates of potential for explosive conditions in adjacent sewer lines	Additional (limited) data collected prior to design would be useful to confirm that this is not an issue; however, this information is not required to design the system. Operation of the remediation systems may decrease the potential for explosive conditions rather than increase them.	Design system based on conservative estimates of potential for explosive conditions in adjacent sewer lines

Circle K 1461

Category	Data Gap	Options for Resolution (initial preferred solution bolded)	Pros/Cons	Decision
Soil Vapor Extraction System	System layout, including use of vertical, horizontal, or angled wells	- Evaluate system layout with regard to efficacy, costs, and implementability	This will be conducted as part of the design.	Evaluate system layout (either an SVE or an MPE system) with regard to efficacy, costs, and implementability.
Soil Vapor Extraction System	Soil vapor extraction vs. multi-phase extraction	- Soil vapor extraction system: design with existing data can be implemented. - Multi-phase extraction (MPE) system: install with higher vacuum system as a single unit to combine groundwater extraction and vapor extraction as demonstrated at the site previously. - Alternatives Analysis to evaluate options?	Since an SVE pilot study was not conducted, more information is available to design a MPE system compared to an SVE system. However, SVE was designated in the CAP. MPE is similar to the remedial alternatives chosen in the CAP but would utilize larger vacuums to extract water and vapor with the same infrastructure. Design/install of MPE would likely be more expensive than separate groundwater extraction/recirculation and SVE systems. SVE system more amenable to expansion to allow VI treatment than MPE systems.	Conduct an alternatives analysis to evaluate the costs, efficacy, and implementability of both an SVE system and an MPE system; provide Ecology with a recommendation of the preferred alternative.
Soil Vapor Extraction System	SVE Design Basis Data: - Extraction well ROI - Extraction vacuum and rates - Vapor mass loading	- Conduct SVE pilot study to estimate ROI - Design/install SVE vapor collection system. Bring in initial operation with temporary thermal oxidation for startup before conversion to Granular Activated Carbon (GAC) - Design SVE system using conservative estimates of ROI - Design MPE system utilizing data from MPE pilot study	Conducting an SVE pilot study is the preferred method to optimize the system design. However, since pilot testing is not feasible under the current contracting mechanism, there is a preference towards using existing information and conservative estimates to design the system without a pilot. Alternatively, an MPE system, for which a pilot was conducted, could be designed.	Conduct an alternatives analysis to evaluate costs, efficacy, and implementability. Depending on the chosen alternative, design/install either an SVE or MPE system. Design SVE system using conservative estimates or design MPE system utilizing data from MPE pilot study.
Bioremediation/ Groundwater Recirculation System	Infrastructure Layout	- Evaluate system layout with regard to efficacy, costs, and implementability	The previous pilot study provides sufficient information to evaluate this as part of the design and pre-design.	Evaluate system layout with regard to efficacy, costs, and implementability
Bioremediation/ Groundwater Recirculation System	Extraction and injection well ROI	- Design system using conservative estimates of ROI	The previous pilot study provides sufficient information to evaluate this as part of the design and pre-design.	Design system using conservative estimates of ROI.
Bioremediation/ Groundwater Recirculation System	Groundwater system mass loading to determine the treatment selection (GAC vs. air stripping)	- Evaluate mass loading using existing data to determine treatment selection	The previous pilot study provides sufficient information to evaluate this as part of the design and pre-design.	Evaluate mass loading using existing data to determine treatment selection.
Bioremediation/ Groundwater Recirculation System	Dissolved iron and hardness information to evaluate system fouling	- Collect additional groundwater geochemical data to assess fouling - Utilize limited existing information to assess fouling as best as possible, and utilize conservative design assumptions	Limited data exists to evaluate this; the existing data can be used to assess fouling as best as possible and design the system based on conservative assumptions. Collection of additional data would require a contract amendment.	Utilized limited existing information to assess fouling and utilize conservative design assumptions
General	Locations of utility corridors	- Locate and survey utility corridors and depths, where possible, during pre-design task	This is a task included as part of pre-design.	Locate and survey utility corridors and depths, where possible, during pre-design task
General	Route and discharge locations of sanitary sewers in adjacent roadways	- Locate and survey utility corridors during pre-design task and utilize existing GIS layers to evaluate discharge locations	This is a task included as part of pre-design.	Locate and survey utility corridors during pre-design task and utilize existing GIS layers to evaluate discharge locations
General	Power supply capacity	- Evaluate current power supply during pre-design phase - Evaluate current power supply and potential upgrades during design	While this task could be evaluated as part of the design, it is advantageous to evaluate this during pre-design since power upgrades could be costly and time-consuming.	Evaluate current power supply during pre-design phase
General	Sanitary sewer permit requirements	- Address through existing Permitting task - Based on design calculations, evaluate if excess water will be created through system operation, and if needed, assess permit requirements	While this task could wait for a later time (system implementation), it is advantageous to know what will be required if water needs to be routed to the sanitary sewer.	Address through existing Permitting task

30 June 2021

**Circle K Check-in Call
Meeting Notes**

Attendees:

Dale Myers (Ecology, Project Manager)
Sunny Becker (Ecology, Environmental Engineer)
Julia Schwarz (KJ, Project Manager)
Ben Fuentes (KJ)
Gordon Alexander (KJ)
Jarod Fisher (KJ)
Craig Dockter (KJ)
Cayla Whiteside (KJ)

Objective: The goal of this meeting is to update the Washington State Department of Ecology (Ecology) on KJ's initial thoughts on soil vapor extraction (SVE) vs. dual-phase extraction (DPE) following the alternatives analysis, present initial process diagrams, and get agency buyoff on the approach prior to moving forward with the EDR.

Notes:

Summary of Tasks Completed in 2021:

- Updated utility survey to determine where the major utilities are located. Will have an updated basemap soon.
- Working with subs to complete pre-design tasks:
 - Permitting task is ongoing, to understand what permits will be required.
 - Geotechnical to understand backfill requirements and constraints on design.
 - Horizontal Wells (Macauley Trenchless): if we were to put in horizontal wells, understand what the costs, constraints, and other site related information are.
- Data Gaps Memo
 - Data Gaps Technical Memo was finalized in early June.
 - KJ and Ecology had a call earlier in June to discuss the results.
 - It was decided that, where possible, Ecology prefers to use conservative design assumptions to design the system and avoid extra effort and potential contract changes associated with pilot testing and additional monitoring.
 - The CAP calls for an SVE system for remediation of residual soil impacts and implementation of a GW recirculation system with injection of bioaugmentation reagents. KJ identified a process option alternative for SVE system implementation which is a DPE system. Similar to SVE, DPE addresses residual hydrocarbon contamination of the vadose zone and can also be designed to protect against Vapor Intrusion (VI). Both systems would pull water and air from the ground for treatment, but they differ in the method and level of vacuum applied.
 - KJ was tasked with conducting an alternatives analysis comparing an SVE and DPE system and providing Ecology with a recommended alternative.

Overview of Alternatives Analysis:

- Evaluated system costs, restoration time frame, O&M costs, and difficulty of implementation.
- Reviewed the draft process flow diagrams to provide a conceptual process flow diagram for the two systems.
- The site soil conditions are low permeability.
- Both systems include extracting and recirculating groundwater using different equipment and configurations. Both provide mass removal from groundwater and vapor, just using different equipment.
- DPE uses a higher vacuum than a normal SVE system causing groundwater to be entrained with the vapor. The groundwater is carried to a knockout tank where the liquid is removed, and the

vapor stream is then treated and discharged to atmosphere. The water stream is treated via filtration and granular activated carbon (GAC) before discharge or reinjection. The benefit of the DPE is that the high vacuum pulls more air out of the fine-grained materials that underly the site.

- The SVE system has the same beginning process flow as DPE but the water that is extracted would be incidental. The air is discharged after treatment via GAC vessels. There would be separate wells for water extraction using submersible centrifugal pumps. Extracted water would be treated via filtration and GAC vessels before being recirculated and reinjected. Due to the limited flow and vacuum that can be applied because of the shallow groundwater and low permeability soils, more vapor extraction wells are needed for an SVE system than for DPE system, as shown in the draft flow diagram.
- Both SVE and DPE might need to use an alternative, high-capacity air treatment system (a thermal or catalytic oxidizer) on the air stream initially until the vapor concentrations drop, in order to control the GAC costs.
- Modifying the vapor extraction system to dual phase extraction is not a major change to the approach defined in the CAP and would not require a modification of the RI/FS or CAP and therefore the documents would not need to go out again for public comment. This understanding was confirmed by Ecology.
- Based on the results of the alternatives analysis, Kennedy Jenks recommends moving forward with a DPE system to implement groundwater and soil vapor mass removal as noted in the preferred alternative identified in the CAP (SVE + GW recirculation). Ecology agreed with the approach of DPE vs. a separate SVE and GW recirculation system.
- Disproportionate cost analysis:
 - Used to quantitatively compare the SVE and DPE systems. In a lot of ways, the two systems are similar.
 - O&M might be slightly easier on an SVE system because the SVE system would shut down after a couple of years (the GW recirculation system would continue for the duration of the project). This would simplify O&M after SVE shutdown.
 - Implementability of DPE is slightly more advantageous since there is less infrastructure and less wells, resulting in less of the parking lot shut down at one time.
 - Preliminary cost estimates for the SVE and DPE system show that DPE would be less expensive. Note that the SVE system costs do not currently include groundwater circulation.

Recommended Approach: DPE system.

Upcoming Tasks:

- Develop Draft EDR & Opinion of Probable Cost by end of July.

Discussion:

- SVE/DPE systems could be implemented using either horizontal or vertical wells.
- In the DPE system, vertical wells would be screened in both the saturated and unsaturated zones.
- There was an SVE system in the former UST area that was previously shut down. There is no information or figures from the operation of that system. Limited understanding of what the results were.
- Elements of the former GW recirculation and SVE systems remain on site. The SVE system didn't run for very long but there aren't good operational details on that system available. GW recirculation was relatively effective.
- The former SVE system operated in and around in the pea gravel area where the excavation backfill is located. This system blew through its carbon treatment very quickly in the first few months. After a couple of years, it wasn't accomplishing much treatment. The existing documents noted that it may have been more efficient, in hindsight, to have used a thermal oxidizer initially to reduce the GAC consumption. Once the system reached a point within the pea gravel area where vapor diminished, it was decided to shut down the SVE system. There is little documented data available in the record to confirm the above statements.

- The current system design will address the site as a whole and not just the area near the tank excavation area. It will be more focused on the parking lot area and the areas adjacent to the existing buildings.
- Vertical wells are more advantageous than horizontal wells in that you can locate your vertical extraction wells more easily around the site. The primary reason for implementing horizontal wells is because some of the contamination extends into 24th Avenue East, and it is difficult to get vertical wells located in the ROW or sidewalk, so horizontal wells would potentially be able to address contamination under 24th Ave E.
- The previously completed SVE Pilot test was not getting a large radius of influence from the SVE wells. DPE system has a higher vacuum so these wells would have a greater radius of influence as documented in previous DPE pilot testing completed onsite. With the horizontal wells, it's a bit more unknown what ROI you would be able to achieve, and heterogeneity of the subsurface can influence the areas where this technology can be applied.
- **KJ to share the Draft Process Flow Diagrams and Alternatives Comparison documents with Ecology to review.**
- Ecology gave verbal approval of the DPE System for moving forward. KJ to move forward with the EDR and OPC with the design of the DPE system.

EDR and Design Plans:

- The EDR will lay out the basis of design, confirm the rationale for the selected system, identify the components of the system, provide a conceptual layout, and include more details of the system.
- The EDR will be a conceptual design, but the Plans and Specs will have the precise locations and detailed information on the implementation.
- By establishing the conceptual layout in the EDR, both KJ and Ecology will be able to understand the basis of the system so we are all on the same page where we will be heading in the future.
- There will be a Draft EDR, Final EDR, and then 50% design, 90% design, 100% design packages.
- The number of wells and general location and other components should be finalized by the final EDR, but these are subject to change during the design process. Ecology will be involved in any changes that need to be made. Examples of changes include shifting well locations due to permitting or construction requirements.
- The CAP notes that there is a potential VI pathway but that has not been confirmed. During system operation, KJ recommends air quality monitoring. No indoor air sampling has been done before. The draft EDR will propose methods for further screening this exposure pathway during system operation. Air or sub-slab vapor sampling are two potential options.
- The effectiveness of the DEP system will be monitored by measuring the mass removal via the inlet concentrations of VOCs to the system and by continued groundwater monitoring to document drops in groundwater concentrations over time.

Table 1: Alternatives Analysis of SVE vs. MPE

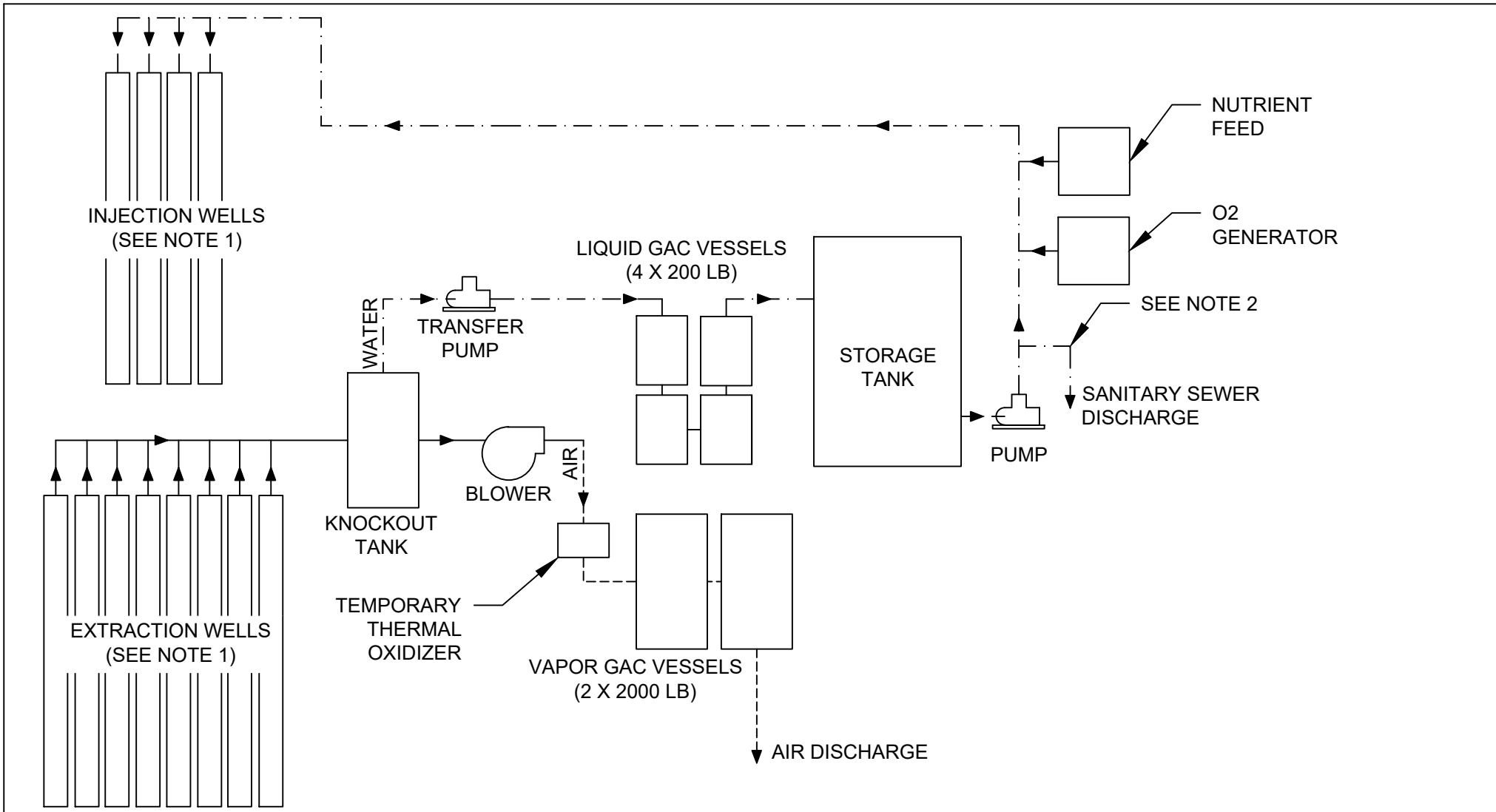
Circle K 1461
 Washington State Department of Ecology
 30 June 2021

DRAFT

		ALTERNATIVE 1 SVE (plus Groundwater Recirculation)	ALTERNATIVE 2 DPE
Restoration Timeframe	15%	6 Ability to change flow paths may decrease amount of concentration rebound. Recirculation system expected to run for approximately 5 years, SVE system for approximately 2 years.	6 Higher vacuums may lead to faster/easier cleanup of soils in the vadose zone. System expected to run for 5 years.
O&M	15%	7 SVE plus groundwater recirculation would have slightly more infrastructure than DPE due to the potential for additional pumps or wells needed. However, operationally, the recirculation system could allow for more flexibility in how the system would operate (e.g. which wells to inject into, changing flow paths). O&M on just the recirculation system would last longer than on the SVE system, simplifying O&M after SVE shutdown.	6 DPE has less infrastructure. However, dealing with both water and vapor in one system could lead to additional mechanical issues compared to one system for groundwater and one for SVE. Less concerned about how much water would be collected through the system since that is a feature of the system. O&M is only on one system (and blower) so is made simpler. Recirculation would still be included in this alternative to allow flexibility in how the system would operate (e.g. which wells to inject into, changing flow paths), but slightly fewer wells would mean less flexibility in operation.
Protectiveness	15%	6 Both systems equally protective of VI and would reduce contaminant concentrations at the site.	6 Both systems equally protective of VI and would reduce contaminant concentrations at the site.
Permanence	15%	8 Ability to change flow paths may decrease amount of concentration rebound.	7 Higher vacuums may lead to faster/easier cleanup of soils in the vadose zone.
Long-Term Effectiveness	10%	7 Once contaminant mass is removed, effect is permanent.	8 DPE may be more effective in unsaturated soils. Once contaminant mass is removed, effect is permanent.
Short-Term Risks	10%	7 Remediation worker risk due to potential contact with impacted media during installation, operation, and maintenance. Moderate degree of risk to workers (contact with impacted media) and minimal risk to the community and environment (discharge of treated air and water).	7 Remediation worker risk due to potential contact with impacted media during installation, operation, and maintenance. Moderate degree of risk to workers (contact with impacted media) and minimal risk to the community and environment (discharge of treated air and water).
Implementability/Constructability	15%	7 Installation between the systems would be similar, but may be slightly more complicated with SVE because of the access needed during implementation (due to number of wells).	8 Installation between the systems would be similar, but may be slightly easier with DPE due to fewer wells being needed and less infrastructure (fewer pumps).
Public Concerns	5%	5	5
Total Weighted Benefits		6.8	6.7
Estimated Cost (millions)		\$2.419	\$2.165
Benefit/Cost Ratio		2.8	3.1
		DPE is the recommended alternative.	

Notes:

Alternatives are ranked on a scale of 1 to 10 based on how each alternative satisfies the listed criteria (1 = does not meet criteria, 10 = meets criteria completely). Cost for alternative 1 includes SVE only (not groundwater recirculation costs). With the costs for groundwater recirculation, DPE is more cost effective.



NOTES:

1. SYSTEM WILL BE OPERATED TO ALLOW FOR FLEXIBILITY WITH REGARDS TO FLOW PATH AND WELL USAGE. WELLS USED FOR EXTRACTION MAY ALSO BE USED FOR REINJECTION WHERE FEASIBLE AND VICE VERSA.
2. GROUNDWATER INITIALLY EXTRACTED FROM THE SYSTEM IS EXPECTED TO BE DISCHARGED TO THE SANITARY SEWER. ONCE GROUNDWATER CONCENTRATIONS ARE AMENABLE TO BIOREMEDIATION VIA REINJECTION, WATER WILL BE REINJECTED AS POSSIBLE. EXCESS WATER WILL BE SENT TO SANITARY SEWER. VOLUMES AND FLOW RATES WILL BE DETERMINED DURING OPERATION.

DRAFT

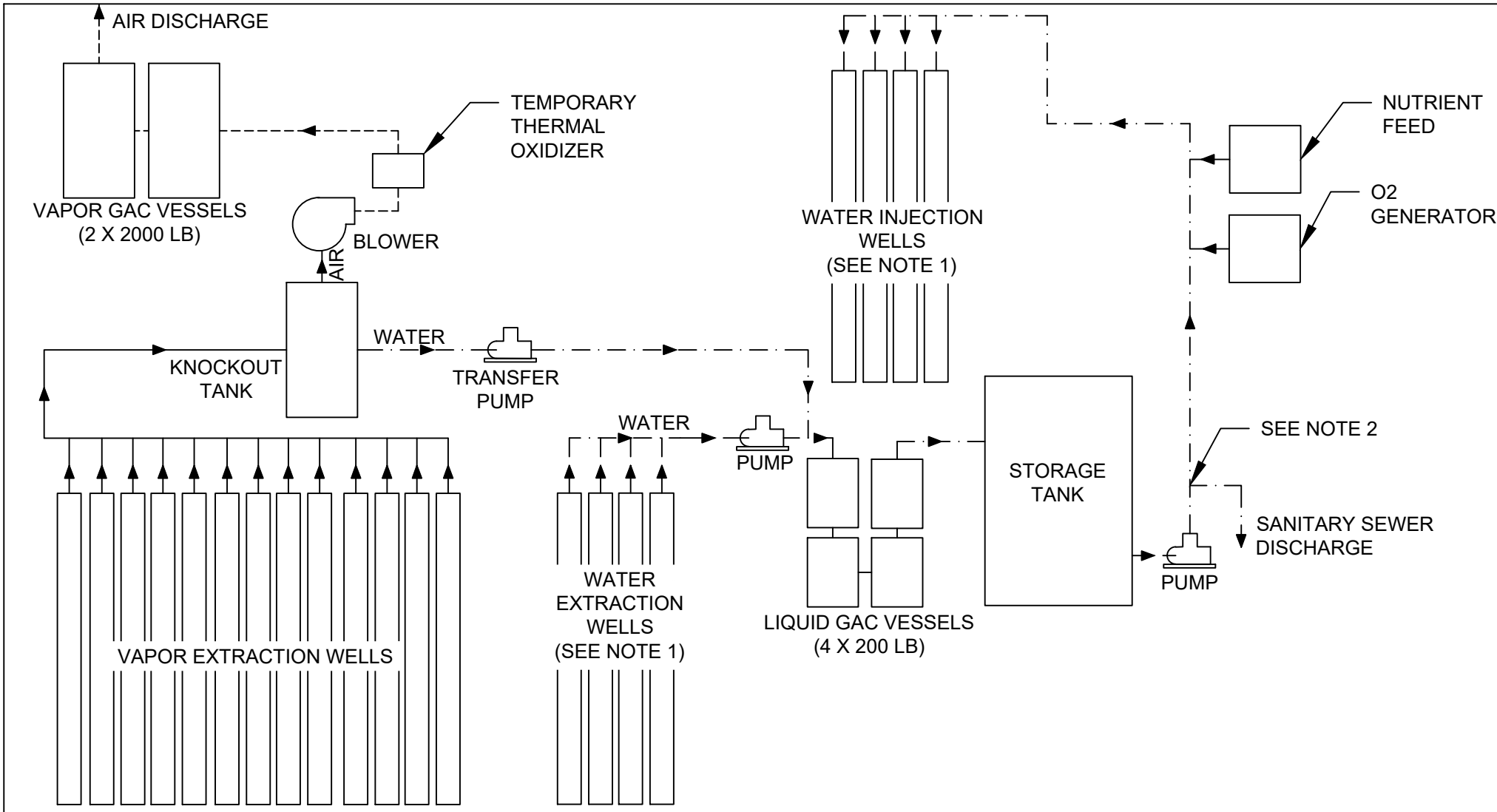
Kennedy/Jenks Consultants

FORMER CIRCLE K SITE
SEATTLE, WA

DUAL PHASE EXTRACTION SYSTEM

K/J 2196008*00
JUNE 2021

FIGURE 1



NOTES:

1. SYSTEM WILL BE OPERATED TO ALLOW FOR FLEXIBILITY WITH REGARDS TO FLOW PATH AND WELL USAGE. WELLS USED FOR EXTRACTION MAY ALSO BE USED FOR REINJECTION AND VICE VERSA.
2. GROUNDWATER INITIALLY EXTRACTED FROM THE SYSTEM IS EXPECTED TO BE DISCHARGED TO THE SANITARY SEWER. ONCE GROUNDWATER CONCENTRATIONS ARE AMENABLE TO BIOREMEDIATION VIA REINJECTION, WATER WILL BE REINJECTED AS POSSIBLE. EXCESS WATER WILL BE SENT TO SANITARY SEWER. VOLUMES AND FLOW RATES WILL BE DETERMINED DURING OPERATION.

DRAFT

Kennedy/Jenks Consultants

FORMER CIRCLE K SITE
SEATTLE, WA

**SOIL VAPOR EXTRACTION AND
GROUNDWATER RECIRCULATION SYSTEM**

K/J 2196008*00
JUNE 2021

FIGURE 2

Appendix B

GAC Vessel Sizing and Removal Efficiency Information

Cayla Whiteside

From: Turek, Chris J <christopher.turek@evoqua.com>
Sent: Tuesday, June 29, 2021 10:14 AM
To: Cayla Whiteside
Cc: Julia Schwarz; Gordon Alexander; Morrical, Thomas C; Markson, David R; Fontana, Matthew P
Subject: RE: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

Hi Cayla,

I've done some additional research on our removal % of constituents within the water you're treating.

Our general rule of thumb is that our vessels tend to have 95% efficacy in removing contaminants from a waste stream. So for the worst case well, the incoming water is at 31 ppmw benzene. At 95% removal, your effluent will be at about 1.5ppmw. That's quite far above your discharge limit of 0.07ppmw (mg/L). A second pass through a separate vessel will get us close to your limit at 0.077ppmw, and this is for the worst case well scenario.

Let me know what your thoughts are on this.

Thank you,

Christopher J. Turek
Inside Sales Specialist – Western Region
ProAct Environmental Solutions

Evoqua Water Technologies LLC
Office: +1 (714) 228-8826
Mobile: +1 (661) 369-6151
Email: christopher.turek@evoqua.com
www.evoqua.com

From: Turek, Chris J
Sent: Monday, June 28, 2021 2:29 PM
To: Cayla Whiteside <CaylaWhiteside@kennedyjenks.com>
Cc: Julia Schwarz <JuliaSchwarz@kennedyjenks.com>; Gordon Alexander <GordonAlexander@KennedyJenks.com>; Morrical, Thomas C <thomas.morrical@evoqua.com>; Markson, David R <david.markson@evoqua.com>; Fontana, Matthew P <matthew.fontana@evoqua.com>
Subject: RE: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

Good Afternoon Cayla,

Thank you for reaching out with this question! Given all these monitoring stations, I chose to use the worst case scenario to run some calculations so that your time between changeouts ends up being longer than what I calculated. That worst case scenario was well KJB-8 with 110,000 ug/L of gasoline range organics. I performed this calculation using all of the constituent organics (Benzene, Toluene, etc) which did not add up to 110,000. If you know of what the remaining 24,000 ug/L of contaminants are, it would help make my calculations more accurate.

For well KJB-8, I calculated a usage rate of 11.4 lbs of GAC per 1000 gallons of water. This simplifies down to 0.0114 lbs of GAC per gallon of water through the system. At 2 gallons per minute, we'll run 120 gallons per hour. I don't know how long these will run each day so I assumed 10 hrs, or 1200 gallons. At that rate, the worst case well would use 13.68 lbs of

carbon per day. At that rate, **it would take 14.6 days to exhaust one 200 lb drum.** With four (4) 200 lbs drums, **you would need to change out all four as soon as 2 months into treatment.** Replacement would be easy and we can have replacement drums ready to swap out the spent ones in advance of any breakthrough. If this changeout window is too short, we can look into larger vessels to extend the treatment time.

I will get back to you on your discharge limits just to be sure of what I'm relaying to you, but I believe we should be able to meet those requirements in the effluent coming out of the drums; especially in a lead/lag configuration.

If you have any further questions, feel free to let me know!

Thank you,

Christopher J. Turek
Inside Sales Specialist – Western Region
ProAct Environmental Solutions

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Office: +1 (714) 228-8826
Mobile: +1 (661) 369-6151
Email: christopher.turek@evoqua.com
www.evoqua.com

From: Cayla Whiteside <CaylaWhiteside@kennedyjenks.com>
Sent: Monday, June 28, 2021 11:26 AM
To: Turek, Chris J <christopher.turek@evoqua.com>
Cc: Julia Schwarz <JuliaSchwarz@kennedyjenks.com>; Gordon Alexander <GordonAlexander@KennedyJenks.com>
Subject: RE: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

[This message came from an external mail server outside of the company.]

Hi Chris,

We have some pretty high VOC concentrations in the groundwater on the site that we will be running through these vessels. I am attaching two samples of groundwater analytical results from 2017. The flow rate through the liquid phase GAC vessels would be approximately 2 gpm. We would like to discharge the treated water to the sewer, which has the following chemical limits:

- Benzene = 0.070 mg/L
- Ethylbenzene = 1.7 mg/L
- Toluene = 1.4 mg/L
- Total Xylenes = 2.2 mg/L
- Lead = 2 mg/L (daily avg.)
- Fats, Oils, Grease (FOG) = 100 mg/L
- settleable solids = <7ml/L
- Pure gasoline is prohibited

With this in mind, we have a couple of additional questions:

- For the liquid phase GACs: Is 4 vessels at 200 lbs each sufficient to handle these concentrations or would you recommend larger sized vessels?
- How often would the vessels need to be replaced?

Let me know if you have any questions or need more information.

Best,



Cayla Whiteside | Staff Engineer

275 Battery St.,
Suite 550, San Francisco, CA 94111
Direct: (925) 953-1522
Teams: CaylaWhiteside@kennedyjenks.com

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From: Turek, Chris J <christopher.turek@evoqua.com>
Sent: Monday, June 21, 2021 4:11 PM
To: Cayla Whiteside <CaylaWhiteside@kennedyjenks.com>
Cc: Morrical, Thomas C <thomas.morrical@evoqua.com>; Markson, David R <david.markson@evoqua.com>; Fontana, Matthew P <matthew.fontana@evoqua.com>
Subject: RE: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

Hi Cayla,

No problem! If you need a full written proposal, let me know and I can produce one in about a day or two.

Thank you,

Christopher J. Turek
Inside Sales Specialist – Western Region
ProAct Environmental Solutions

Evoqua Water Technologies LLC
Office: +1 (714) 228-8826
Mobile: +1 (661) 369-6151
Email: christopher.turek@evoqua.com
www.evoqua.com

From: Cayla Whiteside <CaylaWhiteside@kennedyjenks.com>
Sent: Monday, June 21, 2021 4:07 PM
To: Turek, Chris J <christopher.turek@evoqua.com>
Cc: Morrical, Thomas C <thomas.morrical@evoqua.com>; Markson, David R <david.markson@evoqua.com>; Fontana, Matthew P <matthew.fontana@evoqua.com>
Subject: RE: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

[This message came from an external mail server outside of the company.]

Thank you Chris!

I'll make a note about the shipping estimates. I sent this info on to my PM and will reach out if we have any questions.

Thanks again.

Best,



Cayla Whiteside | Staff Engineer

275 Battery St.,
Suite 550, San Francisco, CA 94111
Direct: (925) 953-1522
Teams: CaylaWhiteside@kennedyjenks.com

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From: Turek, Chris J <christopher.turek@evoqua.com>

Sent: Friday, June 18, 2021 2:01 PM

To: Cayla Whiteside <CaylaWhiteside@kennedyjenks.com>

Cc: Morrical, Thomas C <thomas.morrical@evoqua.com>; Markson, David R <david.markson@evoqua.com>; Fontana, Matthew P <matthew.fontana@evoqua.com>

Subject: RE: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

Good Afternoon Cayla,

I hope you're having a great Friday!

As requested, here is a preliminary quote for this project:

Two (2) VSC2000 vapor carbon units prefilled with carbon will be \$8,743.57 each.

Four (4) ASC200 liquid phase carbon units prefilled with carbon will be \$500 each. Our ASC200 unit is the closest to 160 lbs that we have available.

Total project cost before shipping and taxes: **\$19,487**.

I've attached the specification summaries for both units for you to look over. With the VSC2000 units, we're coming up against the vacuum max at 12 in Hg, however it's possible to run these in parallel and split the vacuum as to not stress these units.

As we get closer to the project date, I can give you firm shipping estimates. As of right now, shipping rates are volatile so I don't want to over/under quote you.

Evoqua also performs reactivation for spent carbon if needed.

Feel free to give me a call if you'd like to talk about this quote.

Have a great weekend!

Christopher J. Turek

Inside Sales Specialist – Western Region
ProAct Environmental Solutions

Evoqua Water Technologies LLC

Office: +1 (714) 228-8826

Mobile: +1 (661) 369-6151

Email: christopher.turek@evoqua.com

www.evoqua.com

From: Cayla Whiteside <CaylaWhiteside@kennedyjenks.com>
Sent: Wednesday, June 16, 2021 2:41 PM
To: Turek, Chris J <christopher.turek@evoqua.com>
Subject: GAC Vessel Quote for Gasoline Removal Project in Seattle, WA

[This message came from an external mail server outside of the company.]

Hi Chris,

Thank you for speaking with me earlier today. The GAC vessels will be used as part of a multiphase extraction, groundwater recirculation system composed of 7 extraction wells and 4 injection wells.

Flow rate: approximately 200 cfm
Pressure: 12 inches Hg (for the blower that is doing the extracting)
Vapor GAC: 2 vessels at 2000 lbs ea
Liquid GAC: 4 vessels at 160 lbs ea

Contaminant is gasoline.
Reactivated carbon is okay.

Let me know if you have any questions or if you need any additional information from me.

Best,



Cayla Whiteside | Staff Engineer

275 Battery St.,
Suite 550, San Francisco, CA 94111
Direct: (925) 953-1522
Teams: CaylaWhiteside@kennedyjenks.com

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Appendix C

Groundwater ROI Calculation Information

Appendix C. Calculation of Groundwater Radius of Influence

Cooper Jacob Method

Parameter	Value	Units	Notes
Q, flowrate	0.4 gpm 77 ft ³ /day		Allowable pumping rate
t, time	1.00E+05 days		Assumed time
S, storativity	0.1 -		Typical for unconfined aquifer
DTW	7.5 ft		Average depth-to-water based on site conditions
base	19.5 ft		Average depth to base of aquifer based on site conditions
b =	12 ft		Aquifer thickness, calculated
K	2.5 ft/day		Posited hydraulic conductivity
T0 =	30 ft ² /day		Transmissivity, calculated

$$s = \frac{Q}{4\pi T} w(u) \quad (1)$$

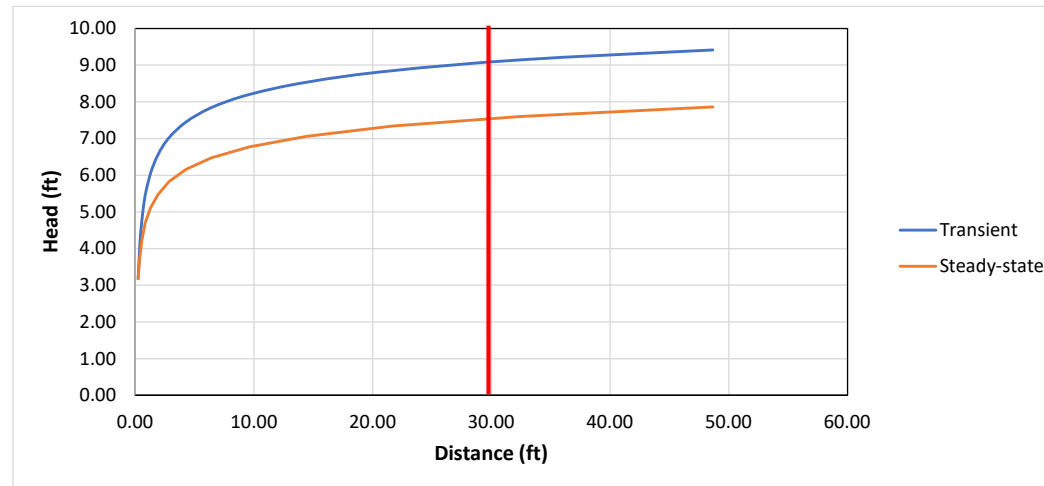
$$u = \frac{r^2 S}{4Tt} \quad (2)$$

= Assumption
 = Calculation
 = Site Conditions

$$w(u) \cong -0.5772 - \ln(u) \quad (4)$$

Distance, d (ft)	u	w(u)	s (drawdown)	T (rev1)	u (rev1)	w(u) (rev1)	s (rev1)	T (rev2)	u (rev2)	w(u) (rev2)	s (rev2)	Transient	Steady-State
												h (Cooper-Jacob)	Dupuit (h2)
0.25	5.21E-10	20.80	4.25	19.38	0.00	20.36	6.44	13.91	0.00	20.03	8.83	3.17	3.17
0.38	1.17E-09	19.99	4.08	19.79	0.00	19.57	6.06	14.85	0.00	19.28	7.96	4.04	3.75
0.56	2.64E-09	19.18	3.92	20.21	0.00	18.78	5.69	15.76	0.00	18.53	7.20	4.80	4.25
0.84	5.93E-09	18.37	3.75	20.62	0.00	17.99	5.35	16.64	0.00	17.78	6.55	5.45	4.69
1.27	1.33E-08	17.55	3.59	21.04	0.00	17.20	5.01	17.48	0.00	17.01	5.97	6.03	5.10
1.90	3.00E-08	16.74	3.42	21.45	0.00	16.41	4.69	18.28	0.00	16.25	5.45	6.55	5.47
2.85	6.76E-08	15.93	3.25	21.86	0.00	15.62	4.38	19.06	0.00	15.48	4.98	7.02	5.82
4.27	1.52E-07	15.12	3.09	22.28	0.00	14.82	4.08	19.81	0.00	14.71	4.55	7.45	6.16
6.41	3.42E-07	14.31	2.92	22.69	0.00	14.03	3.79	20.53	0.00	13.93	4.16	7.84	6.47
9.61	7.70E-07	13.50	2.76	23.11	0.00	13.24	3.51	21.22	0.00	13.15	3.80	8.20	6.77
14.42	1.73E-06	12.69	2.59	23.52	0.00	12.45	3.24	21.89	0.00	12.37	3.46	8.54	7.06
21.62	3.90E-06	11.88	2.43	23.93	0.00	11.65	2.98	22.54	0.00	11.59	3.15	8.85	7.33
32.44	8.77E-06	11.07	2.26	24.35	0.00	10.86	2.73	23.17	0.00	10.81	2.86	9.14	7.60
48.65	1.97E-05	10.26	2.09	24.76	0.00	10.06	2.49	23.77	0.00	10.02	2.58	9.42	7.86

Approximate Radius of Influence for Groundwater
 30 to 50 ft
 Choose 30 ft to be conservative



Appendix D

Trenchless Design Memorandum

To: Julia Schwarz, PE, Kennedy Jenks
Ben Fuentes, Kennedy Jenks
Cayla Whiteside, Kennedy Jenks

From: Michelle L. Macauley, PE, LEG, Macauley Trenchless

Date: July 21, 2021

Regarding: Circle K 1461 Environmental Design and Cleanup

Subject: Trenchless Feasibility for Installation of Horizontal Drains

1. INTRODUCTION AND PROJECT UNDERSTANDING

This report presents the results of our trenchless feasibility evaluation for the Circle K 1461 Environmental Design and Cleanup project. Our portion of the project is focused on evaluating the trenchless feasibility of installing horizontal drains that extend under 24th Avenue East from the Circle K 1461 site to aid in remediation of contaminated groundwater and saturated soils.

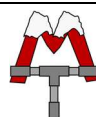
The Circle K 1461 Site is a former gasoline service station located at the southeastern corner of the intersection of 24th Avenue East and East McGraw Street. Based on previous work performed at the site by Kennedy Jenks (KJ), residual petroleum hydrocarbons are present at the site in soil and groundwater and the contaminants appear to have migrated off-site under the right-of-way of 24th Ave East.

Based on information provided by KJ, we understand the conceptual plan for the horizontal drains is to install 3 slotted drainpipes from the Circle K site extending under 24th Ave East. The slotted drains would be oriented roughly due west, north-west, and south-west. The original concept was for the drains to originate from the northeast corner of the site and extend 150 to 180 feet west. As discussed in Section 3 Trenchless Feasibility, this concept was later revised to have drain lengths ranging from approximately 30 to 50 feet depending on the orientation. The minimum diameter of the drains is still in development but would be between 2 and 6 inches. There is no stated preference for horizontal drainpipe material. The conceptual installation depth for the horizontal drains is between 15 and 20 feet below the ground surface.

2. SITE CONDITIONS

Subsurface Explorations

Many exploratory borings have been drilled at or near the Circle K site over the years. We reviewed the subsurface information provided by Kennedy Jenks which included a summarized site map of exploration locations, boring logs, and draft cross-sections along East McGraw Street and 24th Ave East. Figure 1 is a



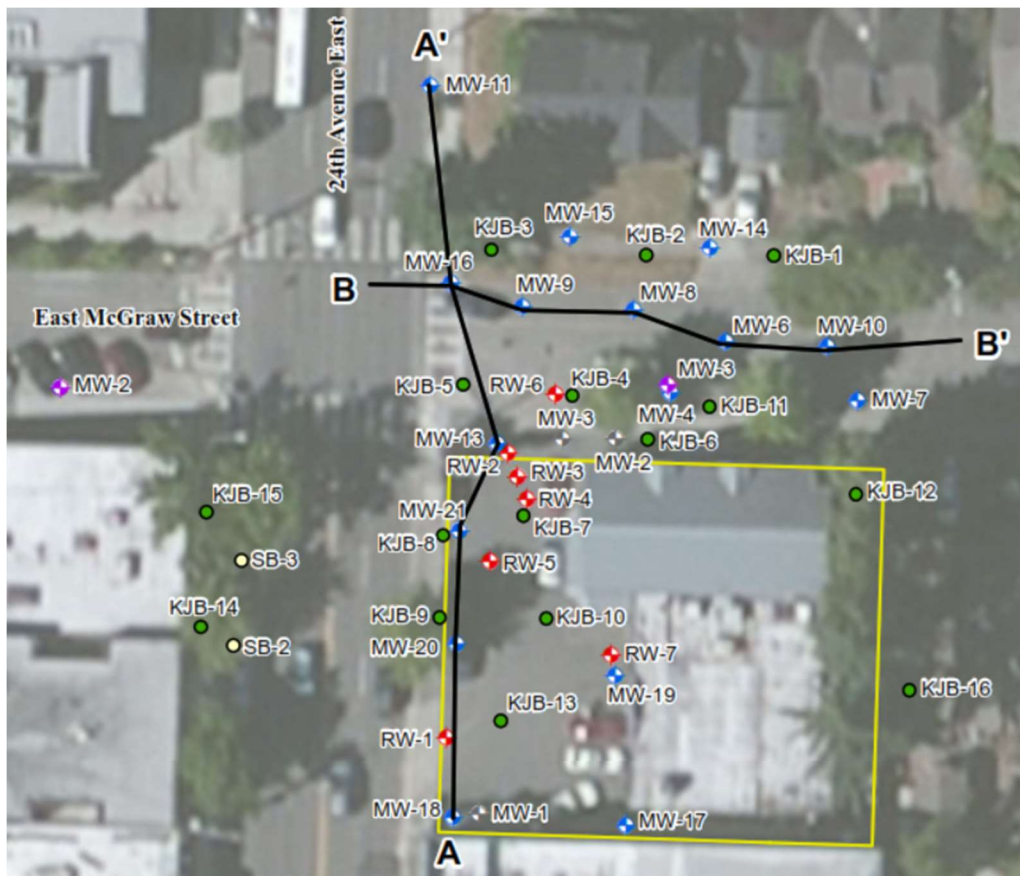


Figure 1: Boring and cross-section locations provided by Kennedy Jenks

screen shot of a figure provided by Kennedy Jenks showing the site, the cross-section locations, and the boring locations.

Based on the subsurface information reviewed, the project area is underlain by medium dense to very dense silty sand, silt with sand lenses, and sand with silt. Near the conceptual depth of the horizontal drains approximately 19 feet below the ground surface, there appears to be a layer of hard sandy silt. Groundwater

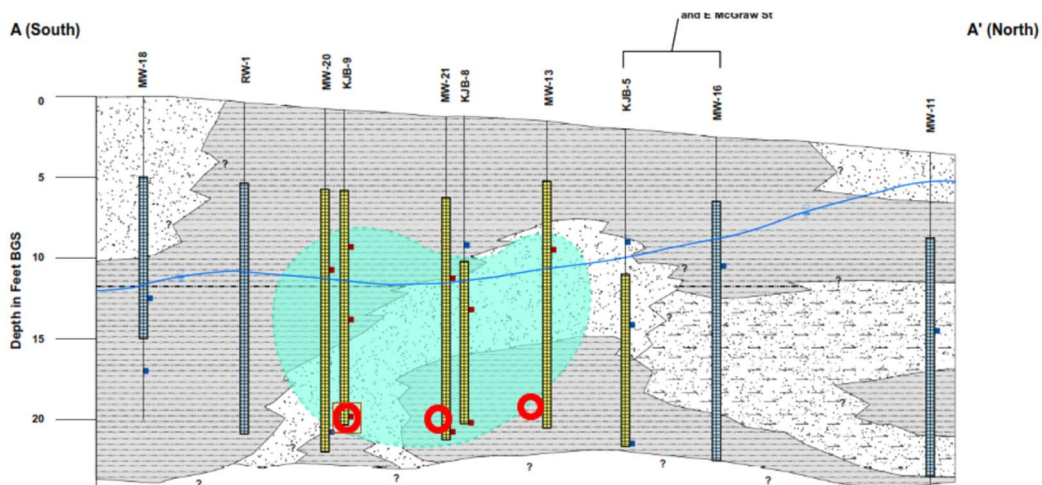


Figure 2: Preliminary geotechnical cross-section developed by Kennedy Jenks along Alignment A-A'

was reported approximately 10 to 12 feet below the ground surface. A preliminary geotechnical cross section (A-A') was developed by KJ and is presented in Figure 2. The red circles on Figure 2 represent approximate horizontal drain locations projected onto the cross-section alignment.

3. INITIAL TRENCHLESS SCOPE AND CONCEPT

During the initial project scoping, two primary trenchless construction methods were considered for installation of the horizontal drains. Those methods were Horizontal Directional Drilling (HDD) and guided auger boring. The original conceptual layout was for the horizontal drain to be installed from the northeast corner of the property and traverse west and southwest to 24th Ave East. This original concept is shown in Figure 3.

However, during a site visit on June 16th, KJ staff informed me that previous remediation efforts along the north side of the building had backfilled the excavation with pea gravel. The area essentially extended from the northern driveway east along McGraw and from the north side of the building to McGraw. This new information effectively eliminated the original layout for a trenchless solution because pea gravel backfill does not maintain a stable borehole, caves into the trenchless borehole, and results in collapse of the borehole and the ground over the borehole. As such, a trenchless installation from the northeast corner of the site, going along McGraw (and partially under the building) was no longer a viable option. While on-site, another trenchless option/concept was discussed. This option would shorten the horizontal drains by starting the installation in the parking lot/driveway on the west side of the site and consist of horizontal drains approximately 30 to 60 feet long that extend out under 24th Ave East. The viability of this revised concept is dependent on the footprint of the trenchless installation equipment relative to the available site layout, the cost considerations for construction, and construction impacts to the onsite businesses which need to remain open during construction. The feasibility of this revised trenchless concept is discussed in the next section.

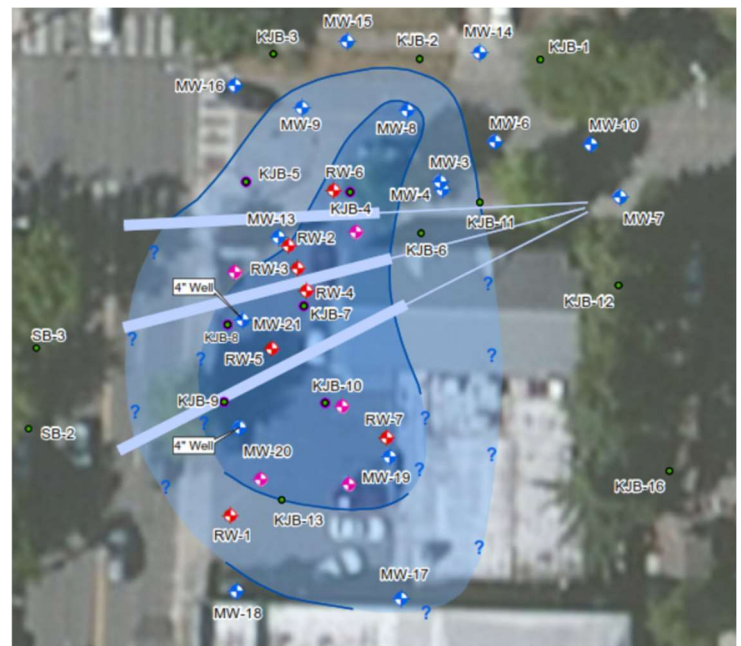


Figure 3: Original Horizontal Drain Concept

4. TRENCHLESS METHODS

General

Because the length of the horizontal drain installation was greatly reduced from the original concept, additional trenchless installation methods (in addition to auger boring and HDD) were considered for this

project. These included pipe ramming and evaluating drill equipment typically used to install drains in advance of tunneling. The following sections describes the trenchless methodology and focus on the minimum required excavation footprint required to set-up and use the equipment.

Auger Bore Construction

Auger boring is also known as horizontal auger boring or bore and jack (Figure 4). It is a common trenchless installation method used to install casings under roadways and railways. Recently this method has been adapted to install horizontal drains under structures. This trenchless technology is typically used to install steel casings

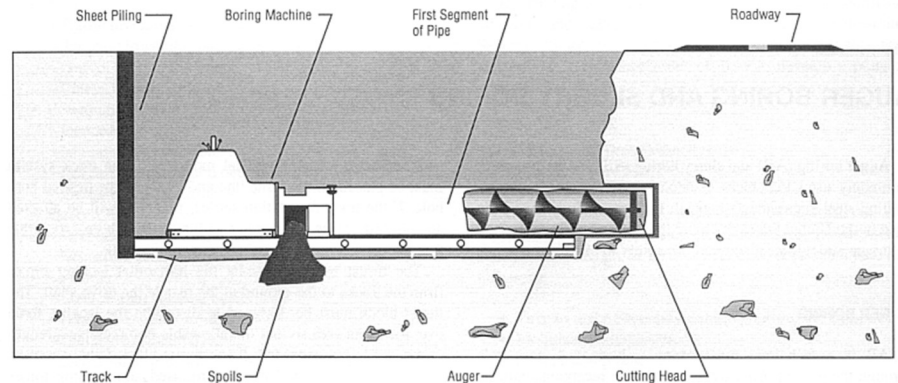


Figure 4: Schematic showing the typical auger bore components

between a jacking and receiving shaft and with diameters between 4 and 72 inches, depending on the soil conditions. For this application, it was considered to install a slightly larger diameter steel casing (approximately 4 or 6 inches) under the roadway, remove the soil from inside the steel casing, slide a plastic pipe into the steel casing, and then hammer the steel casing out from around the plastic pipe. This entire operation would be conducted from one side and is considered a dead head installation.

Typically, steel casing lengths range from 10 feet each to 20 feet each. Because this would be a relatively short installation (approximately 30 to 60 feet), we recommend the steel casing be 10-foot lengths to reduce the minimum shaft length dimension. With 10-foot lengths of steel pipe and a conservative casing diameter of 8 inches, the minimum inside dimensions of the jacking shaft are approximately 20 feet long by 6 feet wide and extend approximately 2 feet below the invert of the new drain. Because of the various orientations of the

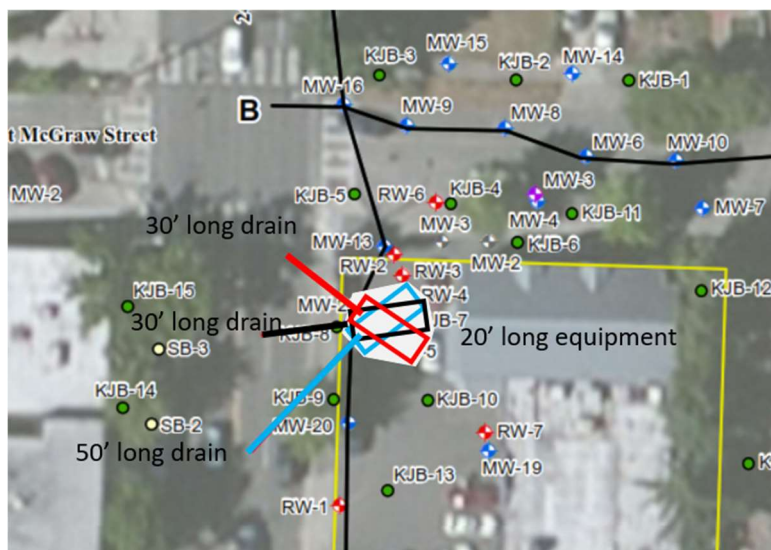


Figure 5: Layout of shaft configurations for various orientations of horizontal drains

installations, the jacking pit would need to encompass the dimensions of all the installations. As shown on Figure 5, this would require a very large area (shown in white in Figure 5).

Horizontal Directional Drilling (HDD) Methodology

Traditionally, HDD is a multiple-pass trenchless construction process that uses a bored hole stabilized by pressurized drilling fluid (drilling mud) rather than a structurally supported hole. The first pass uses a steerable bit to drill that pumps a bentonite-based drilling fluid into a pilot hole along the planned alignment that is subsequently enlarged with various reaming tools (see Figure 6). After the fluid-filled hole has been enlarged to the required size, the pipeline is pulled into the hole.

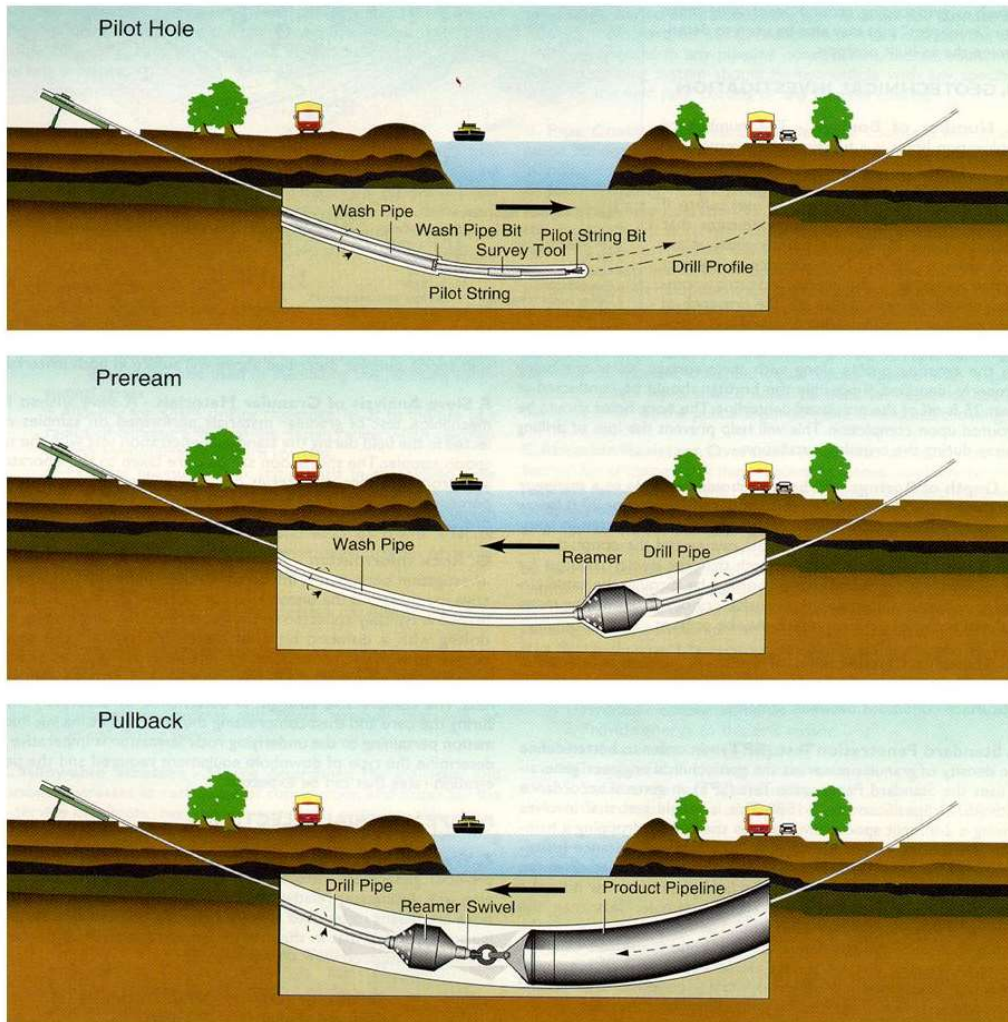


Figure 6: HDD Schematic (DCCA, 1999)

For this project, the typical HDD process would be adapted to drill the pilot bore, retract the pilot drill rods (leaving the borehole open), and then a plastic drainpipe would be pushed into the open borehole. However, because a bentonite-based drilling mud is used during the HDD process, drilling mud would remain in the

borehole. This residual drilling mud would cause challenges to develop the horizontal drain and could cause the system to clog.

While HDD drill rigs have been lowered into shafts and launched from the excavation, it is rare. The HDD equipment is approximately 13 feet long would require a minimum shaft length of approximately 18 to 20 feet. Like the auger bore set-up, the excavation for the HDD rig would need to be oriented in the direction of the installation and would require additional construction workspace.

Pipe Ramming

Pipe ramming is a trenchless construction method that uses a large pneumatic ramming tool to drive steel pipe through a variety of soil types (see Figure 7). For crossings that require shafts or pits to be excavated (such as for this project), the steel pipe is usually driven in shorter sections with the shorter sections welded together in the shaft. Once the full length of the pipe casing has been installed, the spoils inside the casing are removed. For this project, once the steel casing is installed to the full length, the soil would be removed with an auger machine, and the drainpipe pushed into the steel casing. The hammer would then be reversed and used to remove the steel casing from around the drainpipe. The general approach to installation of steel casing, removal of soil from inside the casing, and subsequent removal of the casing is very similar for auger boring and pipe ramming. As such the space needed for a construction footprint and for minimum shaft length are very similar. The shaft size, lengths, and orientations for pipe ramming are consistent with those listed for auger boring (i.e., 20 feet long and 6 feet wide).

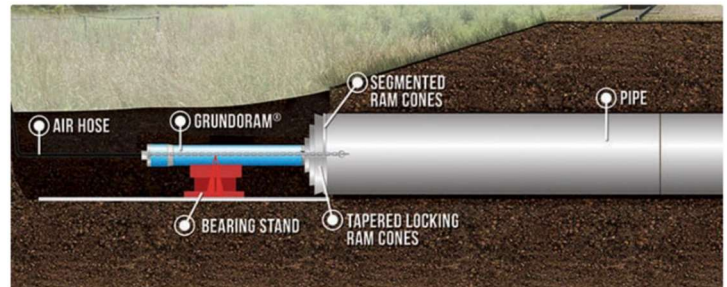


Figure 7: Pipe ramming (graphic courtesy of TT Technologies).

Drainage Lances



Figure 8: Drain lance components

While outside the scope of typical trenchless technologies, we considered other installation methods that would accomplish the intent of installing a drainpipe without conventional trenchless equipment in an excavation. Specifically, we considered tunneling equipment and approaches used to install drains in advance of large tunnel projects. Drain lances are robust drainpipes typically used in advance of and parallel to tunnel excavation to reduce water pressures. Drain lances are typically installed piecewise in 3-to-6-foot lengths using rotary percussive equipment. The lance consists of a perforated exterior steel tube and an interior slotted PVC drainage tube that is installed after drilling (Figure 8). The drain lances can be installed by attaching a specialty pneumatic drill to a conventional excavator (Figure 9). While this method appeared promising due to the short length of drain lance sections that could be installed, discussions with the lance manufacturer indicated that the specialty equipment

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Figure 9: Drain lance installation using excavator

used to install the lance using a conventional excavator would still require an excavation of approximately 10-foot diameter. Because of the angle required by the excavator and the limitations of the specialty lance drilling equipment, this 10-foot diameter may need to be increased due to angle of the excavator arm and the deep installation depth of 15 to 20 feet.

5. CONCLUSIONS

We do not recommend using trenchless methods for installation of the horizontal drains for this project. Each method considered requires a deep shaft to install the horizontal drains. The construction of the shaft would dwarf the cost of the horizontal drain installation. Additionally, when discussing possible trenchless solutions with trenchless contractors, they expressed concern for being in a shaft where the soil and groundwater were contaminated. Trenchless contractors do not typically work within contaminated soils and would likely increase their construction costs to account for their unfamiliarity with contaminated soils.

We understand there are other options for installation of drains such as slant drains and recommend the design team consider those options that require less shaft/pit excavation to install.

6. LIMITATIONS

We prepared this report for the exclusive use of Kennedy Jenks and their authorized agents for the Circle K 1461 Environmental Design and Cleanup in Seattle, Washington. The recommendations within this report are valid for 2 years from the date of this report. If this project resumes beyond that time, this report and the recommendations herein should be reviewed by a trenchless professional to confirm applicability and cost of the trenchless method and to evaluate if new technologies are available which may be more efficient, less costly, or more applicable for this project.

Our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Appendix E

Site-Specific Health and Safety Plan



32001 32nd Avenue South
Federal Way, Washington 98001
253-835-6400
FAX: 253-952-3435

**Site-Specific
Health and Safety Plan (HASP)
Former Circle K Site
2350 24th Avenue East
Seattle, Washington**

[9 December 2021]

Prepared for

**Washington State Department of
Ecology**

3190 160th Avenue Southeast
Bellevue, Washington 98008

Project No. 2196008*00

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- 1 Map and Written Directions to Local Hospital

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- A Job Hazard Analysis
- B Tailgate Safety Briefing Record
- C Heat Stress Fact Sheet
- D Cold Stress Fact Sheet
- E Utility Locate Standard Operation Procedures and Utility Location and Acknowledgement Form
- F Field Chemical Use Policy and Procedures, Field Chemical Use Form, and Hazard Communications Written Program
- G Safety Data Sheets (SDSs)
- H CDC Fact Sheets
- I Injury/Illness, Property Damage Incident, Near Miss Reporting Forms, and Motor Vehicle Accident Report

Health and Safety Plan (HASP) Summary

Project Name	Circle K 1461 Environmental Design & Cleanup	Project No.	2196008*00
Prepared by	Ryan Hultgren	Date	9 December 2021
Project Manager	Ryan Hultgren	Office	Federal Way

Field Services Description

Field Services Date(s)	2021 - 2026		
Site Name	Former Circle K		
Location	2350 24th Avenue East, Seattle, WA		
Client Site Contact	Dale Myers	Client Site Telephone	425-649-4446

Type of Investigation:

Sampling Investigation:

- Hand Auger
- Drilling
- Trenching
- Well Installation
- Soil Sampling
- Groundwater Sampling
- Other:

Site Walk-through

Site Remediation:

- Excavation
- Treatment System Installation/O&M
- Underground Storage Tank (UST) Removal

Other: _____

Section 1: Introduction

This Site-Specific Health and Safety Plan (SSHSP), also referred to as a Health and Safety Plan (HASP), developed in accordance with Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations (29 CFR 1910.120), and CAL/OSHA Standards (8 CCR 5192), establishes general health and safety protocols for Kennedy Jenks personnel at Washington State Department of Ecology's Former Circle K site (Site) located at 2350 24th Avenue East in Seattle, Washington. As needed, addenda containing activity-specific health and safety protocols will be prepared and attached to this HASP prior to the initiation of each additional field activity. The HASP and activity-specific addenda, as a minimum, contain the following information:

- Names of key personnel and alternates responsible for site health and safety and appointment of a Site Safety Officer (SSO).
- A job hazard analysis (JHA) for each site task and operation (see Appendix A for example).
- Personal protective equipment (PPE) to be used by employees for each site task and operations being conducted.
- Medical surveillance requirements.
- Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used. Methods of maintenance and calibration of monitoring and sampling equipment to be used.
- Site control measures.
- Decontamination procedures.
- An Emergency Response Plan that addresses effective site response to emergencies.
- Procedures to report injuries or illness, property damage, or near miss incidents.

For informational purposes only, this plan may be provided to subcontractors of Kennedy Jenks involved in activities at the site, interested regulatory agencies, or others. However, entities and personnel other than Kennedy Jenks shall be solely responsible for their own health and safety and shall independently assess onsite conditions and develop their own health and safety protocols to meet the minimum health and safety requirements.

Kennedy Jenks has developed a Health & Safety Operations Manual (Kennedy Jenks, Corporate Health and Safety Program, June 2020). Kennedy Jenks' Health & Safety Program, upon which the manual is based, complies with current health and safety regulations, including OSHA 29 CFR 1910.120 and Hazardous Waste Operations and Emergency Response. Many of the protocols of the corporate program are conducted on a routine basis (general training, respirator fit testing, general medical record keeping, etc.) and are not repeated herein. The Health and Safety Operations Manual is available to Kennedy Jenks employees upon request during normal business hours. Questions regarding the program should be referred to the

Kennedy Jenks Health & Safety Manager (H&S Manager) John Jindra, or the Director of Health, Safety, and Environment (Director of HS&E) Bert Drews.

A copy of this HASP, along with any addenda containing activity-specific health and safety information, will be kept in a conspicuous location at all times while work is being conducted at the site.

Section 2: Key Health and Safety Personnel

Kennedy Jenks' SSO will be designated by the Project Manager, as appropriate. The current SSO for the project is Ryan Hultgren. In the absence of the SSO during field activities, a member of the field investigation team will be designated as Kennedy Jenks SSO. The SSO is responsible for the following.

- Conducting daily tailgate safety briefings (TSBs) for Kennedy Jenks personnel at the beginning of each workday and documenting that subcontractors are also conducting TSBs. Kennedy Jenks staff may combine TSBs with the subcontractor in lieu of conducting separate safety meetings. Combined TSB meetings will be led by the subcontractor and must include emphasis provided by the subcontractor relative to the subcontractor's work. Other participants, including Kennedy Jenks and any regulatory personnel in attendance, should also discuss their respective health and safety issues and oversight specific to their activities. The TSB Record is attached to this HASP as Appendix B, and a copy of each day's executed form for Kennedy Jenks' TSB must be obtained for the project files, signed by all Kennedy Jenks employees attending the TSB meeting. Any subcontractors must provide the SSO with a daily copy of the subcontractor's own safety briefing form for the project file.
- Observing field activities for compliance with this HASP, applicable addenda, and Kennedy Jenks Health and Safety Operations Manual.
- Maintaining onsite medical surveillance, if required, and emergency medical treatment programs, and assisting in onsite emergencies.
- Modifying health and safety protocols or terminating field work when unsafe work conditions exist.
- Assuring all project team members participating in field activities have read and signed this HASP and have had the opportunity to ask safety-related questions regarding this project.
- Familiarizing personnel with health and safety protocols.
- Observing field personnel wear appropriate PPE.
- Recording data from direct reading instruments on field logs (as appropriate) and evaluating potential hazards.
- Monitoring decontamination procedures.
- Recording occurrence of any site injury, illness, property damage or near miss incident.

If unsafe conditions are encountered, if illness or injury occurs, or if the level of protection needs to be changed, the SSO will consult, in a timely manner, with the Project Manager, Ryan Hultgren; the H&S Manager, John Jindra, or the Director of HS&E, Bert Drews.

Section 3: Site Description and History

The Site is associated with a former gasoline service station property located at 2350 24th Avenue East in Seattle, Washington. In 1989, approximately 4,000 to 6,000 gallons of gasoline from a leaking underground storage tank (UST) was released to the subsurface at the Site. Based on available information, the related contaminant plume has extended off-property beneath adjacent streets and residential properties.

The property is approximately 0.26 acre in size and is located in the Montlake neighborhood southeast of the intersection between 24th Avenue East and East McGraw Street, approximately 1,800 feet south of Lake Washington. The area surrounding this Site consists mainly of residential houses and buildings, with some small commercial business located west of the Site along the 24th Avenue East. The property consists of a one-story building and a newer addition to it, which are presently being utilized as a retail dry cleaning store and a convenience store, known as Jay's Cleaners and Mont Market.

The property was operated as a gasoline station and convenience store from 1968 to 1981, owned by Mr. George Renale. Prior to 1968, it is believed the property was residential. From 1981 to July 1990, the property was leased by Mr. Renale to Circle K Corporation, who also operated the facility as a gasoline station and convenience store. In November 1990, Mr. Kuk Jin Chung, the current owner, purchased the property from Mr. Renale and has operated it as a retail dry cleaning retail store since then. In February 1992, Mr. Chung entered into a Consent Decree with Ecology to begin investigation and remediation of contamination at the Site.

Section 4: Planned Site Activities

Type of Investigation:

Sampling Investigation:

- Hand Auger
- Drilling
- Trenching
- Well Installation
- Soil Sampling
- Groundwater Sampling
- Other: Soil Gas/Indoor Air Sampling

Site Remediation:

- Excavation
- Treatment System Installation/O&M
- UST Removal

- Site Walk-through
- Other: _____

- Onsite Inspection or Construction-Related Services
- Entry into a Confined Space or Excavation¹
- Work Along a Leading Edge Requiring Fall Protection
- Entry into an Excavation or Trench with a Depth of 5 feet or Greater (4 feet in Oregon and Washington)
- Field Investigation Requiring
 - a. Entry into (potentially) hazardous area
 - b. Interruption of vehicular traffic
 - c. Interruption of plant processes
 - d. Operation of pilot plant
- Chemical Use²
- Other - specify

¹ Completion of Kennedy Jenks Confined Space Pre-Entry Checklist and Entry Authorization is required or review of Client's Confined Space Procedures.

² A Field Chemical Use Plan must be completed.

Potential Hazards:

- Organics
- Inorganics
- Metals
- Acids
- Solvents
- Pesticides
- Other: Traffic
- Bases
- Fire/Explosion

Personal Protective Equipment:

- Level C
- Level D

The Site is currently operated as a retail mini-mart and dry cleaners with limited parking onsite. Field investigation activities will include utility locate, oversight of subcontractors (e.g. surveying) and resident engineering for a contractor hired by Ecology to install a remediation system. Work will require coordination with the current property owner/operator to consider appropriate means to protect facility operations and workers/customers. In addition, traffic control services may be needed for work in City of Seattle right-of-way areas.

Section 5: Hazard Assessment

5.1 Potential Physical & Environmental Hazards

Every job must be scrutinized for potential hazards, which may cause an injury, illness, property damage, or an near miss incident. The preferred method of assessing a job for hazards is to break down each job into smaller tasks. Each task may then be scrutinized by performing a JHA.

Kennedy Jenks JHA form provides examples to assist employees in performing their own JHA. The JHA process is intended to provide a brief, consistent means of identifying and addressing hazards, which may injure employees.

Potential hazards may include, but are not limited to, the following:

- Heavy equipment
- Excavations and Trench work
- Tripping and falling hazards
- Heat stress
- Cold exposure
- Underground/overhead utilities
- Motor vehicle hazards
- Biological exposure
- Equipment hazards
- Working over or near open water
- Chemical exposure
- Fire/explosion hazard.

5.1.1 Heavy Equipment

Field personnel should be cognizant of potential physical hazards associated with use of heavy equipment and electrical equipment during field operations. Appropriate precautions include the following:

- American National Standards Institute (ANSI)-approved hardhats, Class II reflective safety vests (when outside), safety glasses or goggles, and safety-toe boots will be worn.

- Loose clothing that may catch in moving parts will not be worn.
- Hearing protection will be worn if a preliminary noise survey or past experience indicates maximum noise levels will exceed 85 decibels at any time during site operations or if sound levels become uncomfortable or prevent conversation at normal levels.
- Maintain visual contact with the equipment operator at all times within or near the equipment operating radius.

Prior to conducting drilling, a survey shall be conducted and discussed in the TSB to identify overhead electrical hazards and potential ground hazards, such as hazardous agents in the soil or underground utilities. Kennedy Jenks' staff will stay at least 25 feet from active drilling rig when possible. Coordinate collection of samples with equipment operator. Wear hearing protection when equipment is operating.

5.1.2 Excavation and Trench Work

Field personnel should enter an excavation or trench only as a last resort. Any excavation or trench exceeding 5 feet (4 feet in Washington and Oregon) in depth must be properly shored, braced, or sloped, and a safety ladder must be provided for ready access or egress.

5.1.3 Tripping and Falling Hazards

Other potential physical hazards include falling and tripping on slippery, uneven, or unpaved surfaces.

Extra care should be taken in the event of frozen ground, sleet, or snow. Modify walking activities accordingly, paying close attention to exposed bare surfaces, such as stairs, platforms, concrete walkways, truck beds, etc.

5.1.4 Heat Stress

Adverse climate conditions, primarily heat, are important considerations in planning and conducting site operations. Maximum daytime temperature may exceed 75 degrees Fahrenheit (°F) at the site, and heat stress is an associated concern. Provisions of Kennedy Jenks Heat Illness Prevention Program, Appendix C, will be applied to all projects when Kennedy Jenks employees are subjected to sustained temperatures of 85 °F or greater.

Preventive measures include the following:

- Water and/or commercial electrolyte solutions will be available, and drinking these fluids will be encouraged. When temperatures exceed 85 °F, sufficient water will be provided to accommodate each employee with 1 quart of water per hour. Water will be kept cool by means of a portable cooler with ice or similar means.
- Suitable acclimation periods will be provided for workers to gradually establish their resistance to heat stress.

Personnel exhibiting symptoms of heat stress (nausea, cramps, dizziness, clammy skin) will be removed from the work area, cooled, and provided with water, and the personnel will be

observed (see Appendix C, Heat Stress Card). Personnel exhibiting symptoms of heat stroke (hot dry skin, mental confusion, unconsciousness) will be immediately cooled and taken to the hospital. A map and written directions to the local medical facility are included as Attachment 1.

5.1.5 Cold Exposure

Cold injury (e.g., frostbite and hypothermia) and impaired ability to work are dangers encountered at low temperatures and high wind-chill factors. To guard against these conditions, if cold weather is an important consideration at this site, field personnel should wear appropriate clothing, have access to readily available warm shelter, take carefully scheduled work and rest periods, and monitor physical conditions of other workers. See Appendix D, Cold Stress Fact Sheet.

5.1.6 Underground/Overhead Utilities

The site may contain underground and aboveground utilities, including buried electrical, natural gas, water, sewer and fuel lines, and aboveground utilities, such as high-voltage transmission lines. These utilities present a potential hazard if they are struck or can arc if equipment is located too close to them. Kennedy Jenks will use the following notification, documentation and clearance procedures to clear all boring or excavation locations of utilities prior to subsurface invasive activities. Subsurface invasive work includes excavations, borings, surface grading, and hand augering soil samples when depths penetrate more than 6 inches below ground surface (bgs). Work is not to proceed where there is doubt regarding the location of underground utilities or obstructions. Invasive Activities – Utility Location Standard Operating Procedures are included as Appendix E.

Notification Procedures: Notification is made through the One-Call Center (811) for all subsurface invasive work located on public property. Kennedy Jenks or its designated subcontractor will call for a universal underground notice at least 2 business days before drilling or subsurface invasive activities are to begin.

Document time of the call, names of utilities to be contacted, and obtain a ticket number for the call on Kennedy Jenks Utility Location and Acknowledgement Form included as Appendix E. On private property not covered by the Utilities Underground Location Center, Kennedy Jenks may be required to contact and receive utility clearance approval from a combination of other public and private entities, as well as private landowners, City officials, and State of ***** entities to obtain clearance approval who may have underground utilities in the work area.

Documentation: All proposed subsurface excavations, boring, and well locations are to be marked on the ground surface using **white** paint in accordance with American Public Works as shown on the American Public Works Association (APWA) Uniform Color Code. A Kennedy Jenks Utility Location and Acknowledgement Form must be filled out for each proposed well, boring, or excavation location. Obtain signatures from each private or public utility owner to document clearance on the each form, as required.

At all locations where drilling, probing, or well installation will be performed, an air knife or similar form of suction potholing will be performed to assess possible underground utilities in the upper 6 to 8 feet of soils (depending on local conditions and expected depth of utilities). Potholing is required at **all drilling locations**, except in remote areas where the likelihood of encountering underground utilities is very low and only as approved by a Risk Manager.

Resource/Operations Manager or Officer of the company familiar with underground utilities.
 (Note: Use of an air knife will be appropriate for most invasive drilling and probing work, but may not be appropriate for certain activities like very shallow borings (less than 1-foot deep), certain hand-auger borings, remedial injections using probe equipment, and test pitting.)
 Case-by-case exceptions for activities may be provided.

Should an underground line or pipe or other obstruction be encountered unexpectedly or disturbed (broken, damaged, or undermined) immediately discontinue invasive activities and contact the Project Manager. If the Project Manager cannot be reached, contact an officer of Kennedy Jenks. Secure the area to prevent further disturbance/damage.

When clearing the site for utilities, **ALWAYS REMEMBER TO LOOK UP for overhead utilities.** Kennedy Jenks will direct its subcontractors to limit the proximity of equipment to overhead power transmission lines according to the following schedule:

Power Line	Distance from Power Line
50 kilovolts (kV) or below	10 feet
50 KV - 200 kV	15 feet
200 KV - 350 kV	20 feet
350 KV - 500 kV	25 feet
500 kV - 750 kV	35 feet
750 kV – 1,000 kV	45 feet

If the voltage of a power line is unknown, assume it is 1,000 kV

5.1.7 Motor Vehicle Hazards

When working at the site, personnel should be aware of the following situations or activities:

- Vehicle, truck, and equipment traffic on residential streets and nearby service roads. Use barricades, signage, and/or a traffic control plan, where appropriate. Kennedy Jenks personnel are NOT trained in and are NOT authorized to set up traffic control or work as a highway flagger.
- When driving, personnel should be aware of the potential for wildlife to be on the road or run into the road. Driving after dark should be limited as much as possible.
- When driving, personnel should be aware of the potential of falling asleep at the wheel and take rest stops and breaks, at regular intervals or as needed. Do not drive to and from the site if weather conditions make road travel unsafe.
- Unpaved, uneven, or soft roadways. Personnel should only consider driving sport utility vehicles (SUVs) or pickup trucks into the site with 4x4 or all-wheel drive to prevent tires from getting stuck in soft or loose sand/mud.

5.1.8 Biological Hazards

Personnel should be aware of the potential presence of insects such as spiders and wasp/hornets, or snakes in wellheads or other enclosures.

The site may have some vegetative areas that may contain poisonous plants or tress such as sumac and/or poison ivy. Contact with such plants should be avoided. If contact is suspected, wash the area immediately with soap and water.

Ticks are prevalent at the site. To prevent exposure, staff should wear long sleeves, light colors, and consider tucking pant legs into boot cuffs and/or duct taping pant legs to boots. Regular “tick checks” should be conducted throughout the day. Field clothes should be removed immediately after work is complete and washed.

Insect repellent with DEET should also be used to prevent exposure to biting insects such as ticks and mosquitoes.

Mosquitoes may pose a hazard because they are potentially infected with Eastern Equine Encephalitis (EEE) which may be transmitted through their bite. Personnel should have awareness of the severity of EEE warnings currently in the area. Field work should not be conducted during times of day when mosquitoes are known to be most active (i.e., dawn and dusk). Long-sleeve shirts, pants, gloves, and mosquito netting (over head and neck) should be worn to prevent exposure.

5.1.9 Equipment Hazards

Working with hand and small power tools, personnel should be aware of the following:

- Utilize tools only for the purpose for which they were designed.
- Inspect all tools and equipment before they are used.
- Immediately remove from service any tool or piece of equipment that is damaged.
- Be aware of potential of a burning hazard should equipment get hot during use.
- Do not wear any jewelry (including finger rings) or loose-fitting clothes that may get caught in equipment while conducting field activities.
- Use caution when lifting and carrying backpack containing bladder pump. The backpack weighs approximately 25 pounds. If walking long distances between monitoring wells, take intermittent rest breaks as needed to prevent fatigue.

5.1.10 Working Over or Near Water

Employees working over or near water shall consider the following recommended safety procedures:

- Employees must evaluate water conditions such as temperature or water current to select proper PPE. Example: dry suit and/or fall protection equipment. In addition, employees working within 4 feet of the water edge must wear properly sized U.S. Coast Guard personal floatation device (PFD).
- Perform visual inspections of area noting potential overhead and other hazards that are not in the normal field of vision.

- For work to be performed near water and more than 4 feet from the water's edge, erect sufficient barricades 4 feet away from the water's edge using traffic cones, plastic fencing, or caution tape to serve as a warning system when a worker unintentionally approaches the water's edge.
- For work to be performed above water and/or within 4 feet of the water's edge, another worker who can immediately summon emergency rescue must stand guard.
- Employees must know how to use rescue equipment such as "pole & life hook or ring buoy." (Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations.)
- Proper footwear with adequate traction must be utilized when working or walking on wet faces.

5.1.11 Weather Hazard

There is a potential for snow and/or ice in the area of the proposed investigation. Personnel should layer clothing to lessen impact of the cold stress on the body (see Cold Stress Fact Sheet in Appendix D). Snow and ice can also cause roads and ground to be slick; therefore, extra precaution should be taken while driving, and moving around the work site. If personnel become too cold, they should take a break to warm up or add extra layers that do not impact PPE. If personnel experience symptoms of cold stress, they should stop work, and seek medical attention.

5.1.12 Other Safety Considerations

When working at the site, personnel should be aware of the following situations or activities:

- Vehicle, truck, and equipment traffic on residential streets and nearby service roads. Use barricades, signage, and/or a traffic control plan, where appropriate. Kennedy Jenks personnel are NOT trained in and are NOT authorized to set up traffic control or work as a highway flagger.
- Working with hand and small power tools. Utilize tools only for the purpose for which they were designed. Inspect all tools and equipment before they are used. Immediately remove from service any tool or piece of equipment that is damaged. Be aware of the potential of a burning hazard should equipment get hot during use.
- Do not wear any jewelry (including finger rings) or loose fitting clothes that may get caught in equipment while conducting field activities.
- Personnel should be aware of the potential presence of black widow spiders, wasp/hornets, or snakes in wellhead or other enclosures.
- When driving, personnel should be aware of the potential for wildlife to be on the road, or run into the road. Driving after dark should be limited as much as possible.

- When driving, personnel should be aware of the potential of falling asleep at the wheel and take rest stops and breaks, at regular intervals or as needed. Do not drive to and from the site if weather conditions make road travel unsafe.

5.2 Potential Chemical Hazards

Contaminants of concern (COC) identified for this site include gasoline-range organics (GRO), and benzene, toluene, ethylbenzene, and xylenes (BTEX). Other possible related COCs include gasoline additives such as methyl-tert-butyl-ether (MTBE), 1,2-dichloroethane (EDC), 1,2-dibromoethane (EDB), and total lead. Although not previously detected at the site, a dry-cleaning business is present on the site indicating a potential for the presence of chlorinated solvents such as tetrachloroethylene (PCE).

Field personnel could potentially be exposed to COCs at the site by direct contact with soil or groundwater, through inhalation of dusts containing organic chemicals or through inhalation of organic chemical vapors. Field personnel will minimize potential chemical hazards by 1) avoiding direct contact with groundwater and soil, 2) performing air monitoring to determine necessary level of personal protective equipment, and 3) avoiding generation of dust. Ingestion of particulate matter containing chemicals is another general exposure route. However, for site personnel, the potential for this type of exposure is minimal. Safe work practices, including restriction of eating, drinking, or smoking to certain times and places, will be enforced at the work site.

5.2.1 Groundwater Samples

Chemicals detected in groundwater from the site and the highest detected concentrations are listed in Table 1. The highest COC concentrations in groundwater are typically for samples collected from wells in which free-phase product [i.e., non-aqueous phase liquid, (NAPL)] has been present historically.

5.2.2 Soil Samples

COCs have been detected in subsurface soil samples collected at the site. The highest reported concentrations are listed in Table 2.

Available Threshold Limit Values (TLV) or Permissible Exposure Limits (PEL) published for potential chemicals that may be detected in soil and groundwater are listed in Table 1.

5.2.3 Chemical Use Plan and Safety Data Sheets (SDS)/Hazard Communication

In addition to site-related chemicals, Kennedy Jenks field personnel may work with compressed gasses, decontamination materials, and other materials that present potential health and safety issues. Typical chemicals that may be brought to the site are listed below.

- Aerosol marking paint for utility locating
- Simple Green for equipment decontamination

Kennedy Jenks has a "cradle to grave" policy regarding the purchase, storage, use, transportation, and disposal of chemicals used in the field. The Chemical Use Policy and Procedures are attached as Appendix F to provide guidance on the proper protocols for chemical use in the field. The Chemical Use Plan (see Appendix G) must be completed by Kennedy Jenks field staff using the chemicals and approved by the H&S Manager.

Kennedy Jenks has a Hazard Communication Written Program (see Appendix F) and training programs that cover these materials. Personnel conducting field activities must complete a review of the Hazard Communication Written Program and site-related chemical hazards prior to starting field activities.

The Hazard Communication Written Program is part of Kennedy Jenks Health and Safety Operations Manual.

Copies of the SDS for chemicals listed in Table 1 or listed in this section are provided in Appendix G.

Section 6: Community Hazard Analysis

Generally, insignificant particulate and vapor emissions are generated during routine soil and groundwater sampling activities. During construction-related activities, particulate and vapor emissions may increase above concentrations generated during routine soil and groundwater sampling activities. Therefore, activity-specific health and safety addenda will be developed for activities where elevated particulate and vapor emissions may develop. Onsite worker exposure to chemicals at concentrations of concern is not expected. Potential exposures to the surrounding community will likely be much less than potential onsite worker exposure and is, therefore, also not expected to be of concern.

However, a potential for onsite worker exposure to chemicals exists during drilling and sampling activities. If, based on the action levels provided in Section 7, it becomes necessary for site personnel to don Level C PPE, Kennedy Jenks along with its subcontractors, will establish three work zones: Exclusion Zone, Contaminant Reduction Zone, and Support Zone as described in Section 7.2. Exclusion and Contaminant Reduction Zones will control entrance and exit from potential exposure areas. Continuous air monitoring will be performed during activities performed within the Exclusion Zone to ensure that the appropriate level of PPE is selected and within the Support Zone to ensure that support workers are not exposed to chemicals. Potential exposures to the surrounding community are unlikely based on the size of the property. If air monitoring indicates that there is the potential for the surrounding community to be exposed, Kennedy Jenks will stop work and evaluate the need for alternative controls.

Use of barricades, caution tape, or signage to keep the general public away from working areas should be used where and when appropriate. At a minimum, keep public and non-essential personnel at least 50 feet away from an active drilling area. This can be accomplished using barricades, cones, vehicles, and caution tape.

Section 7: Protective Actions

7.1 PPE

Field personnel will wear equipment to protect against potential physical and chemical hazards, which have been identified herein and those that become apparent in the field. Guidelines for Contaminants Commonly Encountered at Kennedy Jenks Sites provide guidance in assessing potential hazards and selecting the appropriate protection. Level D protection will be required at a minimum for field activities at the site. Level D personal protective equipment to be used may include all items on the following list that are denoted by an asterisk (*).

The level of protection employed may be upgraded, as deemed necessary by the SSO. If non-routine field activities are initiated, the level of protection will be specified in the activity-specific health and safety addenda.

Personal Protective Equipment (PPE) and Monitoring Equipment

- | | | |
|--|---|--|
| <input checked="" type="checkbox"/> Safety Glasses | <input type="checkbox"/> Face Shield | <input type="checkbox"/> Lockout Tags and Locks |
| <input checked="" type="checkbox"/> Safety-Toe | <input type="checkbox"/> Work | <input type="checkbox"/> Rubber |
| <input type="checkbox"/> Other | <input checked="" type="checkbox"/> Class II High-Visibility Reflective Safety Vest | <input type="checkbox"/> Ventilator/Fan |
| <input checked="" type="checkbox"/> Hard hat | <input checked="" type="checkbox"/> Earmuffs/Plugs (as needed) | <input type="checkbox"/> Volt/Ampere Meter |
| <input checked="" type="checkbox"/> Work Gloves | <input type="checkbox"/> Neoprene | <input type="checkbox"/> PID (<i>calibration date: specify</i>) |
| <input type="checkbox"/> Rubber | <input checked="" type="checkbox"/> Nitrile | <input type="checkbox"/> OVA (<i>calibration date: specify</i>) |
| <input type="checkbox"/> Suits: <input type="checkbox"/> Cotton | <input type="checkbox"/> Tyvek | <input type="checkbox"/> OVM (<i>calibration date: specify</i>) |
| <input type="checkbox"/> Nylon | <input type="checkbox"/> Other | <input type="checkbox"/> Hydrogen Sulfide Meter (<i>calibration date: specify</i>) |
| <input type="checkbox"/> Respirator: (Type/Cartridge: <i>specify</i>) | <input type="checkbox"/> Draeger Detection Tubes | <input type="checkbox"/> Soil Sampling Kit |
| <input checked="" type="checkbox"/> Emergency Eyewash | <input type="checkbox"/> Emergency Shower | <input type="checkbox"/> pH Meter/Paper |
| <input type="checkbox"/> Spill Kit | <input checked="" type="checkbox"/> Fire Extinguisher | <input type="checkbox"/> Conductivity/Temperature Meter |
| <input checked="" type="checkbox"/> First Aid Kit | <input type="checkbox"/> Life Jackets | <input type="checkbox"/> Metal Detector |
| <input type="checkbox"/> Rescue Life Ring | <input type="checkbox"/> Safety Belt/Harness/Tripod | <input checked="" type="checkbox"/> Air Sampling Equipment |
| <input type="checkbox"/> Lights (<i>type: Flashlight</i>) | <input checked="" type="checkbox"/> Camera/Video | <input type="checkbox"/> Peristaltic Pump |
| <input checked="" type="checkbox"/> Cell Phone | <input type="checkbox"/> Other: <i>specify</i> | <input type="checkbox"/> Face covering |

7.2 Work Zones

Work zones, including designation of an Exclusion Zone, a Contamination Reduction Zone, and a Support Zone, will be established for any field activity that requires Level C protection or greater. Work zones will be clearly marked in the field. Work zones may vary depending on the proposed field activity and will be established in the activity-specific health and safety addenda.

7.3 Monitoring

7.3.1 Hazardous Substances

As appropriate, field personnel will perform air monitoring at least twice daily with a direct reading organic vapor analyzer (OVA, OVM, or HNU) in the breathing zone at each work location. All readings shall be recorded in field logs. All direct reading instruments shall be calibrated according to the manufacturer's specifications. The following action levels will be used.

- If OVA readings for a particular work area consistently exceed 5 parts per million (ppm) above background, then sampling will cease and personnel will withdraw from the work area.
- If concentrations persist above 5 ppm, then Level C protection will be required if work is to continue.
- If OVA readings exceed 10 ppm in the breathing zone while workers are in Level C protection, then work will cease, and the source of the emission will be determined and eliminated before work continues.
- Periodic measurements of the area will be taken before re-entry to ensure lower exposure limit (LEL) has been reduced to safe working levels.

7.3.2 Explosive Limits

If conditions encountered during drilling or sampling suggest potentially explosive conditions may exist, the SSO will direct explosimeter monitoring be conducted. The following explosimeter monitoring action levels will be used:

- If gas or vapor concentration is less than 10 percent of its LEL, continue investigation.
- If concentrations are between 10 and 25 percent of its LEL, continuously monitor site and continue investigation with extreme caution.
- If concentrations are greater than 25 percent of LEL, withdraw from area immediately.

7.3.3 Noise

Field personnel will initially monitor noise levels associated with equipment and machinery with a direct reading portable noise level monitor unless based on experience, it is known that hearing protection is not necessary. Readings will be taken within the normal worker hearing zone. If maximum noise levels exceed 85 decibels at any time during site operations, hearing protection will be worn.

The OSHA permissible noise exposure limit is 90 decibels as an average exposure over an 8-hour work period. If an employee's 8-hour time-weighted average noise exposure for any day is in excess of 85 decibels, the employee must participate in a hearing conservation program. For most field activities, it is unlikely the employee exposure in excess of 85 decibels for 8 hours will occur. Although a written hearing conservation program is not required, Kennedy Jenks will

provide field personnel with appropriate hearing protection (i.e., earmuffs or plugs) whenever noise levels have the potential to exceed 85 decibels.

All contractors are responsible to ensure whether a hearing conservation program is warranted per site conditions and are to ensure compliance with applicable OSHA regulations.

7.4 Site Control

Work zones will not be established for Level D activities. Individuals not directly involved in ongoing work will be requested to stay at least 50 feet away from Level D activities. For work inside a building, access will be controlled using building access control.

7.5 Decontamination

For activities requiring Level D protection and modified Level C protection without established work zones, it is unlikely major decontamination will be necessary. At the conclusion of each day or work period, disposable gloves and coveralls will be removed and disposed of in onsite containers.

If full Level C protection is required, minimum decontamination procedures associated with Level C protection will be followed and established within the Contamination Reduction Zone. These procedures are presented in Table 2.

7.6 Training

Kennedy Jenks personnel participating in field activities will have completed the Hazardous Waste Operations and Emergency Response 40-hour health and safety training course (29 CFR 1910.120), or have equivalent training, and have undergone annual 8-hour refresher training. Training requirements are discussed in Kennedy Jenks Health and Safety Operation Manual. Prior to each work day, a TSB meeting will be held at the site to familiarize personnel with health and safety issues, protective equipment, emergency information, and supplies and to discuss special topics.

7.7 Medical Monitoring

Kennedy Jenks personnel participating in field activities will be included in a medical monitoring program. The program includes a baseline physical examination, pulmonary function test, and blood and urine tests. Periodic (annual) examinations will be provided to employees who are exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year. Annual examinations will also be provided to Kennedy Jenks employees who wear a respirator for 30 days or more a year or as required by 1910.134. Details of the medical program are included in the Kennedy Jenks Health and Safety Operations Manual.

7.8 Sanitation and Illumination

The site may have drinking water, washing water, and restroom facilities available. If drinking water is not available at the site, a sufficient amount of water will be provided to accommodate each employee with 1 quart of water per hour. The water will be kept cool by means of a portable cooler with ice or similar means.

No eating, drinking, smoking, or gum or tobacco chewing is allowed in restricted areas.

Activities will take place during daylight hours. Because natural illumination (approximately 50- to 200-foot candles) will be sufficient to meet the 5-foot candle requirement for general site areas, no additional illumination will be required.

7.9 COVID-19 Procedures and Processes

The following information summarizes hazards, risks, and mitigation/minimization strategies for COVID-19 exposure and transmission in anticipation of field activities in the coming months. The procedures established herein provide a framework, with the expectation that site personnel will work together to optimize and refine these procedures to most effectively achieve the objective of minimizing COVID-19 exposure and transmission risks and safely completing their field assignments.

7.9.1 COVID-19 Background

COVID-19 is a new strain of coronavirus which originated in Wuhan, China, and has since been detected worldwide and now in the United States. COVID-19 is a respiratory virus and symptoms of infection include fever, dry cough, shortness of breath, and breathing difficulties. In severe cases, infection can cause pneumonia, acute respiratory syndrome, organ failure, and death. Treatment of COVID-19 is typically with medication to reduce fever and to support and improve respiratory function.

COVID-19 is thought to spread mainly from person-to-person between people who are in close contact with one another (within about 6 feet), or through respiratory droplets produced when an infected person coughs or sneezes. These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs. It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes, but this is not thought to be the main way the virus spreads.

7.9.2 Prevention and Treatment

The best way to prevent illness is to avoid being exposed to this virus. COVID-19 vaccines are becoming available and being distributed to communities throughout the U.S. when available. Based on the information that is currently available, the vaccine is not expected to have widespread distribution until mid to late 2021. Centers for Disease Control and Prevention (CDC) recommends everyday preventive actions to help prevent the spread of respiratory diseases.

CDC Fact Sheets specific to COVID-19 are included in Appendix H.

7.9.3 Site-Specific Procedures and Guidelines

The following presents guidelines to be followed by all personnel onsite in conjunction with those already set in place. Other contractors/consultants working onsite should be provided this document and commit to abiding by these procedures (or more stringent firm-specific procedures). These procedures supplement those established in each firm's site-specific health and safety plan.

7.9.3.1 Transportation and Parking

Employees are encouraged to drive separately to/from the site, unless their vehicle provides adequate interior space for social distancing. Parking will be situated such that staff traveling between their designated workspace and vehicle should not encounter members of other field teams.

Travel around the site will occur on foot with appropriate social distancing and/or in separate vehicles.

7.9.3.2 Interactions Within Field Teams

All site personnel should limit physical interactions as much as practicable while still allowing for a safe and efficient workspace. Social distancing is the primary means of avoiding physical interactions. The means by which a field team establishes and maintains social distance is task- and location-specific and will be assessed and refined in the field. Those routine elements of the field program are addressed below and associated procedures ensure the CDC suggested 6-foot buffer during physical interactions.

7.9.3.3 Social Distancing – Non-Work Hours

Procedures established herein effectively limit interactions while onsite. To supplement these onsite procedures, all personnel who will be returning to site the following day should practice social distancing during non-work hours away from the facility. In the event that a questionable encounter occurs during non-working hours, Kennedy Jenks recommends that the employee mention the interaction at the next safety briefing to make others aware and refine onsite procedures if needed.

7.9.3.4 Meals

All personnel should pack and bring their meals (and snacks/drinks) onsite with them. Employees are discouraged from leaving the site during the workday.

7.9.3.5 Daily Safety Tailgate

Field teams conduct daily safety tailgate briefings at the beginning of every workday. These meetings will be conducted outside in the parking area onsite each morning. The meetings include daily scope of work and hazards that are present onsite. Recognizing the everchanging stream of information and decisions related to COVID-19, safety briefings will include an overview of pertinent updates. At the end of each meeting (and anytime during the day), all personnel present will have a chance to voice concerns. All personnel onsite have stop work authority, and COVID-19 comfort concerns are a valid reason to stop work and revisit the procedures outlined herein and/or make a go/no-go decision regarding additional field activities.

Field teams will record the meeting attendees in a field book in lieu of passing the tailgate sheet for signatures.

7.9.3.6 Sanitation

All personnel will be required to sanitize their field equipment at the end of the workday before leaving the site to help decrease spread or migration of the virus using sanitation wipes provided by their company. Similarly, once arriving onsite, all personnel should immediately thoroughly wash their hands in the designated restroom.

7.9.4 Communication and Updates

Kennedy Jenks will provide updates as more information on COVID-19 exposure and transmission risks becomes available.

While onsite, all personnel should practice safe prevention techniques as outlined in the Introduction and follow the guidelines hereinto. As the COVID-19 pandemic continues to unfold across the U.S. and in Washington, Kennedy Jenks will maintain constant communication with personnel onsite. Daily updates will be provided to verify that work can continue safely and address emerging situations.

IF YOU FEEL ILL, CONTACT YOUR H&S REPRESENTATIVE - DO NOT COME TO THE SITE.

Section 8: Emergency Response Plan

Hazard recognition is an essential part of the Emergency Response Plan. Initiation of the contingency plan relies on the employee's ability to recognize an emergency or potential for an emergency. The following is a list of events that will immediately initiate emergency procedures:

- Explosion
- Fire
- Release of organic vapors or particulate above the action levels
- Personal injury
- Failure or expected failure of runoff/runoff control measures
- Natural occurrences (i.e., lightning, tornado, high winds, etc.)
- Spills.

8.1 Emergency Communications

Emergency communications will consist of two methods.

8.1.1 Verbal Communication

Verbal communication will be the primary method of emergency communication between onsite personnel, distance permitting.

8.1.2 Telephones

Telephones are used for routine communication and to notify offsite agencies of incidents and request assistance. Emergency telephone numbers are given in Section 9.

8.2 Emergency Protocol

When an event recognized as an emergency occurs, the alarm system will be used to notify personnel. As soon as the alarm system is activated, the SSO will be notified.

The SSO will take into account the following information:

- Nature of emergency
- Wind direction
- Location of personnel
- Monitoring results

- Emergency equipment available
- Offsite population.

Based on this information, the SSO will direct appropriate emergency action and agency notification. After the emergency has been controlled and the site is considered safe to re-enter, the SSO, in coordination with the Project Manager, will direct remedial action to restore the site to full operating condition.

The SSO will investigate the nature and cause of the incident so work procedures can be modified to minimize the likelihood of the incident's recurrence.

All incidents must be reported in a timely, appropriate manner to the Director of HS&E or H&S Manager. An incident is any unplanned event resulting in injury, damage, loss of assets, adverse publicity, or which requires notification of a regulatory agency, regardless of severity. All Kennedy Jenks personnel should report an incident to the SSO. The SSO will report to the Project Manager, who is responsible for notifying the Director of HS&E or H&S Manager.

Each incident will be investigated and a Root Cause Analysis Report will be generated and forwarded to the Project Manager and the H&S Manager.

If work zones are established, the Exclusion Zone will have several emergency exits, which will allow safe egress in multiple directions from any point onsite. The exit selection will be based on the emergency location, type of emergency, and wind direction. Upon hearing the evacuation signal or otherwise being notified of an evacuation, employees will immediately travel to the assembly area located at the decontamination station.

Employees will follow a route that avoids locations downwind from the emergency. If emergency exits are used, employees will proceed to the assembly area by the quickest route possible. When the assembly area is reached, employees will immediately check in with the SSO. The site will remain evacuated until the all clear signal has been given.

8.3 Emergency Supplies

The following is a list of emergency equipment available to take to the site:

- Portable emergency eye wash
- First aid supplies
- Cooler for water and ice (when temperatures are predicted to be above 85°F)
- Shade cover to protect from sun exposure.

All personnel will have a thorough understanding of the HASP before starting work. It will be reviewed periodically to keep it current with new or changing site conditions or information.

8.4 Injury Response

In the event of an employee injury in a contaminated area, consideration must be given before moving the injured and contaminated employee to outside the restricted contamination area. The nature of the injury, hazards posing an immediate danger, and other factors must all be weighed before moving an injured employee who is wearing contaminated PPE. Initial responders should follow directions from 9-1-1 personnel or the Director of HS&E or H&S Manager.

Section 9: Reporting (Injury/Illness, Property Damage, or Near Miss)

9.1 Injury/Illness Care and Notification Procedures

9.1.1 Emergency Services (9-1-1)

Call 9-1-1 for critical injuries or illnesses (i.e., head injuries, uncontrolled bleeding, difficulty breathing, chest pain, or altered level of consciousness) or if an employee or his/her supervisor has immediate concerns about an injury or illness.

9.1.2 Injury/Illness Intervention

Kennedy Jenks has retained WorkCare, a team of occupational physicians, to provide our employees with effective treatment of non-critical work-related injuries and illnesses. WorkCare provides on the spot, 24/7 employee consultations at the time an on-the-job incident occurs, as well as post-accident follow-up and consultation.

9.1.3 When to Call WorkCare

In the instance of a non-critical workplace injury or illness, an employee should call WorkCare at (888) 449-7787 to receive instruction on how to contact one of its clinicians and contact their immediate supervisor as soon as possible. Common non-critical workplace injuries/illnesses include:

- Back sprains
- Slips, trips, falls
- Shoulder strains
- Contact with a harmful substance.

9.1.4 Employee Role

The injured employee, if able, must do the following:

- Report any non-critical injuries/illness to WorkCare at (888) 449-7787 and, as soon as possible, to their immediate supervisor. WorkCare will notify the Director of HS&E and the H&S Manager of the injury or illness. The Director of HS&E will immediately notify the appropriate Business Unit President and Director of Operations of the injury or illness.

- If WorkCare determines medical attention is required, transportation must be provided for the injured employee. An injured employee must not transport himself/herself to a facility for medical treatment. If a co-worker is not available to transport the injured employee, an ambulance, a taxi, or other means of transportation must be provided, unless the employee is working in a remote area and no other form of transportation is available. WorkCare will send the employee to an approved local facility and inform the treating physician the injury is work related.

9.1.5 Project Manager Role

The Project Manager must do the following:

- Make sure the injured employee contacts WorkCare and is provided transportation to immediately obtain any required medical care from an approved doctor or hospital, if required.
- Provide emergency ambulance service if needed for critical injuries or illnesses, if required.
- Notify the Director of HS&E and H&S Manager of the injury or illness.

9.1.6 Injured Subcontractor or Other Non-Kennedy Jenks Employee

In the case of injuries or illness to non-employees, the appropriate staff member should ensure they receive proper medical attention, and their supervisor and the Director of HS&E are notified immediately. The Director of HS&E will notify Senior Leadership Team.

9.2 Property Damage and Near Miss Incident Investigation

All work-related property damage and near miss incidents will be investigated by Kennedy Jenks in a timely manner. Minor incidents and "near misses" will also be investigated so the risk of serious occurrences can be reduced in the future. All serious incidents and serious "near misses" will be investigated by the Director of HS&E or the H&S Manager.

- Near Miss. Incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.
- Rule of Thumb. If you need to ask yourself if the incident was a near miss or not, you have answered the question, and it is a near miss.

Forms

The Injury/Illness, Property Damage Incident, and Near Miss Reporting Forms are included as Appendix I.

Section 10: Emergency/Team Contacts & Approvals

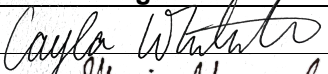
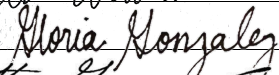
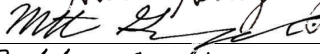
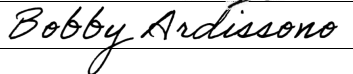
Emergency Telephone Numbers

	Name	Phone
Site Contact	Dale Myers (DOE)	425-649-4446
WorkCare (Non-Critical Injuries)	WorkCare	888-449-7787
Fire Department ¹		9-1-1
Hospital:		206-598-3300
UW Medical Center 1959 NE Pacific Street, Suite 207 Seattle, WA 98195		
Directions to hospital ² : See attached map		
Ambulance		9-1-1
Police		9-1-1
Kennedy Jenks:		
Project Manager	Ryan Hultgren	253-835-6432
Site Safety Officer (SSO)	Ryan Hultgren	253-835-6432
Health and Safety Manager	John Jindra	253-835-6466 (Office) 253-254-1079 (Cell)
Director of Health, Safety and Environment	Bert Drews	415-710-0002 (Cell)

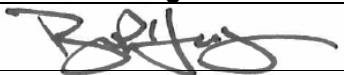
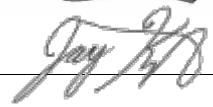
¹ The local fire department prefers the public use 911 to assure the proper assistance in case of accident or injury.

² Attach written directions and map showing route to hospital.

Project Team Members Participating in Field Activities

Name	Affiliation	Responsibility	Signature/Date
Cayla Whiteside	KJ	Field Engineer/SSO	 12/14/21
Gloria Gonzalez	KJ	Field Geologist/SSO	 12/15/21
Matthew Grzegorzewski	KJ	Field Engineer/SSO	 12/15/21
Bobby Ardissono	KJ	Field Engineer/SSO	 12/15/21

Approvals

	Name	Signature/Date
Project Manager	Ryan Hultgren	 12/9/21
Health and Safety Manager	Jay Knight (for John Jindra)	 12/9/21

CC: Project File
PM Portal

Site-Specific Health and Safety Plan
DOE, Former Circle K Site

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Tables

Table 1: Chemicals Detected In Groundwater Monitoring Samples

Chemical	Maximum Concentrations (mg/L)	Sample Location
TPH ^(a) (GRO) ^(b)	historical: 464 recent: 109	MW-8 ^(c) (2001) MW-13 ^(c) (2006)
Benzene	historical: 54 recent: 7.26	MW-13 (1990) MW-13 (2006)
Toluene	historical: 28 recent: 14.7	MW-4 ^(c) (2001) MW-13 (2006)
Ethylbenzene	historical: 50 recent: 27.7	MW-13 (1990) MW-8 (2006)
Total Xylenes	historical: 17.1 recent: 15.5	MW-4 (2001) MW-13 (2006)
MTBE	15.5 ug/L	MW-15 (2003)

Note:

- (a) Total petroleum hydrocarbon
 - (b) Gasoline-range organics
 - (c) Non-aqueous phase liquid (NAPL) has been present historically in wells MW-4, -8, -9, and -13.
- mg/L = milligrams per liter
ug/L = micrograms per liter

Table 2: Chemicals Detected in Soil Samples

Chemical	Maximum Concentrations (mg/kg)	Sample Location
TPH ^(a) (GRO) ^(b)	1700	NW-1 (north side of former UST excavation area) at 13 feet bgs ^(c) (1990)
Benzene	31	NW-1 (north side of former UST excavation area) at 13 feet bgs (1990)
Toluene	55	NW-1 (north side of former UST excavation area) at 13 feet bgs (1990)
Ethylbenzene	140	NW-1 (north side of former UST excavation area) at 13 feet bgs (1990)
Total Xylenes	300	NW-1 (north side of former UST excavation area) at 13 feet bgs (1990)

Note:

- (a) Total petroleum hydrocarbon
 - (b) Gasoline-range organics
 - (c) Below ground surface
- mg/kg = milligrams per kilogram

Table 3: Chemical Allowable Exposure Values and Exposure Symptoms

Chemical	TLV TWA ^(a)	CalOSHA STEL ^(b)	CalOSHA PEL ^(b)	Acute Exposure Symptoms ^(c)	Target Organs ^(d)
Benzene	0.5 ppm	5 ppm	1 ppm	Irritant to eyes, nose respiratory system nausea.	Skin ^(d) , liver, kidneys, respiratory system, cardiovascular system, central nervous system.
Ethylbenzene	100 ppm	125 ppm	100 ppm	Irritant to eyes, mucous membranes, dermatitis, narcosis coma.	Skin, liver, kidneys, respiratory system, cardiovascular system, central nervous system.
Toluene	50 ppm	300 ppm ceiling	100 ppm	Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils.	Central nervous system, liver, kidneys, skin.
Xylene	100 ppm	150 ppm	100 ppm	Dizziness, excitement, vomiting.	Central nervous system, eyes, gastrointestinal (GI) tract, blood, liver, kidneys, skin.
Methanol (preservative)	100 ppm	250 ppm	200 ppm IDLH 6,000 ppm	Eye, skin and mucus irritant, dizziness, nausea.	Optic nerve, liver, and other organ damage.
Lead	0.05 mg/m ³	----	0.05 mg/m ³ IDLH 100 mg/m ³	Weakness, lassitude, insomnia, facial pallor, abdominal pain, anemia, tremor, eye irritation, liver and kidney disease.	Eyes, GI tract, CNS, kidneys, blood, gingival tissue.
Gasoline	None Developed	----	None Developed	Irritant to eyes, skin, mucous membranes, dermatitis, lassitude, blurred vision, dizziness, slurred speech, confusion, convulsions.	Eyes, skin, respiratory system, CNS, liver, kidneys.
Ethylene dichloride (1,2-DCE; EDC)	1 ppm (Ca TWA ^(c))	2 ppm (ST REL ^(c))	50 ppm TWA	Irritant to eyes, corneal opacity, CNS depression, nausea, vomiting, dermatitis.	Eyes, skin kidneys, liver, CNS, cardiovascular system.
Ethylene dibromide (1,2-DBE; EDB)	0.045 ppm (Ca TWA ^(c))	----	20 ppm TWA	Irritant to eyes, skin, respiratory system, dermatitis with vesiculation..	Eyes, skin, respiratory system, liver, kidneys, reproductive system.

Notes:

- (a) TLV TWA = threshold limit value – 8-hour time-weighted average.
 STEL = short-term exposure limit.
 American Conference of Governmental Industrial Hygienists. TLV and Biological Exposure Indices for 1997.
 TLV TWA reported in ppm represents parts of vapor per million parts of air by volume at 25 degrees Celsius (°C) and 760 torr. TLV - TWA reported in milligrams per cubic meter (mg/m³) represents milligrams of substance per cubic meter of air.
- (b) PEL = Federal Occupational Safety and Health Administration (OSHA) (29 CFR 1910 Subpart Z) Permissible Exposure Level based on 8-hour time weighted average.
- (c) Source: U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards. June 1994. Sittig, Marshall. 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens. Park Ridge, New Jersey. Noyes Publications.
- (d) Skin notation indicates route of exposure through cutaneous absorption.
 ppm = parts per million
 IDLH = immediately dangerous to life and health

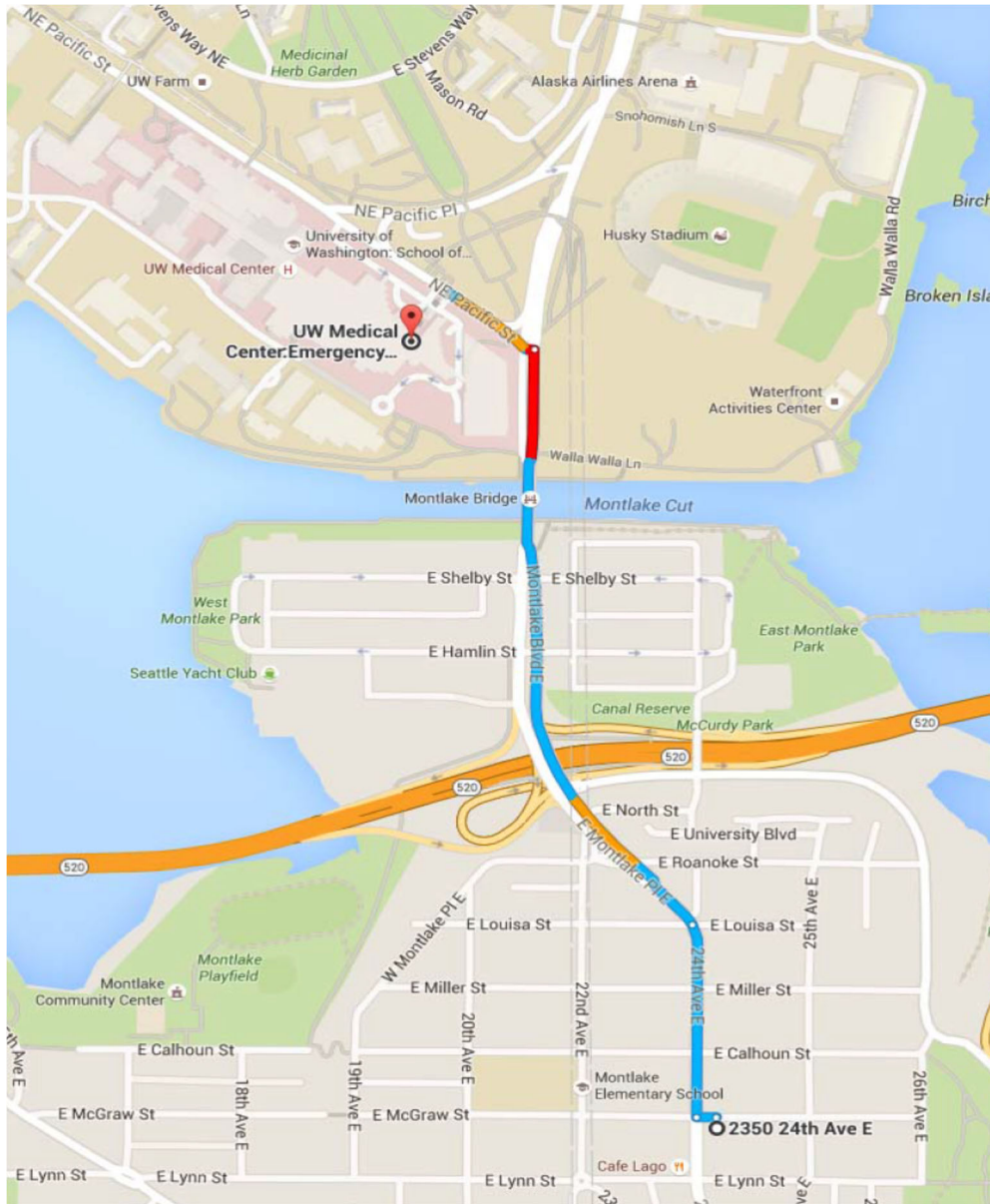
Table 4: Measures for Level C Decontamination

Station	Description
1	<p>Equipment Drop</p> <p>Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.</p>
2	<p>Outer Garment, Boots, and Gloves Wash and Rinse</p> <p>Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.</p>
3	<p>Outer Boot and Glove Removal</p> <p>Remove outer boots and gloves. Deposit in container with plastic liner.</p>
4	<p>Canister or Mask Change</p> <p>If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.</p>
5	<p>Boot, Gloves and Outer Garment Removal</p> <p>Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.</p>
6	<p>Face Piece Removal</p> <p>Face piece is removed. Avoid touching face with fingers. Face piece is deposited on plastic sheet.</p>
7	<p>Field Wash</p> <p>Hands and face are thoroughly washed. Shower as soon as possible.</p>

Attachment 1

Site Map

Map and Written Directions to Local Hospital



- From the Site, turn north onto 24th Avenue East.
- Follow 24th Avenue northbound; 24th Avenue becomes East Montlake Place E and then Montlake Blvd East (north of SR 520).
- Follow Montlake Blvd northbound to NE Pacific Street.
- Turn left (westbound) onto NE Pacific Street.
- Turn left from NE Pacific Street to UW Medical Center.

Appendix A

Job Hazard Analysis

JOB HAZARD ANALYSIS	Project No.: 2196008*00
Job/Operation Title: Excavation or Trenching	Date: April 2021
Business Unit: Industrial	JHA Reviewed By: Julia Schwarz
Project Location: Seattle, WA	JHA Revised By: Katie Haskins
Person(s) Performing This Job/Task: Julia Schwarz, Katie Haskins, Gloria Gonzalez, Matt Grzegorzewski, Bobby Ardissono	Project Manager: Julia Schwarz
Job/Task Start Date: April 2021	Job/Task Duration: 2021-2026

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Mobilize equipment	Risk of injury to automotive or pedestrian traffic.	<p>A Traffic / Pedestrian Control Plan is required when blocking or partially blocking any walkway, roadway, or driveway.</p> <p>Work area should be delineated off from Unauthorized personnel and signs posted.</p> <p>Proper PPE shall be worn by adjacent personnel, as required by their proximity to the work task.</p>
Locate utilities	Risk of damaging underground utilities.	<p>Follow Utility Locate Stand Operating Procedures (SOPs).</p> <p>Ensure all areas to be disturbed have been scanned prior to the start of work.</p>

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Excavate or trench	Risks of injury from cave-in's collapse of unstable or poorly supported soil.	<p>Soil type shall be classified by an Excavation Competent Person (CP). The contractor or subcontractor will provided an Excavation CP.</p> <p>Trenches, spoil piles, and surrounding work areas must be inspected daily or as needed.</p> <p>Kennedy Jenks personnel will not enter any trench greater than 5 feet deep (4 feet in Washington and Oregon) that is not shored or benched. Appropriate shoring or benching is determined by the CP.</p> <p>Excavated soil spoils are properly managed.</p> <p>Any trench greater than 5 feet deep (4 feet in Washington and Oregon), located next to underground piping or tanks containing hazardous materials or having soil discoloration or odors shall be evaluated for permit-required confined space controls.</p>
Containment	Risk of accidental release into the storm water drains	<p>Follow Stormwater Pollution Prevention Program as required.</p> <p>If storm drains are below work areas, ensure drain covers are surrounded by waddles, lined with mesh covers (silt screens).</p>

7JOB HAZARD ANALYSIS

COVID-19 Safety Practices

Similar to any other hazard encountered in the performance of field work, COVID-19 presents hazards we must consider and address as part of our job hazard analysis (JHA).

Supplemental Document References:

COVID-19 General Guidelines

https://kjcnet.sharepoint.com/sites/SafetyZone/SiteAssets/SitePages/Coronavirus/KJ_COVID_01_GeneralGuidelines.pdf?web=1

COVID-19 Projects

https://kjcnet.sharepoint.com/sites/SafetyZone/SiteAssets/SitePages/Coronavirus/KJ_COVID_03_Projects.pdf?web=1

COVID-19 Vehicles

https://kjcnet.sharepoint.com/sites/SafetyZone/SiteAssets/SitePages/Coronavirus/KJ_COVID_04_Vehicles.pdf?web=1

COVID-19 Travel

https://kjcnet.sharepoint.com/sites/SafetyZone/SiteAssets/SitePages/Coronavirus/KJ_COVID_05_Travel.pdf?web=1

Controlling spread of COVID-19 infection

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Pre-Trip Planning	Travel by vehicle Access restrictions/closures due to COVID-19 Lack of vital services due to COVID-19 Increased exposure potential to COVID-19	<ul style="list-style-type: none"> • Confirm with supervisor and Chief Risk Officer travel is deemed business essential. • Check with client regarding potential access restrictions or specific guidance regarding COVID-19. • Determine requirements of any local, state, federal government directives/ordinances applicable to the areas of travel. • Verify flights, hotels, and meal accommodations are available in areas of travel. • Review CDC or local health department guidance with project team members and KJ's COVID-19 Travel Planning Policy (linked above) to prevent or reduce the likelihood of exposure. • Provide adequate supplies for the task and access for all team members (hand washing and sanitation stations, PPE (gloves, safety glasses, face covering, as appropriate). • Follow hygienic practices to reduce the spread of germs: <ul style="list-style-type: none"> ▪ Wash hands regularly and thoroughly with soap and water, for a minimum of 20 seconds. While in the field keep hand sanitizer^(a) (containing at least 60% alcohol) and/or disinfectant wipes^(b) easily accessible. ▪ Avoid touching your nose, mouth, and eyes and wash hands before and after eating. ▪ Cover coughs and sneezes with a tissue, or cough and sneeze into upper sleeve if tissues are not available.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		<ul style="list-style-type: none"> ▪ Properly dispose of tissues, napkins, and other items that you have used immediately after use (do not place used tissues on desk surfaces or in clothing pockets). ▪ Wash hands or use hand sanitizer^(a) after coughing, sneezing, or blowing your nose. ▪ Wipe down frequently touched work surfaces, tools, and equipment with sanitizing wipes. ▪ Use disposable gloves if handling tools and equipment that may be contaminated. ▪ Avoid using other employees' work tools and equipment. • Avoid close contact with others; maintain social distancing when possible (defined by the CDC as remaining out of congregate settings, avoiding mass gatherings, and maintaining distance (approximately 6 feet from others). • Avoid handshakes. Always wash hands after physical contact with others.
Travel to and from Jobsite	Inadequate social distancing for COVID-19	<ul style="list-style-type: none"> • Avoid public transportation when possible. • Separate vehicle occupants as far as possible or plan to take individual vehicles/means of transportation to maintain social distancing.
Evaluate Job Sites and Discuss with Client and or Contractor	Contracting COVID-19 virus	<p>Project managers and assigned field staff should evaluate job sites where we will be working for potential exposure. Obtain as much information as you can from the client and/or contractor on current projects and for new projects.</p> <ul style="list-style-type: none"> • Have there been reported COVID-19 cases or suspected cases at the site? • What precautions has our client and or contractor put in place for disease transmission prevention? • Has the client/contractor provided a COVID-19 revision of their Safety Plan for all site staff to follow and if yes, are you following it? • Ask our client or contractor to immediately notify us of suspected cases at the site. • What requirements or restrictions does our client or contractor have for KJ personnel that will be onsite? <ul style="list-style-type: none"> ▪ Has anything changed that will impact our services, schedule, staffing, costs? If yes, we will need to discuss with our client immediately.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Interacting with Co-workers and Client Employees to Deliver Essential Services	Contracting COVID-19 virus	<ul style="list-style-type: none"> • Provide services remotely if possible, utilizing teleconferencing resources. • Observe social distancing by maintaining a minimum of 6 feet between all persons. • Amend work environment by providing physical barriers or maintaining social distancing. • Limit all physical contact with persons and time spent in close proximity to absolute minimum. • Conduct ongoing cleaning and disinfection of high touch surfaces (e.g., tables, hard-backed chairs, doorknobs, light switches, remotes, handles, desks, toilets, sinks, other's computers and cell phones) following the Safety Practices for Cleaning^(c) and Disinfecting^(d). • Observe proper hand hygiene <ul style="list-style-type: none"> ▪ Wash your hands often with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, or sneezing. ▪ If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands and rub them together until they feel dry. • If social distancing (6 feet minimum) is not possible and employees must work in close proximity wear the following PPE. <ul style="list-style-type: none"> ▪ Non-sterile or nitrile exam gloves. ▪ Safety glasses. ▪ Face Coverings. • Hand washing should be done immediately after removing PPE.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Cleaning and Disinfecting	Contracting COVID-19 virus	<ul style="list-style-type: none"> • Amend work environment to limit physical contact with high touch surface. • Provide individual equipment as possible to limit multiple persons contacting same surfaces. • Maintaining social distancing to limit physical contact. • Wear disposable gloves when cleaning and disinfecting surfaces. <ul style="list-style-type: none"> ▪ Gloves should be discarded after each cleaning. If reusable gloves are used, those gloves should be dedicated for cleaning and disinfection of surfaces for COVID-19 and should not be used for other purposes. ▪ Clean hands immediately after gloves are removed. • If surfaces are dirty, they should be cleaned using a detergent or soap and water prior to disinfection. • For disinfection, diluted household bleach solutions, alcohol solutions with at least 70% alcohol, and most common EPA-registered household disinfectants should be effective. • After cleaning: <ul style="list-style-type: none"> ▪ Launder or dispose of items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely. • Staff should wear disposable gloves for all tasks in the cleaning process, including handling trash. <ul style="list-style-type: none"> ▪ Gloves should be compatible with the disinfectant products being used. ▪ Additional PPE might be required based on the cleaning/disinfectant products being used and whether there is a risk of splash. ▪ Gloves should be removed carefully to avoid contamination of the wearer and the surrounding area. Be sure to clean hands after removing gloves. • Gloves should be removed after cleaning. Clean hands immediately after gloves are removed. • Staff and others should clean hands often, including immediately after removing gloves, by washing hands with soap and water for 20 seconds. If soap and water are not available and hands are not visibly dirty, an alcohol-based hand sanitizer that contains 60% to 95% alcohol may be used. However, if hands are visibly dirty, always wash hands with soap and water.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Essential Staff Reporting to Work Location	Contracting COVID-19 virus	<ul style="list-style-type: none"> • Reduce contact with high touch surfaces. <ul style="list-style-type: none"> ▪ Disinfect personal spaces with available cleaning solutions. • Amend physical work environment to maximize physical distance between employees. • Provide individual equipment and position workstations to prevent employees from being closer than 6 feet to each other while working. • Limit the number of persons working in the same location contacting same surfaces. • Stay home if you have a fever, cough, or are experiencing shortness of breath. • Follow guidelines for workplace cleaning and disinfection.

Notes:

- (a) Hand Sanitizer - Use hand sanitizer as needed and if available. If hand sanitizer is not available, use a combination of nitrile gloves and wash hands with soap and water to prevent the spread of the virus.
- (b) Disinfectant Wipes - If disinfecting wipes are not available, mix 1/3 cup of bleach with 1 gallon of water, spray into clean towel or rag and wipe surfaces down. Use caution using bleach on fabric or porous surfaces.
- (c) Cleaning refers to the removal of germs, dirt, and impurities from surfaces. Cleaning does not kill germs, but by removing them, it lowers their numbers and the risk of spreading infection.
- (d) Disinfecting refers to using chemicals, found on the Environmental Protection Agency (EPA) "List N", to kill germs on surfaces. This process does not necessarily clean dirty surfaces, but by killing germs on a surface after cleaning, it can further lower the risk of spreading infection.
"List N" includes products that meet EPA's criteria for use against SARS-CoV-2, the novel coronavirus that causes the disease COVID-19. When purchasing a product, check if its EPA registration number is included on "List N".

JOB HAZARD ANALYSIS

Lone Worker

Control measures to decrease exposure of a lone worker to hazards may include instruction, training, supervision, protective equipment and communication devices.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Working alone	<ul style="list-style-type: none">• Remote location• Unidentified hazards• Equipment and material handling• Chemical or hazardous substances exposure• Limiting medical conditions	<ul style="list-style-type: none">• Identify hazards of the work and assessing the risks involved• Establish emergency procedures• Regular contact between the lone worker and supervision using cell phone or computer• Lone workers should have access to adequate first-aid facilities or should carry a first-aid kit suitable for treating minor injuries• Verify that a lone worker has returned to their base or home on completion of a task.

JOB HAZARD ANALYSIS

Vehicle Operation

For KJ Vehicle Use:

Before and after every use, ensure that all items listed in the Vehicle Disinfection Checklist are disinfected and sanitized with an approved cleaner such as disinfectant wipes, 70% isopropyl alcohol (IPA) and disposable paper towels, or similar.

Hard copies of the Vehicle Disinfection Checklist are located within the KJ owned vehicle mileage log. Leave a copy of the completed checklist with the mileage log.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Entering vehicle	Injury from door	<ul style="list-style-type: none"> • Be careful when opening vehicle door.
Turn on engine	None foreseen	
Driving motorized vehicle	Injury to self from accidents Injury to others	<ul style="list-style-type: none"> • Fasten seat belt before driving. • Use defensive driving skills. • Obey all traffic regulations. • Never leave unattended car running. • Refer to the State Department of Motor Vehicles handbook for more information. • Survey surroundings before driving. • Use defensive driving skills.
Parking	Property damage Injury to self from accidents Injury to others	<ul style="list-style-type: none"> • When or if available, back vehicle into position when parking to enable operator to pull forward when leaving the site.
Turn off engine	None foreseen	
Cleaning and Disinfecting	Infectious disease exposure	At a minimum, vehicle parts to be cleaned Pre- and Post-Use: <ul style="list-style-type: none"> • Steering Wheel • Shift Knob • Emergency Brake • Switch Levers (Windshield Wiper Lever, Signal Lever, Fuel Lever) • Dashboard • Console • Rearview Mirror

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		<ul style="list-style-type: none"> • Front and Used Side Window Interiors (if sneeze or cough) • Radio and Climate Control Buttons • Cupholders • All Used Door Handles (inside and outside), including Door Locks, Window Controls and Glove Compartment • Seat Adjusters • Seat Belts • Car Keys • Arm Rests • Common Equipment Stored in Vehicle if Used • Mileage Log Binder and Pen

JOB HAZARD ANALYSIS	Project No.: 2196008*00
Job/Operation Title: Lifting	Date: April 2021
Business Unit: Industrial	JHA Reviewed By: Julia Schwarz
Project Location: Seattle, WA	JHA Revised By: Katie Haskins
Person(s) Performing This Job/Task: Julia Schwarz, Katie Haskins, Gloria Gonzalez, Matt Grzegorzewski, Bobby Ardissono	Project Manager: Julia Schwarz
Job/Task Start Date: April 2021	Job/Task Duration: 2021-2026

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Lifting /carrying/ moving/pulling objects	Sprains, strains – back, shoulder injury	<ul style="list-style-type: none"> • Always use proper lifting techniques (avoid twisting). • Clear your path – make sure you have plenty of room to lift the object properly. • Size up your load – get a sense of the weight. • Use a hand truck, push cart, or forklift. • Make sure the contents will not shift. • Get help or use lift assist devices for awkward loads or those that block your vision. • Hold the load close to your body. • Keep your back straight. • Walk slowly and maintain firm footing.
Setting the load down	Sprains, strains – back, shoulder injury	<ul style="list-style-type: none"> • Squat down to lower the object, using your legs. • Avoid twisting and bending at the waist – keep your head up.

JOB HAZARD ANALYSIS	Project No.: 2196008*00
Job/Operation Title: Lone Worker	Date: April 2021
Business Unit: Industrial	JHA Reviewed By: Julia Schwarz
Project Location: Seattle, WA	JHA Revised By: Katie Haskins
Person(s) Performing This Job/Task: Julia Schwarz, Katie Haskins, Gloria Gonzalez, Matt Grzegorzewski, Bobby Ardissono	Project Manager: Julia Schwarz
Job/Task Start Date: April 2021	Job/Task Duration: 2021-2026

Control measures to decrease exposure of a lone worker to hazards may include instruction, training, supervision, protective equipment and communication devices.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Working alone	<ul style="list-style-type: none"> • Remote location • Unidentified hazards • Equipment and material handling • Chemical or hazardous substances exposure • Limiting medical conditions 	<ul style="list-style-type: none"> • Identify hazards of the work and assessing the risks involved • Establish emergency procedures • Regular contact between the lone worker and supervision using cell phone or computer • Supervisors may periodically visit and observe lone workers • Lone workers should have access to adequate first-aid facilities or should carry a first-aid kit suitable for treating minor injuries • Verify that a lone worker has returned to their base or home on completion of a task.

JOB HAZARD ANALYSIS	Project No.: 2196008*00
Job/Operation Title: Utility Locating Clearing	Date: April 2021
Business Unit: Industrial	JHA Reviewed By: Julia Schwarz
Project Location: Seattle, WA	JHA Revised By: Katie Haskins
Person(s) Performing This Job/Task: Julia Schwarz, Katie Haskins, Gloria Gonzalez, Matt Grzegorzewski, Bobby Ardissono	Project Manager: Julia Schwarz
Job/Task Start Date: April 2021	Job/Task Duration: 2021-2026

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Inspect site for evidence of utilities	Slips, Trips, and Falls	<ul style="list-style-type: none"> Inspect walking surfaces for terrain hazards or potholes that could cause a slip, trip, or fall. Identify and/or communicate fall hazards to project team. Do not walk through tall grass or vegetation where the walking surface cannot be viewed. The area should be cut down prior to walking through it. Wear appropriate work shoes or boots. Avoid working at times when it is dark, or you should use additional lighting when necessary.
	Biological Hazards Animals Insects Poisonous Plants	<ul style="list-style-type: none"> Avoid all animals, including domestic animals. Be aware of insect nests and wear long pants, long sleeve shirts. Apply insect repellent. Use insect pesticide to eradicate insects that interfere with work activities. Review site HASP for understanding of biological hazards, including poisonous plants. If contacted by a poisonous plant, immediately decontaminate skin with soap and water. If contact with poisonous plants is necessary, you must don chemical resistant suits and gloves. Report all incidents involving biological hazards to the site safety officer.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
	Heat/Cold Stress	<ul style="list-style-type: none"> • Monitor for heat/cold stress. • Dress appropriate for the weather. • Provide fluids to prevent worker dehydration. • Establish work/rest.
	Traffic	<ul style="list-style-type: none"> • Don a hi-visibility vest. • Do not enter the right-of-way or roads unless free of traffic or a traffic control plan has been developed and implemented.
Perform utility locating using GPR and/or Electromagnetic Induction	Slips, Trips, and Falls	<ul style="list-style-type: none"> • Inspect walking surfaces for terrain hazards or potholes that could cause a slip, trip, or fall. • Identify and/or communicate fall hazards to project team. • Do not walk through tall grass or vegetation where the walking surface cannot be viewed. The area should be cut down prior to walking through it. • Wear appropriate work shoes or boots. • Avoid working at times when it is dark, or you should use additional lighting when necessary.
	Biological Hazards	<ul style="list-style-type: none"> • Avoid all animals, including domestic animals. • Be aware of insect nests and wear long pants, long sleeve shirts. • Apply insect repellent. • Use insect pesticide to eradicate insects that interfere with work activities. • Review site HASP for understanding of biological hazards, including poisonous plants. • If contacted by a poisonous plant, immediately decontaminate skin with soap and water. • If contact with poisonous plants is necessary, you must don chemical resistant suits and gloves. • Report all incidents involving biological hazards to the site safety officer.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
	Heat/Cold Stress	<ul style="list-style-type: none"> • Monitor for heat/cold stress. • Dress appropriate for the weather. • Provide fluids to prevent worker dehydration. • Establish work/rest.
	Traffic	<ul style="list-style-type: none"> • Don a hi-visibility vest. • Do not enter the right-of-way or roads unless free of traffic.
	Lifting – Strains/Sprains	<ul style="list-style-type: none"> • Utilize proper lifting techniques when loading and unloading equipment. • Use a team lift if the weight of object is greater than 40 pounds or if the object is an awkward size or shape.
	Electrical	<ul style="list-style-type: none"> • Avoid opening electrical panels or outlets. • Don insulated gloves and tools if required to be exposed to live electrical wires. • Do not attempt to repair damaged electrical lines. • Maintain a minimum of 10 feet from unprotected electrical lines.
	Gas leaks	<ul style="list-style-type: none"> • If leaks in gas or fuel lines are identified, immediately contact the public utility company responsible for the utility. • Evacuate area and do not let anyone into area until the leak is resolved. • Remove all sources of ignition from the area if it is safe to do so.
	Hazardous Chemicals	<ul style="list-style-type: none"> • All chemicals, including spray paints, must have an MSDS onsite. • Portions of the site may be contaminated with hazardous substances. Don nitrile gloves (or similar type of glove if handling soils). • Decontaminate shoes/boots, if necessary.
Soft digging to clear/daylight utilities (air knife, hand dig w/shovel, hydro excavation)	Slips, Trips, and Falls	<ul style="list-style-type: none"> • Inspect walking surfaces for terrain hazards or potholes that could cause a slip, trip, or fall. • Identify and/or communicate fall hazards to project team.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
		<ul style="list-style-type: none"> • Do not walk through tall grass or vegetation where the walking surface cannot be viewed. The area should be cut down prior to walking through it. • Wear appropriate work shoes or boots. • Avoid working at times when it is dark, or you should use additional lighting when necessary.
	Biological Hazards	<ul style="list-style-type: none"> • Avoid all animals, including domestic animals. • Be aware of insect nests and wear long pants, long sleeve shirts. • Apply insect repellent. • Use insect pesticide to eradicate insects that interfere with work activities. • Review site HASP for understanding of biological hazards, including poisonous plants. • If contacted by a poisonous plant, immediately decontaminate skin with soap and water. • If contact with poisonous plants is necessary, you must don chemical resistant suits and gloves. • Report all incidents involving biological hazards to the site safety officer.
	Heat/Cold Stress	<ul style="list-style-type: none"> • Monitor for heat/cold stress. • Dress appropriate for the weather. • Provide fluids to prevent worker dehydration. • Establish work/rest.
	Traffic	<ul style="list-style-type: none"> • Don a hi-visibility vest. • Do not enter the right-of-way or roads unless free of traffic.
	Lifting – Strains/Sprains	<ul style="list-style-type: none"> • Utilize proper lifting techniques when loading and unloading equipment. • Use a team lift if the weight of object is greater than 40 pounds or if the object is an awkward size or shape.

Task/Step	Potential Hazards	Recommended Safe Job Procedures
	Noise	<ul style="list-style-type: none"> • Utilize hearing protection during air knife and hydro excavation.
	Flying Debris	<ul style="list-style-type: none"> • Wear safety glasses with side shield at a minimum. Upgrade to add a face shield during air knife or at any time debris is flying up towards the operators face.
	Abrasions/Cuts/Contusions	<ul style="list-style-type: none"> • Wear work gloves to prevent blisters or scratches • Wear steal toe boots or shoes. • Avoid contact with pressure lines/wands for air knife and hydro excavation.

JOB HAZARD ANALYSIS	Project No.: 2196008*00
Job/Operation Title: Vehicle Operation	Date: April 2021
Business Unit: Industrial	JHA Reviewed By: Julia Schwarz
Project Location: Seattle, WA	JHA Revised By: Katie Haskins
Person(s) Performing This Job/Task: Julia Schwarz, Katie Haskins, Gloria Gonzalez, Matt Grzegorzewski, Bobby Ardissono	Project Manager: Julia Schwarz
Job/Task Start Date: April 2021	Job/Task Duration: 2021-2026

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Entering vehicle	Injury from door	<ul style="list-style-type: none"> • Be careful when opening vehicle door.
Turn on engine	None foreseen	
Driving motorized vehicle	Injury to self from accidents Injury to others	<ul style="list-style-type: none"> • Fasten seat belt before driving. • Use defensive driving skills. • Obey all traffic regulations. • Never leave unattended car running. • Refer to the State Department of Motor Vehicles handbook for more information. • Survey surroundings before driving. • Use defensive driving skills. • Never leave unattended car running. • Refer to the Department of Motor Vehicles handbook for more information.
Parking	Property damage Injury to self from accidents Injury to others	<ul style="list-style-type: none"> • When or if available, back vehicle into position when parking to enable operator to pull forward when leaving the site.
Turn off engine	None foreseen	

JOB HAZARD ANALYSIS	Project No.: 2196008*00
Job/Operation Title: Working in the Vicinity of Heavy Equipment	Date: April 2021
Business Unit: Industrial	JHA Reviewed By: Julia Schwarz
Project Location: Seattle, WA	JHA Revised By: Katie Haskins
Person(s) Performing This Job/Task: Julia Schwarz, Katie Haskins, Gloria Gonzalez, Matt Grzegorzewski, Bobby Ardissono	Project Manager: Julia Schwarz
Job/Task Start Date: April 2021	Job/Task Duration: 2021-2026

Task/Step	Potential Hazards	Recommended Safe Job Procedures
Preparing Job Site	Trips and Falls. Bodily injury to others.	<ul style="list-style-type: none"> • Clear area within work zone; remove trip hazards and/or mark clearly hazards with cones, etc. • Identify work zone with cones, barricades, and other means necessary to keep pedestrian and other traffic out of work zone.
Operational Tasks	Bodily Injury to workers.	<ul style="list-style-type: none"> • Wear reflective safety vest, hardhat, and safety glasses. • A pre-job discussion should occur to ensure both the equipment operator and assisting workers understand the scope of the project. • Operator should keep watch for ground workers near equipment and ensure they are aware of operator's intended direction of movement. Use spotter, as needed, to warn/watch for ground workers. • Ground workers should watch operator and equipment, staying clear of equipment's path. • All workers need to be aware of changing conditions at work site.
After Operations or during periods when area is not occupied by workers	Bodily Injury to workers and others.	<ul style="list-style-type: none"> • Operator should always leave equipment with bucket/attachments down. • Operator should ensure equipment is secured/locked out so it cannot be used by unauthorized personnel. • Workers should secure job site with barricades, cones, and signs to warn others to keep out of work site. • Supervisor may place employee to watch job site if extreme hazards exist.

Appendix B

Tailgate Safety Briefing Record

Kennedy Jenks DAILY TAILGATE SAFETY BRIEFING

Project Name: _____ Date: _____

Project No.: _____ Conducted By: _____ Contractor(s): _____

Check the Topics/Information Reviewed:

- | | | |
|---|--|--|
| <input type="checkbox"/> emergency procedures & evacuation route | <input type="checkbox"/> insects/snakes/biological hazards | <input type="checkbox"/> scaffolding |
| <input type="checkbox"/> site-specific safety plan, review and location | <input type="checkbox"/> daily scope of work | <input type="checkbox"/> cell phone usage / prohibitions |
| <input type="checkbox"/> fire prevention/safety/fire extinguishers | <input type="checkbox"/> directions to hospital | <input type="checkbox"/> personal protective equipment |
| <input type="checkbox"/> training/certification | <input type="checkbox"/> stop work authority | <input type="checkbox"/> hard hats, safety vest, steel-toe boots |
| <input type="checkbox"/> COVID-19 | <input type="checkbox"/> pinch points | <input type="checkbox"/> strains and sprains |
| <input type="checkbox"/> sharp objects, rebar, and scrap metals | <input type="checkbox"/> lifting techniques | <input type="checkbox"/> buddy system |
| <input type="checkbox"/> slips, trips, and falls | <input type="checkbox"/> site housekeeping | <input type="checkbox"/> tool safety |
| <input type="checkbox"/> vehicle safety and driving/road conditions | <input type="checkbox"/> parking and lay down areas | <input type="checkbox"/> public safety |
| <input type="checkbox"/> overhead utility locations and clearances | <input type="checkbox"/> backing-up hazards | <input type="checkbox"/> traffic safety |
| <input type="checkbox"/> open pits and excavations | <input type="checkbox"/> location of utilities | <input type="checkbox"/> hearing & eyewear protection |
| <input type="checkbox"/> drinking water and restroom locations | <input type="checkbox"/> noise hazards | <input type="checkbox"/> flying debris hazards |
| <input type="checkbox"/> smoking in designated areas only | <input type="checkbox"/> equipment movement | <input type="checkbox"/> fire extinguisher locations |
| <input type="checkbox"/> eye wash station locations | <input type="checkbox"/> decontamination procedures | <input type="checkbox"/> heavy equipment hazards |
| <input type="checkbox"/> Hazard Communication//SDS locations | <input type="checkbox"/> first aid | <input type="checkbox"/> dust and/or vapor control |
| <input type="checkbox"/> site control/security | <input type="checkbox"/> no horseplay | <input type="checkbox"/> drug and alcohol policy |
| <input type="checkbox"/> heat and cold stress | <input type="checkbox"/> visitors / media / passers-by | <input type="checkbox"/> weather hazards |
| <input type="checkbox"/> confined spaces | <input type="checkbox"/> lockout/tagout | <input type="checkbox"/> electrical hazards |
| <input type="checkbox"/> fall protection | <input type="checkbox"/> ladders safety | <input type="checkbox"/> other _____ |

Discussion/Comments/Questions/Near Misses/Follow-up Actions:

--

List Any Special Site Conditions / H&S Precautions Reviewed

By signing below, I acknowledge that I have participated in this safety briefing. I am aware that a site-specific safety plan exists for this project and that it is available to me upon request.

NAME	SIGNATURE	COMPANY

Appendix G

Safety Data Sheets (SDSs)

Safety Data Sheet



1. Identification

Product Name:	ICWB LSPR 12PK WHITE MARKING	Revision Date:	4/8/2020
Product Identifier:	203039	Supersedes Date:	2/18/2019
Recommended Use:	Marking Paint / Aerosols		
Supplier:	Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA	Manufacturer:	Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA
Preparer:	Regulatory Department		
Emergency Telephone:	24 Hour Hotline: 847-367-7700		

2. Hazard Identification

Classification

Symbol(s) of Product



Signal Word

Danger

Possible Hazards

35% of the mixture consists of ingredient(s) of unknown acute toxicity.

GHS HAZARD STATEMENTS

Flammable Aerosol, category 1	H222	Extremely flammable aerosol.
Compressed Gas	H280	Contains gas under pressure; may explode if heated.
Carcinogenicity, category 2	H351	Suspected of causing cancer.
STOT, repeated exposure, category 2	H373	May cause damage to organs through prolonged or repeated exposure.

GHS LABEL PRECAUTIONARY STATEMENTS

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. NO SMOKING.
P211	Do not spray on an open flame or other ignition source.
P251	Do not pierce or burn, even after use.
P410+P412	Protect from sunlight. Do not expose to temperatures exceeding 50°C / 122°F.
P410+P403	Protect from sunlight. Store in a well-ventilated place.
P201	Obtain special instructions before use.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P308+P313	IF exposed or concerned: Get medical advice/attention.
P405	Store locked up.
P501	Dispose of contents/container in accordance with local, regional and national regulations.

P260
P314Do not breathe dust/fume/gas/mist/vapors/spray.
Get medical advice/attention if you feel unwell.

3. Composition / Information On Ingredients

HAZARDOUS SUBSTANCES

<u>Chemical Name</u>	<u>CAS-No.</u>	<u>Wt.% Range</u>	<u>GHS Symbols</u>	<u>GHS Statements</u>
Propane	74-98-6	10-25	GHS04	H280
Titanium Dioxide	13463-67-7	2.5-10	Not Available	Not Available
n-Butane	106-97-8	2.5-10	GHS04	H280
Naphtha, Petroleum, Hydrotreated Light	64742-49-0	2.5-10	GHS08	H304
Xylenes (o-, m-, p- Isomers)	1330-20-7	2.5-10	GHS02-GHS07	H226-315-319-332
Hydrous Magnesium Silicate	14807-96-6	1.0-2.5	Not Available	Not Available
n-Butyl Acetate	123-86-4	1.0-2.5	GHS02-GHS07	H226-336
Ethylbenzene	100-41-4	1.0-2.5	GHS02-GHS07- GHS08	H225-304-332-351-373
Octane	111-65-9	0.1-1.0	GHS02-GHS07- GHS08	H225-304-315-336

4. First-Aid Measures

FIRST AID - EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes holding eyelids open. Get medical attention. Do NOT allow rubbing of eyes or keeping eyes closed.

FIRST AID - SKIN CONTACT: Wash skin with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention. Do NOT use mouth-to-mouth resuscitation. If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention. If swallowed, get medical attention.

5. Fire-Fighting Measures

EXTINGUISHING MEDIA: Alcohol Film Forming Foam, Carbon Dioxide, Dry Chemical, Dry Sand, Water Fog

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20°F. EXTREMELY FLAMMABLE LIQUID AND VAPOR! Water spray may be ineffective. Closed containers may explode when exposed to extreme heat due to buildup of steam. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can.

SPECIAL FIREFIGHTING PROCEDURES: Full protective equipment including self-contained breathing apparatus should be used. Evacuate area and fight fire from a safe distance. Water may be used to cool closed containers to prevent pressure buildup and possible autoignition or explosion. Use water spray to keep fire-exposed containers cool. Containers may explode when heated.

Special Fire and Explosion Hazard (Combustible Dust): No Information

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers. Ventilate area, isolate spilled material, and remove with inert absorbent. Dispose of contaminated absorbent, container, and unused contents in accordance with local, state, and federal regulations.

7. Handling and Storage

HANDLING: Wash thoroughly after handling. Wash hands before eating. Remove contaminated clothing and launder before reuse. Use only with adequate ventilation. Follow all SDS and label precautions even after container is emptied because it may retain product residues. Avoid breathing fumes, vapors, or mist. Avoid contact with eyes, skin and clothing.

STORAGE: Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Contents under pressure. Do not store above 120 ° F. Store large quantities in buildings designed and protected for storage of flammable aerosols. Product should be stored in tightly sealed containers and protected from heat, moisture, and foreign materials. Keep away from heat, sparks, flame and sources of ignition. Avoid excess heat.

Advice on Safe Handling of Combustible Dust: No Information

8. Exposure Controls / Personal Protection

Chemical Name	CAS-No.	Weight % Less Than	ACGIH TLV- TWA	ACGIH TLV- STEL	OSHA PEL-TWA	OSHA PEL- CEILING
Propane	74-98-6	20.0	N.E.	N.E.	1000 ppm	N.E.
Titanium Dioxide	13463-67-7	10.0	10 mg/m3	N.E.	15 mg/m3	N.E.
n-Butane	106-97-8	10.0	N.E.	1000 ppm	N.E.	N.E.
Naphtha, Petroleum, Hydrotreated Light	64742-49-0	10.0	N.E.	N.E.	N.E.	N.E.
Xylenes (o-, m-, p- Isomers)	1330-20-7	10.0	100 ppm	150 ppm	100 ppm	N.E.
Hydrous Magnesium Silicate	14807-96-6	5.0	2 mg/m3	N.E.	N.E.	N.E.
n-Butyl Acetate	123-86-4	5.0	50 ppm	150 ppm	150 ppm	N.E.
Ethylbenzene	100-41-4	5.0	20 ppm	N.E.	100 ppm	N.E.
Octane	111-65-9	1.0	300 ppm	N.E.	500 ppm	N.E.

PERSONAL PROTECTION

ENGINEERING CONTROLS: Use explosion-proof ventilation equipment. Provide general dilution of local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limits. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits.

SKIN PROTECTION: Use gloves to prevent prolonged skin contact. Nitrile or Neoprene gloves may afford adequate skin protection.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further guidance regarding types of personal protective equipment and their applications.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking. Remove contaminated clothing immediately and launder before reuse.

Engineering Measures for Combustible Dust: No Information

9. Physical and Chemical Properties

Appearance:	Aerosolized Mist	Physical State:	Liquid
Odor:	Solvent Like	Odor Threshold:	N.E.
Specific Gravity:	0.883	pH:	N.D.
Freeze Point, °C:	N.D.	Viscosity:	N.D.
Solubility in Water:	Miscible	Partition Coefficient, n-octanol/ water:	N.D.
Decomposition Temp., °C:	N.D.	Explosive Limits, vol%:	0.9 - 12.6
Boiling Range, °C:	-37 - 537	Flash Point, °C:	-96
Flammability:	Does not Support Combustion	Auto-ignition Temp., °C:	N.D.
Evaporation Rate:	Faster than Ether	Vapor Pressure:	N.D.
Vapor Density:	Heavier than Air		

(See "Other information" Section for abbreviation legend)

10. Stability and Reactivity

CONDITIONS TO AVOID: Avoid temperatures above 120°F (49°C). Avoid all possible sources of ignition.

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalies.

HAZARDOUS DECOMPOSITION: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition, it emits acrid smoke and irritating fumes. Contains solvents which may form carbon monoxide, carbon dioxide, and formaldehyde.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

11. Toxicological Information

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes Serious Eye Irritation

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: No Information

EFFECTS OF OVEREXPOSURE - INHALATION: High gas, vapor, mist or dust concentrations may be harmful if inhaled. High vapor concentrations are irritating to the eyes, nose, throat and lungs. Harmful if inhaled. Avoid breathing fumes, spray, vapors, or mist. Prolonged or excessive inhalation may cause respiratory tract irritation.

EFFECTS OF OVEREXPOSURE - INGESTION: Harmful if swallowed.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: Overexposure to xylene in laboratory animals has been associated with liver abnormalities, kidney, lung, spleen, eye and blood damage as well as reproductive disorders. Effects in humans, due to chronic overexposure, have included liver, cardiac abnormalities and nervous system damage. IARC lists Ethylbenzene as a possible human carcinogen (group 2B). Contains Titanium Dioxide. Titanium Dioxide is listed as a Group 2B-"Possibly carcinogenic to humans" by IARC. No significant exposure to Titanium Dioxide is thought to occur during the use of products in which Titanium Dioxide is bound to other materials, such as in paints during brush application or drying. Risk of overexposure depends on duration and level of exposure to dust from repeated sanding of surfaces or spray mist and the actual concentration of Titanium Dioxide in the formula. (Ref: IARC Monograph, Vol. 93, 2010) May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis, and blurred vision) and/or damage.

PRIMARY ROUTE(S) OF ENTRY: Eye Contact, Ingestion, Inhalation, Skin Absorption, Skin Contact

ACUTE TOXICITY VALUES

The acute effects of this product have not been tested. Data on individual components are tabulated below:

<u>CAS-No.</u>	<u>Chemical Name</u>	<u>Oral LD50</u>	<u>Dermal LD50</u>	<u>Vapor LC50</u>
13463-67-7	Titanium Dioxide	>10000 mg/kg Rat	2500 mg/kg	N.E.
106-97-8	n-Butane	N.E.	N.E.	658 mg/L Rat
64742-49-0	Naphtha, Petroleum, Hydrotreated Light	>5000 mg/kg Rat	>3160 mg/kg Rabbit	>4951 mg/L Rat
1330-20-7	Xylenes (o-, m-, p- Isomers)	3500 mg/kg Rat	>4350 mg/kg Rabbit	29.08 mg/L Rat
14807-96-6	Hydrous Magnesium Silicate	6000	N.E.	30
123-86-4	n-Butyl Acetate	10768 mg/kg Rat	>17600 mg/kg Rabbit	> 21 mg/L Rat
100-41-4	Ethylbenzene	3500 mg/kg Rat	15400 mg/kg Rabbit	17.4 mg/L Rat
111-65-9	Octane	N.E.	N.E.	>23.36 mg/L Rat

N.E. - Not Established

12. Ecological Information

ECOLOGICAL INFORMATION: Product is a mixture of listed components.

13. Disposal Information

DISPOSAL INFORMATION: Do not incinerate closed containers. This product as supplied is a USEPA defined ignitable hazardous waste. Dispose of unusable product as a hazardous waste (D001) in accordance with local, state, and federal regulation.

14. Transport Information

	<u>Domestic (USDOT)</u>	<u>International (IMDG)</u>	<u>Air (IATA)</u>	<u>TDG (Canada)</u>
UN Number:	N.A.	1950	1950	N.A.
Proper Shipping Name:	Aerosols	Aerosols	Aerosols, flammable	Aerosols
Hazard Class:	N.A.	2	2.1	N.A.
Packing Group:	N.A.	N.A.	N.A.	N.A.
Limited Quantity:	Yes	Yes	Yes	Yes

15. Regulatory Information

U.S. Federal Regulations:

CERCLA - SARA Hazard Category

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Gas under pressure, Carcinogenicity, Specific target organ toxicity (single or repeated exposure)

Sara Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

<u>Chemical Name</u>	<u>CAS-No.</u>
Xylenes (o-, m-, p- Isomers)	1330-20-7
Ethylbenzene	100-41-4

Toxic Substances Control Act:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(b) if exported from the United States:

<u>Chemical Name</u>	<u>CAS-No.</u>
Castor oil, sulfated, sodium salt	68187-76-8

U.S. State Regulations:

California Proposition 65:

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

16. Other Information**HMIS RATINGS**

Health: 2* Flammability: 4 Physical Hazard: 0 Personal Protection: X

NFPA RATINGS

Health: 2 Flammability: 4 Instability: 0

Maximum Incremental Reactivity 0.83

SDS REVISION DATE: 4/8/2020

REASON FOR REVISION: Substance Chemical Name Changed
Product Composition Changed
Substance and/or Product Properties Changed in Section(s):
09 - Physical & Chemical Properties
15 - Regulatory Information
16 - Other Information
Revision Statement(s) Changed

Legend: N.A. - Not Applicable, N.D. - Not Determined, N.E. - Not Established

Rust-Oleum Corporation believes, to the best of its knowledge, information and belief, the information contained herein to be accurate and reliable as of the date of this safety data sheet. However, because the conditions of handling, use, and storage of these materials are beyond our control, we assume no responsibility or liability for personal injury or property damage incurred by the use of these materials. Rust-Oleum Corporation makes no warranty, expressed or implied, regarding the accuracy or reliability of the data or results obtained from their use. All materials may present unknown hazards and should be used with caution. The information and recommendations in this material safety data sheet are offered for the users' consideration and examination. It is the responsibility of the user to determine the final suitability of this information and to comply with all applicable international, federal, state, and local laws and regulations.

Section 1: IDENTIFICATION**Product Name:** Simple Green® All-Purpose Cleaner**Additional Names:****Manufacturer's Part Number:** **Please refer to Section 16***Recommended Use:** Cleaner & Degreaser for water tolerant surfaces.**Restrictions on Use:** Do not use on non-rinsable surfaces.**Company:** Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA**Telephone:** 800-228-0709 • 562-795-6000 *Mon – Fri, 8am – 5pm PST***Fax:** 562-592-3830**Email:** info@simplegreen.com**Emergency Phone:** Chem-Tel 24-Hour Emergency Service: 800-255-3924**Section 2: HAZARDS IDENTIFICATION**

This product has been assessed in accordance to 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200) and has been determined to not be classifiable as hazardous.

OSHA HCS 2012Label Elements**Signal Word:** None**Hazard Symbol(s)/Pictogram(s):** None required**Hazard Statements:** None**Precautionary Statements:** None**Hazards Not Otherwise Classified (HNOC):** None**Other Information:** None Known**Section 3: COMPOSITION/INFORMATION ON INGREDIENTS**

<u>Ingredient</u>	<u>CAS Number</u>	<u>Percent Range</u>
Water	7732-18-5	> 84.8%*
C9-11 Alcohols Ethoxylated	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Sodium Carbonate	497-19-8	< 1%*
Tetrasodium Glutamate Diacetate	51981-21-6	< 1%*
Citric Acid	77-92-9	< 1%*
Methylchloroisothiazolinone	26172-55-4	< 0.002%*
Methylisothiazolinone	2682-20-4	< 0.001%*
Fragrance	Proprietary Mixture	< 1%*
Liquitint Colorant	Proprietary Mixture	< 1%*

specific percentages of composition are being withheld as a trade secret*Section 4: FIRST-AID MEASURES****Inhalation:** Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.**Skin Contact:** Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.**Eye Contact:** Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.**Ingestion:** May cause upset stomach. Drink plenty of water to dilute. See section 11.**Most Important Symptoms/Effects, Acute and Delayed:** None known.**Indication of Immediate Medical Attention and Special Treatment Needed, if necessary:** Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO₂, water spray or “alcohol” foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

This product is non-flammable. See Section 9 for Physical Properties.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)

Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Green Liquid	Partition Coefficient: n-octanol/water:	Not determined		
Odor:	Added sassafras odor	Autoignition Temperature:	Non-flammable		
Odor Threshold:	Not determined	Decomposition Temperature:	42.7°C (109°F)		
pH ASTM D-1293:	8.5 – 9.2	Viscosity:	Like water		
Freezing Point ASTM D-1177:	0-3.33°C (32-38°F)	Specific Gravity ASTM D-891:	1.01 – 1.03		
Boiling Point & Range ASTM D-1120:	101°C (213.8°F)	VOCs:	<i>**Water & fragrance exemption in calculation</i>		
Flash Point ASTM D-93:	> 212°F	SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
Evaporation Rate ASTM D-1901:	½ Butyl Acetate @ 25°C	CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
Flammability (solid, gas):	Not applicable	SCAQMD Method 313:	Not tested		
Upper/Lower Flammability or Explosive Limits:	Not applicable	VOC Composite Partial Pressure:	Not determined		
Vapor Pressure ASTM D-323:	0.60 PSI @77°F, 2.05 PSI @100°F	Relative Density ASTM D-4017:	8.42 – 8.59 lb/gal		
Vapor Density:	Not determined	Solubility:	100% in water		

Section 10: STABILITY AND REACTIVITY

Reactivity:	Non-reactive.
Chemical Stability:	Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions:	None known.
Conditions to Avoid:	Excessive heat or cold.
Incompatible Materials:	Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products:	Normal products of combustion - CO, CO ₂ .

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:	Inhalation -	Overexposure may cause headache.
	Skin Contact -	Not expected to cause irritation, repeated contact may cause dry skin.
	Eye Contact -	Not expected to cause irritation.
	Ingestion -	May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.

Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.

Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.

Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:	Oral LD ₅₀ (rat)	> 5 g/kg body weight
	Dermal LD ₅₀ (rabbit)	> 5 g/kg body weight

Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation:	Non-irritant per Dermal Irritation® assay modeling. No animal testing performed.
Eye Damage/Irritation:	Non/Minimal irritant per Ocular Irritation® assay modeling. No animal testing performed.
Germ Cell Mutagenicity:	Mixture does not classify under this category.
Carcinogenicity:	Mixture does not classify under this category.
Reproductive Toxicity:	Mixture does not classify under this category.
STOT-Single Exposure:	Mixture does not classify under this category.
STOT-Repeated Exposure:	Mixture does not classify under this category.
Aspiration Hazard:	Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic:	Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC ₅₀ & IC ₅₀ ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial:	Not tested on finished formulation.
Persistence and Degradability:	Readily Biodegradable per OCED 301D, Closed Bottle Test. Reaches 100% biodegradability within 1 year or less.
Bioaccumulative Potential:	No data available.
Mobility in Soil:	No data available.
Other Adverse Effects:	No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping. **ICAO/ IATA:** Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous **ADR/RID:** Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
 Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
 Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed

Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m ³ long term	600 µg/m ³ short term
Sodium Citrate	68-04-2	5 µg/m ³ long term	50 µg/m ³ short term
Sodium Carbonate	497-19-8	5 µg/m ³ long term	50 µg/m ³ short term
Citric Acid	77-92-9	10 µg/m ³ long term	100 µg/m ³ short term

This product has been classified as “not classifiable as hazardous” in accordance with Consumer Product Safety Commission (16 CFR Chapter 2), and labelled and packaged accordingly.

Section 16: OTHER INFORMATION

<u>Size</u>	<u>UPC</u>	<u>Size</u>	<u>UPC</u>
2 fl. oz.	043318131035	67.6 fl. oz.	043318130144
4 fl. oz.	043318130014	67.6 fl. oz.	043318000393
16 fl. oz.	043318130021	1 gallon	043318000799
22 fl. oz.	043318130229	1 gallon	043318130052
24 fl. oz.	043318130137	1 gallon	043318004957
32 fl. oz.	043318002557	1 gallon w/ dilution bottle	043318480492
32 fl. oz.	043318130335	140 fl. oz. w/ dilution bottle	043318001468
32 fl. oz.	043318000652	2.5 gallon	043318004889

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

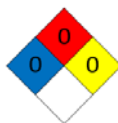
NFPA:

Health – None

Flammability – Non-flammable

Stability – Stable

Special - None



Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.

This SDS has been revised in the following sections: Clarification on hazards in section 2, expanded transparency in section 3, revised layout in section 9, 14 & 16, added statement in section 15.

DISCLAIMER: The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.



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Enter search terms separated by spaces.

Benzene

Synonyms & Trade Names Benzol, Phenyl hydride

CAS No. 71-43-2	RTECS No. CY1400000 (/niosh-rtecs/CY155CC0.html)	DOT ID & Guide 1114 130 (http://www.wapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide130/) ☞ (http://www.cdc.gov/Other/disclaimer.html)
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Formula C ₆ H ₆	Conversion 1 ppm = 3.19 mg/m ³	IDLH Ca [500 ppm] See: 71432 (/niosh/idlh/71432.html)
--	--	---

<p>Exposure Limits NIOSH REL : Ca TWA 0.1 ppm ST 1 ppm See Appendix A (nengapdx.html) OSHA PEL : [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F (nengapdx.html)</p>	<p>Measurement Methods NIOSH 1500 ☞ (/niosh/docs/2003-154/pdfs/1500.pdf), 1501 ☞ (/niosh/docs/2003-154/pdfs/1501.pdf), 3700 ☞ (/niosh/docs/2003-154/pdfs/3700.pdf), 3800 ☞ (/niosh/docs/2003-154/pdfs/3800.pdf); OSHA 12 (http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html) ☞ (http://www.cdc.gov/Other/disclaimer.html), 1005 (http://www.osha.gov/dts/sltc/methods/validated/1005/1005.html) ☞ (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) ☞ (http://www.cdc.gov/Other/disclaimer.html)</p>
---	--

Physical Description Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]

MW: 78.1	BP: 176°F	FRZ: 42°F	Sol: 0.07%	VP: 75 mmHg	IP: 9.24 eV
Sp.Gr: 0.88	Fl.P: 12°F	UEL: 7.8%	LEL: 1.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, many fluorides & perchlorates, nitric acid

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, blood, central nervous system, bone marrow

Cancer Site [leukemia]

Personal Protection/Sanitation (See protection codes ([protect.html](#)))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

Provide: Eyewash, Quick drench

First Aid (See procedures ([firstaid.html](#)))

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

(See Appendix E) ([nengapdx.html](#))

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection ([pgintrod.html#mustread](#))

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0015 \(/niosh/ipcsneng/neng0015.html\)](#) See MEDICAL TESTS: [0022 \(/niosh/docs/2005-110/nmed0022.html\)](#)

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Page last updated: February 13, 2015

Content source: [National Institute for Occupational Safety and Health \(NIOSH\)](#) Education and Information Division

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Ethyl benzene

Synonyms & Trade Names Ethylbenzol, Phenylethane

CAS No. 100-41-4	RTECS No. DA0700000 (/niosh-rtecs/DAAAE60.html)	DOT ID & Guide 1175 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide130/) ☞ (http://www.cdc.gov/Other/disclaimer.html)
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Formula CH ₃ CH ₂ C ₆ H ₅	Conversion 1 ppm = 4.34 mg/m ³	IDLH 800 ppm [10%LEL] See: 100414 (/niosh/idlh/100414.html)
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<p>Exposure Limits NIOSH REL : TWA 100 ppm (435 mg/m³) ST 125 ppm (545 mg/m³) OSHA PEL † (nengapdxg.html) : TWA 100 ppm (435 mg/m³)</p>	<p>Measurement Methods NIOSH 1501 ☞ (/niosh/docs/2003-154/pdfs/1501.pdf) ; OSHA 7 (http://www.osha.gov/dts/sltc/methods/organic/org007/org007.html) ☞ (http://www.cdc.gov/Other/disclaimer.html) , 1002 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html) ☞ (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) ☞ (http://www.cdc.gov/Other/disclaimer.html)</p>
--	---

Physical Description Colorless liquid with an aromatic odor.

MW: 106.2	BP: 277°F	FRZ: -139°F	Sol: 0.01%	VP: 7 mmHg	IP: 8.76 eV
Sp.Gr: 0.87	Fl.P: 55°F	UEL: 6.7%	LEL: 0.8%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes ([protect.html](#)))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

First Aid (See procedures ([firstaid.html](#)))

Eye: Irrigate immediately

Skin: Water flush promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 800 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*

(APF = 10) Any supplied-air respirator*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0268 \(/niosh/ipcsneng/neng0268.html\)](#) See MEDICAL TESTS: [0098 \(/niosh/docs/2005-110/nmed0098.html\)](#)

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Ethylene dibromide

Synonyms & Trade Names 1,2-Dibromoethane; Ethylene bromide; Glycol dibromide**CAS No.** 106-93-4**RTECS No.** KH9275000
(/niosh-rtecs/KH8D8678.html)**DOT ID & Guide** 1605 154
(http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide154/)
(http://www.cdc.gov/Other/disclaimer.html)**Formula** BrCH₂CH₂Br**Conversion** 1 ppm = 7.69
mg/m³**IDLH** Ca [100 ppm]
See: 106934 (/niosh/idlh/106934.html)**Exposure Limits** **NIOSH REL** : Ca TWA 0.045
ppm C 0.13 ppm [15-minute] See Appendix A
(nengapdx.html)**OSHA PEL** : TWA 20 ppm C 30 ppm 50 ppm [5-minute
maximum peak]**Measurement Methods****NIOSH 1008** (/niosh/docs/2003-154
/pdfs/1008.pdf) ;**OSHA 2** (http://www.osha.gov/dts/sltc
/methods/organic/org002/org002.html)
(http://www.cdc.gov/Other/disclaimer.html)See: **NMAM** (/niosh/docs/2003-154/) or
OSHA Methods (http://www.osha.gov
/dts/sltc/methods/index.html)
(http://www.cdc.gov/Other/disclaimer.html)**Physical Description** Colorless liquid or solid (below 50°F) with a sweet odor. [fumigant]**MW:** 187.9**BP:** 268°F**FRZ:** 50°F**Sol:** 0.4%**VP:** 12 mmHg**IP:** 9.45 eV**Sp.Gr:** 2.17**Fl.P:** NA**UEL:** NA**LEL:** NA

Noncombustible Liquid

Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, hot aluminum & magnesium; liquid ammonia; strong oxidizers**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage; reproductive effects; [potential occupational carcinogen]**Target Organs** Eyes, skin, respiratory system, liver, kidneys, reproductive system**Cancer Site** [in animals: skin & lung tumors]

Personal Protection/Sanitation (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: No recommendation

Provide: Eyewash, Quick drench

First Aid (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0045 \(/niosh/ipcsneng/neng0045.html\)](#) See MEDICAL TESTS: [0103 \(/niosh/docs/2005-110/nmed0103.html\)](#)

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Ethylene dichloride

Synonyms & Trade Names 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride

CAS No. 107-06-2

RTECS No. [KI0525000 \(/niosh-rtecs/KI802C8.html\)](/niosh-rtecs/KI802C8.html)

DOT ID & Guide 1184 131
[\(http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide131/\)](http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide131/) [Ⓞ \(http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)


Formula ClCH₂CH₂Cl

Conversion 1 ppm = 4.05 mg/m³

IDLH Ca [50 ppm]
 See: [107062 \(/niosh/idlh/107062.html\)](/niosh/idlh/107062.html)

Exposure Limits **NIOSH REL** : Ca TWA 1 ppm (4 mg/m³) ST 2 ppm (8 mg/m³) See Appendix A ([nengapdxa.html](/nengapdxa.html)) See Appendix C ([nengapdxc.html](/nengapdxc.html)) (Chloroethanes)

OSHA PEL † ([nengapdxg.html](/nengapdxg.html)) : TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]

Measurement Methods
NIOSH 1003  (</niosh/docs/2003-154/pdfs/1003.pdf>) ;
OSHA 3 (<http://www.osha.gov/dts/sltc/methods/organic/org003/org003.html>)
[Ⓞ \(http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)
 See: [NMAM \(/niosh/docs/2003-154/\)](/niosh/docs/2003-154/) or [OSHA Methods \(http://www.osha.gov/dts/sltc/methods/index.html\)](http://www.osha.gov/dts/sltc/methods/index.html) [Ⓞ \(http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]

MW: 99.0

BP: 182°F

FRZ: -32°F

Sol: 0.9%

VP: 64 mmHg

IP: 11.05 eV

Sp.Gr: 1.24

FLP: 56°F

UEL: 16%

LEL: 6.2%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to vinyl chloride & HCl above 1112°F.]

Exposure Routes inhalation, ingestion, skin absorption, skin and/or eye contact

Symptoms irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]

Target Organs Eyes, skin, kidneys, liver, central nervous system, cardiovascular system

Cancer Site [in animals: forestomach, mammary gland & circulatory sys cancer]

Personal Protection/Sanitation (See [protection codes](#) ([protect.html](#)))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

Provide: Eyewash, Quick drench

First Aid (See [procedures](#) ([firstaid.html](#)))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#) ([pgintrod.html#mustread](#))

See also: [INTRODUCTION](#) ([/niosh/npg/pgintrod.html](#)) See ICSC CARD: [0250](#) ([/niosh/ipcsneng/neng0250.html](#)) See MEDICAL TESTS: [0104](#) ([/niosh/docs/2005-110/nmed0104.html](#))

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Gasoline

Synonyms & Trade Names Motor fuel, Motor spirits, Natural gasoline, Petrol [Note: A complex mixture of volatile hydrocarbons (paraffins, cycloparaffins, and aromatics).]

CAS No. 8006-61-9	RTECS No. LX3300000 (/niosh-rtecs/LX325AA0.html)	DOT ID & Guide 1203 128 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide128/) (http://www.cdc.gov/Other/disclaimer.html)
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	Conversion 1 ppm = 4.5 mg/m ³ (approx)	IDLH Ca [N.D.] See: IDLH INDEX (/niosh/idlh/intridl4.html)
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Exposure Limits NIOSH REL : Ca See Appendix A (nengapdx.html) OSHA PEL † (nengapdxg.html) : none	Measurement Methods OSHA PV2028 (http://www.osha.gov/dts/sltc/methods/partial/pv2028/2028.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)
--	---

Physical Description Clear liquid with a characteristic odor.

MW: 110 (approx)	BP: 102°F	FRZ: ?	Sol: Insoluble	VP: 38-300 mmHg	IP: ?
Sp.Gr(60°F): 0.72-0.76	FLP: -45°F	UEL: 7.6%	LEL: 1.4%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers such as peroxides, nitric acid & perchlorates

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Cancer Site [in animals: liver & kidney cancer]	
<p>Personal Protection/Sanitation (See protection codes (protect.html))</p> <p>Skin: Prevent skin contact</p> <p>Eyes: Prevent eye contact</p> <p>Wash skin: When contaminated</p> <p>Remove: When wet (flammable)</p> <p>Change: No recommendation</p> <p>Provide: Eyewash, Quick drench</p>	<p>First Aid (See procedures (firstaid.html))</p> <p>Eye: Irrigate immediately</p> <p>Skin: Soap flush immediately</p> <p>Breathing: Respiratory support</p> <p>Swallow: Medical attention immediately</p>
<p>Respirator Recommendations</p> <p>NIOSH</p> <p>At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:</p> <p>(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode</p> <p>(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus</p> <p>Escape:</p> <p>(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister</p> <p>Any appropriate escape-type, self-contained breathing apparatus</p> <p><u>Important additional information about respirator selection (pgintrod.html#mustread)</u></p>	
See also: INTRODUCTION (/niosh/npg/pgintrod.html)	

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Lead

Synonyms & Trade Names Lead metal, Plumbum

CAS No. 7439-92-1	RTECS No. <u>OF7525000</u> (/niosh-rtecs/OF72D288.html)	DOT ID & Guide
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Formula Pb	Conversion	IDLH 100 mg/m ³ (as Pb) See: <u>7439921</u> (/niosh-idlh/7439921.html)
-------------------	-------------------	--

Exposure Limits **NIOSH REL** *: TWA (8-hour) 0.050 mg/m³ See [Appendix C \(nengapdx.html\)](#) [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]
OSHA PEL *: [1910.1025] TWA 0.050 mg/m³ See [Appendix C \(nengapdx.html\)](#) [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

Measurement Methods
NIOSH 7082 (</niosh-docs/2003-154-pdfs/7082.pdf>), **7105** (</niosh-docs/2003-154-pdfs/7105.pdf>), **7300** (</niosh-docs/2003-154-pdfs/7300.pdf>), **7301** (</niosh-docs/2003-154-pdfs/7301.pdf>), **7303** (</niosh-docs/2003-154-pdfs/7303.pdf>), **7700** (</niosh-docs/2003-154-pdfs/7700.pdf>), **7701** (</niosh-docs/2003-154-pdfs/7701.pdf>), **7702** (</niosh-docs/2003-154-pdfs/7702.pdf>), **9100** (</niosh-docs/2003-154-pdfs/9100.pdf>), **9102** (</niosh-docs/2003-154-pdfs/9102.pdf>), **9105** (</niosh-docs/2003-154-pdfs/9105.pdf>);
OSHA ID121 (<http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html>) (<http://www.cdc.gov/Other/disclaimer.html>), **ID125G** (<http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html>) (<http://www.cdc.gov/Other/disclaimer.html>), **ID206** (<http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html>) (<http://www.cdc.gov/Other/disclaimer.html>)
 See: **NMAM** (</niosh-docs/2003-154/>) or **OSHA Methods** (<http://www.osha.gov/dts/sltc/methods/index.html>) (<http://www.cdc.gov/Other/disclaimer.html>)

Physical Description A heavy, ductile, soft, gray solid.

MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble	VP: 0 mmHg (approx)	IP: NA
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Sp.Gr: 11.34	FLP: NA	UEL: NA	LEL: NA		
Noncombustible Solid in bulk form.					
Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids					
Exposure Routes inhalation, ingestion, skin and/or eye contact					
Symptoms lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension					
Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue					
Personal Protection/Sanitation (See protection codes (protect.html)) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily			First Aid (See procedures (firstaid.html)) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately		
Respirator Recommendations (See Appendix E) (nengapdx.html) NIOSH/OSHA Up to 0.5 mg/m³: (APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators. Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters. (APF = 10) Any supplied-air respirator Up to 1.25 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode (APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter. Up to 2.5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters. (APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50) Any self-contained breathing apparatus with a full facepiece (APF = 50) Any supplied-air respirator with a full facepiece Up to 50 mg/m³: (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode Up to 100 mg/m³:					

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0052 \(/niosh/ipcsneng/neng0052.html\)](#) See MEDICAL TESTS: [0127 \(/niosh/docs/2005-110/nmed0127.html\)](#)

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m-Xylene-alpha,alpha'-diamine

Synonyms & Trade Names 1,3-bis(Aminomethyl)benzene; 1,3-Benzenedimethanamine; MXDA; m-Phenylenebis(methylamine); m-Xylylenediamine**CAS No.** 1477-55-0**RTECS No.** PF8970000
(</niosh-rtecs/PF88DF10.html>)**DOT ID & Guide****Formula** C₆H₄(CH₂NH₂)₂**Conversion****IDLH** N.D.See: **IDLH INDEX** (</niosh/idlh/intridl4.html>)**Exposure Limits** **NIOSH REL** : C 0.1 mg/m³
[skin]**OSHA PEL** † ([nengapdxg.html](http://www.cdc.gov/niosh/docs/2003-154/)) : none**Measurement Methods****OSHA 105** (<http://www.osha.gov/dts/sltc/methods/organic/org105/org105.html>) [ⓘ](http://www.cdc.gov/Other/disclaimer.html)
(<http://www.cdc.gov/Other/disclaimer.html>)
See: **NMAM** (</niosh/docs/2003-154/>) or
OSHA Methods (<http://www.osha.gov/dts/sltc/methods/index.html>) [ⓘ](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless liquid.**MW:** 136.2**BP:** 477°F**FRZ:** 58°F**Sol:** Miscible**VP(77°F):** 0.03 mmHg**IP:** ?**Sp.Gr:**
1.032**FLP:**
243°F**UEL:** ?**LEL:** ?

Class IIIB Combustible Liquid: Fl.P. at or above 200°F.

Incompatibilities & Reactivities None reported**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** In animals: irritation eyes, skin; liver, kidney, lung damage**Target Organs** Eyes, skin, respiratory system, liver, kidneys**Personal Protection/Sanitation** (See [protection codes](#)
([protect.html](#)))**Skin:** Prevent skin contact**Eyes:** Prevent eye contact**First Aid** (See [procedures](#) ([firstaid.html](#)))**Eye:** Irrigate immediately**Skin:** Water flush immediately**Breathing:** Respiratory support

Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

Swallow: Medical attention immediately

Respirator Recommendations

Not available.

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [1462 \(/niosh/ipcsneng/neng1462.html\)](#)

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o-Xylene

Synonyms & Trade Names 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol

CAS No. 95-47-6	RTECS No. ZE2450000 (/niosh-rtecs/ZE256250.html)	DOT ID & Guide 1307 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide130/) (http://www.cdc.gov/Other/disclaimer.html)
Formula C ₆ H ₄ (CH ₃) ₂	Conversion 1 ppm = 4.34 mg/m ³	IDLH 900 ppm See: 95476 (/niosh/idlh/95476.html)

Exposure Limits **NIOSH REL** : TWA 100 ppm (435 mg/m³) ST 150 ppm (655 mg/m³)
OSHA PEL † (nengapdxg.html) : TWA 100 ppm (435 mg/m³)

Measurement Methods
NIOSH 1501 (</niosh/docs/2003-154/pdfs/1501.pdf>) , **3800** (</niosh/docs/2003-154/pdfs/3800.pdf>) ;
OSHA 1002 (<http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html>)
 (<http://www.cdc.gov/Other/disclaimer.html>)
 See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods** (<http://www.osha.gov/dts/sltc/methods/index.html>) (<http://www.cdc.gov/Other/disclaimer.html>)

Physical Description Colorless liquid with an aromatic odor.

MW: 106.2	BP: 292°F	FRZ: -13°F	Sol: 0.02%	VP: 7 mmHg	IP: 8.56 eV
Sp.Gr: 0.88	FLP: 90°F	UEL: 6.7%	LEL: 0.9%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Personal Protection/Sanitation (See [protection codes](#) ([protect.html](#)))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

First Aid (See [procedures](#) ([firstaid.html](#)))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*

(APF = 10) Any supplied-air respirator*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#) ([pgintrod.html#mustread](#))

See also: [INTRODUCTION](#) ([/niosh/npg/pgintrod.html](#)) See ICSC CARD: [0084](#) ([/niosh/ipcsneng/neng0084.html](#))

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Tetrachloroethylene

Synonyms & Trade Names Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

CAS No. 127-18-4	RTECS No. KX3850000 (/niosh-rtecs/KX3ABF10.html)	DOT ID & Guide 1897 160 (http://www.wapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide160/) (http://www.cdc.gov/Other/disclaimer.html)
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Formula Cl ₂ C=CCl ₂	Conversion 1 ppm = 6.78 mg/m ³	IDLH Ca [150 ppm] See: 127184 (/niosh/idlh/127184.html)
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Exposure Limits **NIOSH REL** : Ca Minimize workplace exposure concentrations. See [Appendix A \(nengapdx.html\)](#)
OSHA PEL † ([nengapdxg.html](#)) : TWA 100 ppm
 C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm

Measurement Methods
NIOSH 1003 (</niosh/docs/2003-154/pdfs/1003.pdf>) ;
OSHA 1001 (<http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html>)
[\(http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)
 See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods** (<http://www.osha.gov/dts/sltc/methods/index.html>)
[\(http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%	VP: 14 mmHg	IP: 9.32 eV
Sp.Gr: 1.62	FLP: NA	UEL: NA	LEL: NA		

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system	
Cancer Site [in animals: liver tumors]	
<p>Personal Protection/Sanitation (See protection codes (protect.html))</p> <p>Skin: Prevent skin contact</p> <p>Eyes: Prevent eye contact</p> <p>Wash skin: When contaminated</p> <p>Remove: When wet or contaminated</p> <p>Change: No recommendation</p> <p>Provide: Eyewash, Quick drench</p>	<p>First Aid (See procedures (firstaid.html))</p> <p>Eye: Irrigate immediately</p> <p>Skin: Soap wash promptly</p> <p>Breathing: Respiratory support</p> <p>Swallow: Medical attention immediately</p>
<p>Respirator Recommendations</p> <p>NIOSH</p> <p>At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:</p> <p>(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode</p> <p>(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus</p> <p>Escape:</p> <p>(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister</p> <p>Any appropriate escape-type, self-contained breathing apparatus</p> <p><u>Important additional information about respirator selection</u> (pgintrod.html#mustread)</p>	
<p>See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0076 (/niosh/ipcsneng/neng0076.html) See MEDICAL TESTS: 0179 (/niosh/docs/2005-110/nmed0179.html)</p>	

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Toluene

Synonyms & Trade Names Methyl benzene, Methyl benzol, Phenyl methane, Toluol**CAS No.** 108-88-3**RTECS No.** [XS5250000](http://www.niosh-rtecs.com/XS5250000)
([/niosh-rtecs/XS501BD0.html](http://www.niosh-rtecs.com/XS501BD0.html))**DOT ID & Guide** 1294 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide130/>) [☒](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)**Formula** C₆H₅CH₃**Conversion** 1 ppm = 3.77 mg/m³**IDLH** 500 ppm
See: [108883](http://www.niosh.gov/108883) ([/niosh/idlh/108883.html](http://www.niosh.gov/108883))**Exposure Limits** **NIOSH REL** : TWA 100 ppm (375 mg/m³) ST 150 ppm (560 mg/m³)
OSHA PEL † ([nengapdxg.html](http://www.niosh.gov/nengapdxg.html)) : TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)**Measurement Methods****NIOSH 1500** [☒](http://www.niosh.gov/docs/2003-154/pdfs/1500.pdf) ([/niosh/docs/2003-154/pdfs/1500.pdf](http://www.niosh.gov/docs/2003-154/pdfs/1500.pdf)), **1501** [☒](http://www.niosh.gov/docs/2003-154/pdfs/1501.pdf) ([/niosh/docs/2003-154/pdfs/1501.pdf](http://www.niosh.gov/docs/2003-154/pdfs/1501.pdf)), **3800** [☒](http://www.niosh.gov/docs/2003-154/pdfs/3800.pdf) ([/niosh/docs/2003-154/pdfs/3800.pdf](http://www.niosh.gov/docs/2003-154/pdfs/3800.pdf)), **4000** [☒](http://www.niosh.gov/docs/2003-154/pdfs/4000.pdf) ([/niosh/docs/2003-154/pdfs/4000.pdf](http://www.niosh.gov/docs/2003-154/pdfs/4000.pdf));
OSHA 111 (<http://www.osha.gov/dts/sltc/methods/organic/org111/org111.html>) [☒](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)
See: NMAM ([/niosh/docs/2003-154/](http://www.niosh.gov/docs/2003-154/)) or OSHA Methods (<http://www.osha.gov/dts/sltc/methods/index.html>) [☒](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless liquid with a sweet, pungent, benzene-like odor.**MW:**
92.1**BP:**
232°F**FRZ:**
-139°F**Sol(74°F):**
0.07%**VP:** 21 mmHg**IP:** 8.82 eV**Sp.Gr:**
0.87**FLP:**
40°F**UEL:** 7.1%**LEL:** 1.1%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia;

paresthesia; dermatitis; liver, kidney damage

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Personal Protection/Sanitation (See [protection codes](#) ([protect.html](#)))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

First Aid (See [procedures](#) ([firstaid.html](#)))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 500 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 10) Any supplied-air respirator*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See [ICSC CARD: 0078 \(/niosh/ipcsneng/neng0078.html\)](#) See [MEDICAL TESTS: 0232 \(/niosh/docs/2005-110/nmed0232.html\)](#)

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Content source: [National Institute for Occupational Safety and Health \(NIOSH\)](#) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA
30329-4027, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - [Contact CDC-INFO](#)



Appendix C

Heat Stress Fact Sheet

HEAT EXHAUSTION

What happens to the body:

Headaches, dizziness, or light-headedness, weakness, mood changes, irritability or confusion, feeling sick to your stomach, vomiting, fainting, decreased and dark-colored urine, and pale, clammy skin.

What should be done:

- Move the person to a cool, shaded area. Don't leave the person alone. If the person is dizzy or light-headed, lay him on his back and raise his legs about 6-8 inches. If the person is sick to his stomach, lay him on his side.
- Loosen and remove heavy clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if he is not feeling sick to his stomach.
- Try to cool the person by fanning him. Cool the skin with a cool spray mist of water or wet cloth.
- If the person does not feel better in a few minutes call for emergency help (ambulance or 911.)

If heat exhaustion is not treated, the illness may advance to heat stroke.

PUBLICATION F417-218-909 [05-2008]

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If heat exhaustion is not treated, the illness may advance to heat stroke.

PUBLICATION F417-218-909 [05-2008]

HEAT STROKE - A Medical Emergency

What happens to the body:

Dry, pale skin, sweating may still be present; hot, red skin (looks like a sunburn); mood changes; irritability, confusion, and not making any sense; seizures or fits, and collapse (will not respond).

What should be done:

- Call for emergency help (ambulance or 911.)
- Move the person to a cool, shaded area. Don't leave the person alone. Lay him on his back and if the person is having seizures; remove objects close to him so he won't hit them. If the person is sick to his stomach, lay him on his side.
- Remove heavy and outer clothing.
- Have the person drink small amounts of cool water if he is alert enough to drink anything and not feeling sick to his stomach.
- Try to cool the person by fanning him or her. Cool the skin with a cool spray mist of water, wet cloth, or wet sheet.
- If ice is available, place ice packs in armpits and groin area.

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- If ice is available, place ice packs in armpits and groin area.

PREVENTING HEAT-RELATED ILLNESS

- Drink a lot of water, about 1 cup every 15 minutes.
- Know the signs/symptoms of heat-related illness; monitor yourself and co-workers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.



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Appendix D

Cold Stress Fact Sheet

COLD STRESS PREVENTION



Protecting Workers from Cold Stress

Cold temperatures and increased wind speed (wind chill) cause heat to leave the body more quickly, putting workers at risk of cold stress. Anyone working in the cold may be at risk, e.g., workers in freezers, outdoor agriculture and construction.

Common Types of Cold Stress

Hypothermia

- Normal body temperature (98.6°F) drops to 95°F or less.
- **Mild Symptoms:** alert but shivering.
- **Moderate to Severe Symptoms:** shivering stops; confusion; slurred speech; heart rate/breathing slow; loss of consciousness; death.

Frostbite

- Body tissues freeze, e.g., hands and feet. Can occur at temperatures above freezing, due to wind chill. May result in amputation.
- **Symptoms:** numbness, reddened skin develops gray/white patches, feels firm/hard, and may blister.

Trench Foot (also known as Immersion Foot)

- Non-freezing injury to the foot, caused by lengthy exposure to wet and cold environment. Can occur at air temperature as high as 60°F, if feet are constantly wet.
- **Symptoms:** redness, swelling, numbness, and blisters.

Risk Factors

- Dressing improperly, wet clothing/skin, and exhaustion.

For Prevention, Your Employer Should:

- Train you on cold stress hazards and prevention.
- Provide engineering controls, e.g., radiant heaters.
- Gradually introduce workers to the cold; monitor workers; schedule breaks in warm areas.

How to Protect Yourself and Others

- Know the symptoms; monitor yourself and co-workers.
- Drink warm, sweetened fluids (no alcohol).
- Dress properly:
 - Layers of loose-fitting, insulating clothes
 - Insulated jacket, gloves, and a hat (waterproof, if necessary)
 - Insulated and waterproof boots

What to Do When a Worker Suffers from Cold Stress

For Hypothermia:

- Call 911 immediately in an emergency.
- To prevent further heat loss:
 - Move the worker to a warm place.
 - Change to dry clothes.
 - Cover the body (including the head and neck) with blankets, and with something to block the cold (e.g., tarp, garbage bag). Do not cover the face.
- If medical help is more than 30 minutes away:
 - Give warm, sweetened drinks if alert (no alcohol).
 - Apply heat packs to the armpits, sides of chest, neck, and groin. Call 911 for additional rewarming instructions.

For Frostbite:

- Follow the recommendations "For Hypothermia".
- Do not rub the frostbitten area.
- Avoid walking on frostbitten feet.
- Do not apply snow/water. Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the area unless directed by medical personnel.

For Trench (Immersion) Foot:

- Remove wet shoes/socks; air dry (in warm area); keep affected feet elevated and avoid walking. Get medical attention.

Appendix E

Utility Location Standard Operations Procedures

Utility Location and Acknowledgement Form

KENNEDY JENKS
STANDARD OPERATING PROCEDURES
INVASIVE ACTIVITIES - UTILITY LOCATION PROCEDURES

Below is a summary of the minimum requirements for location of potential underground utilities where invasive activities are planned. Invasive activities include, but are not limited to, drilling soil borings, installing wells, hand-auger borings, excavating test pits, remedial injections, and other similar activities which penetrate the ground surface.

Minimum Procedures

1. Contact the client or property owner where invasive activities will be performed to inquire about possible underground utilities and request maps or drawings documenting the location of the utilities. Document your request for information (e.g., written email request for information).
2. Contact the local/regional underground utility location center to document planned activities and request all underground utilities be located. In most (if not all) of the United States, this can be initiated by dialing “811”. Contacting the local underground utility center is also required by state law. Contacting the local utility location center is required for each episode (event) of invasive work. It is preferred to arrange a field meeting with utility representatives to confirm the absence of utilities at each drilling location. Maintain a written record for each boring/invasive location and get signatures from the locators documenting the locations are clear of utilities. This can be performed on a site map or KJ’s *Utility Locate Form & Acknowledgment Form* (provided in the KJ Safety Zone). The goal is to have written acknowledgement that all final drilling locations are free of underground utilities.
3. At all locations where drilling, probing or well installation will be performed, an air-knife or similar form of suction pot-holing will be performed to assess possible underground utilities in the upper 6 to 8 feet of soils (depending on local conditions and expected depth of utilities). Potholing is required at **all drilling locations**, except in remote areas where the likelihood of encountering underground utilities is very low and only as approved by a Risk Manager, Resource Manager or Officer of the company familiar with underground utilities. (Note: Use of an air knife will be appropriate for most invasive drilling and probing work, but may not be appropriate for certain activities like very shallow borings (less than 1 foot deep), certain hand-auger borings, remedial injections using probe equipment and test pitting.) Case by case exceptions for activities may be provided.

Optional Step – While it is recommended under most conditions, an optional additional step includes coordinating (including establishing a written contract) with a private utility locator to perform an independent utility evaluation to locate “all underground utilities” at the proposed locations of invasive work. Maintain written record for each boring/invasive location and get signatures from the locators. *[Note: This step is typically not too expensive and can save costs incurred during suction pot-holing by focusing the areas of the borings (i.e., provides prior knowledge of possible utilities).]*

KENNEDY JENKS
UTILITY LOCATION & ACKNOWLEDGEMENT FORM
Call 811 for Utility Locate at Least 48 Hours Prior to Work

Project Location: _____

Project Number: _____

Project Name: _____

Planned Start Date of Field Activities: _____

Kennedy Jenks Personnel: _____

Private Utility Locator Name: _____

811 Contact Date and Time (48 hours before work begins): _____

KJ One-Call Contractor ID# (varies by state) _____

Ticket Number: _____

Utility Clearance Information

How Were Boring/Excavation Locations Cleared:

Utilities Contacted by 811	Utility Contact Number	Utility Contacted by Telephone	Marked in Field	Other (Describe)

Contact information verified by (KJ Staff): _____

Scheduled On-Site Meeting Location (if applicable):

Public Utility _____

Private Utility Locator _____

Use back of sheet to sketch of identified utilities and proposed boring/excavation locations **OR** attach figure. Include north arrow and structures if applicable.

Notes:

Mark all proposed borings and excavations with WHITE paint per APWA Utility Color Codes.

Request locator to mark utilities as required by their standard operating procedures or at least within 25 feet of boring/excavation, whichever is greater, with paint/flags.

Utility marks are valid for 14 calendar days and must be remarked if work continues beyond 14 days.

Appendix F

Field Chemical Use Policy and Procedures

Field Chemical Use Form

Hazard Communications Written Program

Field Chemical Use Policy & Procedures

Policy: Kennedy Jenks will follow appropriate chemical handling protocol, implement proper health and safety measures, and follow appropriate waste regulations when using chemicals in the field. Examples of field chemical use include, but are not limited to:

- Test kits with chemical reagents
- Chemical preservatives for samples
- Chemicals for field investigations, bench tests, and pilot studies
- Special chemicals for cleaning equipment.

Procedures: Business Unit Health & Safety Managers must review and approve field chemical use before chemicals can be purchased or taken into the field. A site-specific project Health and Safety Plan (HASP) that addresses field chemical use must be prepared by the Project Manager, then reviewed and approved by the Business Unit Health & Safety Manager. The portion of a project HASP that addresses field use of chemicals should include the following information:

- Chemical use justification. Include evaluation of alternatives, such as, less hazardous chemicals, alternative means of measuring (direct measurements without chemical reagents), and testing by a commercial laboratory or mobile laboratory.
- List of chemicals to be used, including quantities on hand.
- Safety Data Sheets (SDS) for the chemicals.
- Names of staff members that will be using the chemicals.
- Personal protective equipment (PPE) required.
- Description of how the materials will be transported, where the materials will be received and how the materials will be stored (note that our office leases prohibit handling or storage of hazardous materials or non-hazardous materials in quantities considered hazardous).
- Description of how the waste residuals will be disposed. Hazardous wastes generated from field testing, pilot studies, or equipment decontamination must be disposed in accordance with state and federal hazardous waste regulations. Project Managers should include provisions and budget for assisting clients with residual waste disposal. As the generator, the client should sign the hazardous waste manifest. Consider:
 - Coordinating with a local analytical laboratory to accept the waste. Some laboratories will accept small quantities of reagent waste along with samples for disposal for a small fee. This typically involves collecting the wastes in an appropriate container, placing wastes into a sealed container inside of a cooler, and including safety data sheets for the materials with the shipment.

- Using client's existing hazardous waste generator process to dispose of waste. Provide client with information on the type of waste generated to assure compatibility with existing waste streams.
- Returning excess chemicals to the vendor for recycling or reuse. Wherever possible, purchase reagents from a vendor that will accept return of unused product. Have the vendor provide appropriate packaging materials for the return shipment.
- Disposing of non-hazardous residuals as solid waste or in a sanitary sewer. Some wastes, with review and approval by the Business Unit Health & Safety Manager, can be disposed of in the local municipal solid waste or wastewater systems.

This information on the field use of chemicals can be provided by incorporating the example form provided at the end of this document into the HASP. An SDS for each chemical or product must be attached to the HASP. The Business Unit Health & Safety Manager will review the HASP and conduct appropriate Hazard Communication update training for the staff that will be using the chemicals.

Project Task: _____

Name of Preparer: _____

Describe Evaluation of Alternatives to Chemical Use:

Chemicals to be Used for Project:

Chemical Name	Quantity (indicate units)
_____	_____
_____	_____
_____	_____

Names of Staff Using Chemicals During Project:

_____	_____
_____	_____
_____	_____

Describe Personal Protection to be Used When Using or Handling Chemicals:

- | | |
|---|---|
| <input type="checkbox"/> Safety Goggles | <input type="checkbox"/> Portable Eye Wash |
| <input type="checkbox"/> Nitrile Gloves | <input type="checkbox"/> Splash Apron/Coveralls |
| <input type="checkbox"/> Respirator with _____ cartridges | <input type="checkbox"/> Face Shield |
| <input type="checkbox"/> Other: _____ | |

Describe how Chemicals will be Transported and Stored at Project Site:

Describe How Used or Leftover Chemicals will be Disposed:

Health and Safety Manager Approval Signature

Date Approved

Appendix H

CDC Fact Sheets

SHARE FACTS ABOUT COVID-19

Know the facts about coronavirus disease 2019 (COVID-19) and help stop the spread of rumors.

FACT
1

Diseases can make anyone sick regardless of their race or ethnicity.

Fear and anxiety about COVID-19 can cause people to avoid or reject others even though they are not at risk for spreading the virus.

FACT
2

For most people, the immediate risk of becoming seriously ill from the virus that causes COVID-19 is thought to be low.

Older adults and people of any age who have serious underlying medical conditions may be at higher risk for more serious complications from COVID-19.

FACT
3

Someone who has completed quarantine or has been released from isolation does not pose a risk of infection to other people.

For up-to-date information, visit CDC's coronavirus disease 2019 web page.

FACT
4

There are simple things you can do to help keep yourself and others healthy.

- Wash your hands often with soap and water for at least 20 seconds, especially after blowing your nose, coughing, or sneezing; going to the bathroom; and before eating or preparing food.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Stay home when you are sick.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.

FACT
5

You can help stop COVID-19 by knowing the signs and symptoms:

- Fever
- Cough
- Shortness of breath

Seek medical advice if you

- Develop symptoms

AND

- Have been in close contact with a person known to have COVID-19 or if you live in or have recently been in an area with ongoing spread of COVID-19.



[cdc.gov/COVID-19](https://www.cdc.gov/COVID-19)

Appendix I

Injury/Illness, Property Damage Incident, Near Miss Reporting Forms, and
Motor Vehicle Accident Report

Injury/Illness Report Form

This form should only be used for reporting an incident resulting in employee injury/illness. Prior to completing this form, verify that the appropriate notifications have been made as identified below. Use the Property Damage/Incident Report Form to document property damage or other incident. Use the Near-Miss Report Form to document Near-Misses.

Name and job title of injured/illness employee:

Employee's address and telephone number:

Time, Date, and Location where the injury/illness occurred:

Address of KJ site contact:

Check the appropriate nature of injury/illness(s):

- | | | | |
|---|--|--|--|
| <input type="checkbox"/> Sprain | <input type="checkbox"/> Laceration | <input type="checkbox"/> Impact/Compression Injury | <input type="checkbox"/> Nausea |
| <input type="checkbox"/> Fracture | <input type="checkbox"/> Puncture | <input type="checkbox"/> Allergic Reaction | <input type="checkbox"/> Chemical/Substance Exposure |
| <input type="checkbox"/> Abrasion | <input type="checkbox"/> Avulsion (amputation) | <input type="checkbox"/> Eye Injury | <input type="checkbox"/> Heat/Cold Exposure |
| <input type="checkbox"/> Bruise | <input type="checkbox"/> Burn | <input type="checkbox"/> Hearing-Related Injury | |
| <input type="checkbox"/> Altered Level of Consciousness | <input type="checkbox"/> Respiratory/Cardiac-Related Event | | |

Identify the body part affected:

What was the employee doing when the injury/illness occurred?

What action, mechanism, or piece of equipment directly contributed to the injury/illness?

What other processes or items may have indirectly contributed to the employee injury/illness?

Description of accident, accident scene and if accident scene has been instrumentally altered by employees, bystanders and/or emergency personnel and equipment:

How might have this injury/illness been avoided?

Was the injury/illness immediate or did it gradually evolve over time?

If this event occurred at a job site, was a site-specific safety plan prepared and approved? If so, please attach to this form.

If this event occurred at a job site, was a job hazard analysis completed for the task which the employee was performing at the time of injury/illness? If so, please attach.

What were weather conditions at the time of the injury/illness?

Was the employee's supervisor notified? When?

Did the employee contact WorkCare for medical direction? When?

List emergency medical services, fire, or law enforcement agencies summoned for the injured employee:

Provide names and phone numbers of witnesses:

Injured employee was transported to:

Name of person preparing this report: _____

Title: _____ Date: _____

Property Damage Incident Report Form

This form should be used only for an incident resulting in property damage without injury to employees involved. Use the Injury/Illness Report Form to document employee injuries. Use the Near-Miss Report Form to document Near-Misses.

Name(s) of employee(s) involved:

Time, Date, and Location where the incident occurred:

Description of the incident:

What was the employee doing when the incident occurred?

What action, mechanism, or piece of equipment may have directly contributed to the incident?

What other processes or items may have indirectly contributed to this incident?

If this incident occurred at a job site, was a site-specific safety plan prepared and approved? If so, please attach to this form.

Detail any corrective actions taken.

Provide names and phone numbers of witnesses:

Name of person preparing this report: _____

Title: _____ Date: _____

Signature of H&S Manager: _____ Date: _____

Signature of Project Manager: _____ Date: _____

Near-Miss Report Form

This form should only be used for Near-Miss events which did NOT result in injury or property damage. Use the Injury/Illness Report Form to record injuries or illness. Use the Property Damage Incident Report Form to record property damage.

Date: _____ Location: _____

Time: _____ a.m. p.m.

Weather Conditions: _____

Please check all that apply:

Unsafe Act Unsafe Condition Unsafe Equipment Unsafe Use of Equipment

Description of Near-Miss in detail:

Employee Name _____ Date: _____

This section to be completed by Health & Safety Manager or Representative.

Cause of Near-Miss:

Corrective action(s) taken:

H&S Manager _____ Date: _____

Kennedy Jenks Motor Vehicle Accident Report

Directions: Employee, Project Manager or Supervisor must gather the detailed information below and submit to the Health and Safety Manager (John Jindra) and the Chief Risk Officer (Jerry Cavaluzzi) for review as soon as possible or safe to do so. After review and approval by the Health and Safety Manager and the Chief Risk Officer, Employee, Project Manager or Supervisor must contact Zurich noting Policy Number BAP9326879 and E-mail Accident Report to: USZ_CareCenter@Zurichna.com Phone: 1-800-987-3373 Copy Katie Haun at Khaun@lockton.com and Jerry Cavaluzzi at JerryCavaluzzi@KennedyJenks.com on initial report.

Employee Information

Employee Name: _____			
Address: _____		City: _____ State: _____ Zip: _____	
Home Phone (____) ____-____		Employee's preferred language: _____	
Driver's License: _____		State Issued _____ Injured? <input type="checkbox"/> Yes <input type="checkbox"/> No	

Company Vehicle

Was the vehicle Company/Personal/Rental? _____		Rental Agency: _____	
Year: _____ Make: _____		Model: _____ License Plate Number: _____	
VIN: _____		Area of Damage to Vehicle: _____	
Vehicle Drivable? <input type="checkbox"/> Yes <input type="checkbox"/> No		Phone number of garage taken to: _____	

Accident Information

Date of Accident: ____/____/____		Time of Accident: ____:____ A.M./P.M.	
Location of Accident: _____		City: _____ State: _____ Zip: _____	
Were Police Called? <input type="checkbox"/> Yes <input type="checkbox"/> No		Department: _____	
Officer Name/Badge # _____		Phone (____) ____-____	
Police Report Number: _____		Was a citation/ticket issued to any driver? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Reason: _____			
How did accident occur? (please be specific) _____			

Other Vehicle (use additional sheet if necessary, for additional vehicles)

Was another person/vehicle involved in accident? <input type="checkbox"/> Yes <input type="checkbox"/> No		Were they issued a citation? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Year: _____ Make: _____		Model: _____ License Plate Number: _____	
Owner's Name: _____		Address: _____ City: _____ State: _____ Zip: _____	
Driver's Name: _____		Address: _____ City: _____ State: _____ Zip: _____	
Home Phone (____) ____-____		Work Phone (____) ____-____ Damage to Vehicle: _____	
Insurance Carrier: _____ Policy #: _____		Agent's Name: _____ Phone (____) ____-____	
Were there passengers in the other vehicle? <input type="checkbox"/> Yes <input type="checkbox"/> No		Injured	
Name: _____		Phone (____) ____-____ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Name: _____		Phone (____) ____-____ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Name: _____		Phone (____) ____-____ <input type="checkbox"/> Yes <input type="checkbox"/> No	

Witness Information

Were there any witnesses to this accident? Yes No	
Name: _____	Phone (____) ____-____
Name: _____	Phone (____) ____-____

Appendix F

Opinion of Probable Construction Costs

Spec. No.	Item No.	Description	Qty	Units	Materials \$/Unit	Materials Total	Labor \$/Unit	Labor Total	Sub-contractor \$/Unit	Sub-contractor Total	Total	Source and Notes
	10	TPH-Gasoline	120	sample	35	4,200					4,200	
	11	BTEX	120	sample	35	4,200					4,200	
	12	TPH-Diesel	120	sample	35	4,200					4,200	
	13	Consultant Labor and Equipment - Groundwater Monitoring	16	event			2,500	40,000			40,000	
	14	Groundwater Monitoring Report	16	report	12,000	192,000					192,000	
	15	Investigation-Derived Waste Water Handling/Disposal	160	events	185	29,600					29,600	1 disposal per sampling event. 10 wells, 12 sampling events, approximately 1 drum per well.
		SUBTOTAL									839,510	
Other												
	1	Construction Report	1	report	15,000	15,000					15,000	Includes as-built drawings. Based on contract amount.
	2	O&M Manuals (MPE System)	1	report	30,000	30,000					30,000	Based on contract amount.
	3	Project Coordination	4	years			6,000	24,000			24,000	
	4	Washington State Sales Tax	10.1%	per	59,893.52	6,049					6,049	10.1% of construction capital cost (materials) and chemical replacement costs (materials)
		SUBTOTAL									75,049	
		Division 1 Costs	@	10%		104,634		32,280		2,410	139,324	
		Contractor Markup for Sub	@	10%						2,651	2,651	
		Contractor OH&P	@	15%		172,646		53,261			225,907	
		Estimate Contingency	@	20%							352,224	
		Escalate to Midpoint of Construct	@	2%							56,356	
		Total Estimate									2,170,000	

Notes: 1. Based on operation of NPE system with weekly O&M, montly sampling for: 4 years

Estimate Accuracy	
+30%	-20%

Estimated Range of Probable Cost		
+30%	Total Est.	-20%
\$2,821,000	\$2,170,000	\$1,736,000