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May 14, 2024

Ms. Jean Krueskamp
Indiana Brownfields Program
100 North Senate Avenue, Room 1275
Indianapolis, Indiana 46204

RE: Remediation Work Plan
Former Advance Plating Facility
1005 East Sumner Avenue
Indianapolis, Marion County, Indiana
Indiana Brownfields Program Site No. 4200507
EPA ACRES ID No. 226781
USEPA Cleanup Cooperative Agreement (CA) #4B-00E03568-0
USEPA Revolving Loan Fund CA #4B-00E03232

Dear Ms. Krueskamp:

Industrial Waste Management Consulting Group, LLC (IWM Consulting) is pleased to submit this Remediation Work Plan (RWP) for the Former Advance Plating Facility (site) to the Indiana Brownfields Program (IBP). The proposed work activities are being implemented utilizing funds from a United States Environmental Protection Agency (USEPA) Cleanup Grant awarded to the City of Indianapolis (City) and supplemental funds supplied by the City and the Indiana Finance Authority through a USEPA Revolving Loan Fund grant. **Figure 1** displays a topographic map illustrating the location of the site. A map displaying the pertinent site features is included as **Figure 2 – Site Map**.

The proposed field activities will consist of active remediation including the excavation and removal of approximately 1,810 tons of environmentally impacted soil/fill from the top 13 feet in the vicinity of historical sample locations AP-GP8, AP-GP13, AP-GP16, AP-GP17, and AP-GP18. Of this, an estimated 500 tons of trichloroethylene (TCE) impacted soil will be conditioned in-situ to meet the ten times land disposal restriction (10x LDR) requirement. The impacted soil will be disposed of offsite at a properly licensed hazardous waste landfill. Confirmatory soil samples will be obtained during the remediation activities. To help address future migration to groundwater issues, and in preparation for the expected groundwater treatment, a suitable volume of zero-valent iron (ZVI) will be mixed with the soil at the base of the excavation.

Impacted groundwater on portions of the up-gradient (northeast) and down-gradient (west) sides of the site will be treated via installation of two in-situ permeable reactive barriers (PRBs). PlumeStop Liquid Activated Carbon® (PlumeStop) and sulfidated micro-ZVI (S-MZVI™) will be injected into the subsurface via temporary injection points to facilitate the adsorption and microbial degradation of the chlorinated volatile organic compounds (cVOCs). The upgradient and downgradient PRBs would be installed and separated by approximately 180 feet in the direction of groundwater flow. This would address TCE concentrations migrating onsite from the hydraulically upgradient Office Furniture Mart (OFM) release as well as comingled TCE concentrations from the OFM release and Advance Plating, which appear to be migrating offsite (based on data obtained from historical OFM investigations).

The groundwater between the two PRBs will be treated by plume-wide injections of remedial amendments consisting of 3-D Microemulsion (3-DME), S-MZVI™, and Bio-Dechlor Inoculum Plus (BDI Plus). The plume-wide injections will increase the mass of remedial amendments emplaced and lower the chance of the downgradient PRB being overwhelmed by continued migration/leaching of the contaminants.

Confirmatory quarterly groundwater sampling will follow in-situ injection activities for three years. A limited groundwater sampling event will be conducted within two months of the injections to evaluate the progress of the injectate. This will be followed by a comprehensive quarterly monitoring event approximately six months following the completion of in-situ injection activities. It is anticipated seven proposed monitoring wells (AMW-1 through AMW-7) and three existing OFM monitoring wells (MW-20, MW-22, and MW-27) will be utilized for confirmatory groundwater sampling activities. IWM Consulting will generate an RWP Implementation Report documenting all the above-referenced remediation activities and quarterly site status reports documenting quarterly confirmatory groundwater sampling events.

The site background and the tasks to be completed as part of this RWP are described in more detail in the following sections. The RWP will be modified accordingly if it is determined site conditions are different than originally assumed.

Site History Summary

Based on standard historical sources, previous Phase I Environmental Site Assessments (ESA) discovered the site was used as a cannery in 1914, for residential purposes in the 1930s, soap manufacturing in the 1940s and 1950s, a manufacturing warehouse in the 1960s, and Advance Plating Works from the 1970s through 2009. The site was abandoned by 2010. From February to March 2012, the USEPA conducted emergency hazardous waste removal activities at the site. The fire department responded to numerous fires for the main structure between 2016 and 2021. Both buildings were razed by the City in March/April 2022 due to the dilapidated and unsafe condition of the buildings. The building foundations (concrete slabs) and paved parking lot remain at the site. The remainder of the site supports vegetative cover (weeds, trees, bushes, and grass). Aerial photographs indicate historical dumping has occurred at least on the southern portion of the property.

Previous Environmental Assessments/Environmental Investigations

The OFM facility is located approximately 0.1 miles northeast of the site. Investigation into cVOCs released from the OFM property historically resulted in the installation of monitoring wells and soil borings on the Advance Plating property. Additional soil borings were subsequently installed onsite as part of the site investigation completed on behalf of the City. As such, environmental conditions at the site were assessed via numerous investigations completed between 2014 and 2023. Key site features are illustrated in **Figure 2** and **Figure 3**. Historical environmental assessments and investigations of the site were documented in the following reports, which are summarized below. Please refer to **Figure 4** for historical sampling locations.

OFFICE FURNITURE MART REPORTS:

- *Remediation Work Plan*, Environmental Forensic Investigations Inc., July 26, 2016.
- *Further Site Investigation and 2Q20 Groundwater Monitoring Report*, EnviroForensics, LLC, June 29, 2020.
- *2Q21 Groundwater Monitoring Report*, EnviroForensics, LLC, July 15, 2021
- *2022 Annual Groundwater Monitoring Report*, EnviroForensics, LLC, December 15, 2023.

FORMER ADVANCE PLATING FACILITY REPORTS:

- *Phase I Environmental Site Assessment*, IWM Consulting, October 5, 2015.
- *Phase II Environmental Site Assessment*, IWM Consulting, March 27, 2017.
- *Phase I Environmental Site Assessment*, IWM Consulting, September 1, 2017.
- *Asbestos Inspection and Lead Paint Survey*, IWM Consulting, July 2, 2020.
- *Phase I Environmental Site Assessment*, IWM Consulting, July 9, 2020.
- *Per- and Polyfluoroalkyl Substances (PFAS) Groundwater Investigation Report*, IWM Consulting, July 10, 2020.
- *Further Site Investigation Assessment Report*, IWM Consulting, October 15, 2020.
- *Phase I Environmental Site Assessment*, IWM Consulting, January 26, 2021.
- *UST Closure Report*, Heartland Environmental Associates, February 16, 2021.
- *Waste Audit Monitoring Report*, IWM Consulting, April 25, 2022. This report provides a summary of demolition activities including asbestos abatement, waste segregation/ disposal, and outlines future environmental concerns which should be considered before redevelopment.

Historical Report Summary

The aforementioned historical reports are only briefly summarized below. For more details, please refer to the referenced reports.

From October 2014 through February 2016 under the OFM investigation, EnviroForensics advanced 13 direct push borings (T2-1 through T2-6 and T3-1 through T3-7) at the Advance Plating property with soil and grab groundwater samples collected from each boring. Shallow monitoring wells MW-20, MW-22, MW-25, and MW-27 were also installed at the site, and sub-slab vapor samples were collected from beneath the floor of the main onsite building.

From April 2016 through October 2022, EnviroForensics conducted over 20 groundwater monitoring events for the OFM facility. Concentrations of TCE consistently exceeded the applicable state guidelines (Indiana Department of Environmental Management [IDEM] *Remediation Closure Guide* [RCG]) in place at the time. Specifically, the dissolved TCE concentrations exceeded the RCG Commercial/ Industrial vapor exposure (VE) groundwater screening level (GWSL) at MW-20 and MW-22. Degradation daughter products have also periodically been detected at MW-22. Concentrations of cVOCs were not detected at MW-25, while TCE concentrations were more variable at MW-27 and ranged from non-detect to concentrations exceeding RCG Commercial/Industrial VE GWSLs. Since MW-22 is hydraulically upgradient from any potential onsite source areas, it is clear a chlorinated solvent plume is migrating onsite from the upgradient OFM property. However, based on the site sub-slab vapor

and soil/groundwater analytical results, EnviroForensics concluded there may be an additional TCE source area on the Advance Plating property.

IWM Consulting's 2015, 2017, 2020, and 2021 Phase I ESAs identified numerous Recognized Environmental Conditions (RECs) pertaining to historical onsite operations, onsite migration of an upgradient (offsite) solvent plume, an existing underground storage tank (UST), and known onsite soil/groundwater/soil vapor issues.

In January 2017, IWM Consulting personnel collected water samples from two of the three interior sumps (the last sump was blocked by debris and clothing), and advanced 11 soil borings (AP-GP1 through AP-GP12, with AP-GP6 not installed due to interior obstructions) to obtain near-surface and subsurface soil and groundwater samples. A geophysical survey identified two anomalies along the southwest side of the main building which were interpreted to be an existing UST and associated vent line.

In August 2020, 11 additional soil borings (AP-GP13 to AP GP23) were installed as part of a further site investigation (FSI) to further assess previously identified areas with elevated TCE concentrations and the suspect UST location. An approximate 12,000-gallon UST was confirmed to be present south of the site building. The UST was subsequently removed on January 14, 2021.

IWM Consulting's investigations confirmed high concentrations of adsorbed TCE were present in the vicinity of AP-GP8, AP-GP13, AP-GP17, and AP-GP18. When comparing the results to the state regulatory guidelines in place at the time (RCG), soil concentrations above the RCG Industrial/Commercial Direct Contact Screening Levels (IDCSLs) extend northward past AP-GP13, eastward towards AP-GP19, westward past AP-GP17, and southwestward past AP-GP17 and AP-GP18. The full extent of this contaminant plume is not delineated, especially to the west and southwest, but sampling locations were limited at the time of the investigation due to the presence of the collapsing building. Additional conclusions included:

- The magnitude of TCE concentrations inside the former site structure is not vertically continuous. This scenario is best observed at AP-GP13 and AP-GP18, which are located within the northern portion of the main building. Specifically, both sampling locations had TCE concentrations (AP-GP13: 35.4 mg/kg; AP-GP18: 52.1 mg/kg) above the RCG IDCSL within the top one foot of the boring, then TCE concentrations decreased to levels (AP-GP13: 0.15 mg/kg; AP-GP18: 0.78 mg/kg) less than the RCG Migration to Groundwater Screening Level (MTGSL) by two to four feet below ground surface (BGS). The TCE concentrations then subsequently increased near the groundwater interface (approximately 11 to 12 feet BGS) at AP-GP13 (17 mg/kg) and AP-GP18 (76 mg/kg). The presence of a relatively clean sampling interval between the near-surface sampling interval and the deeper sampling interval suggests the deeper TCE concentrations were likely influenced by TCE spills upgradient of AP-GP13 (possibly OFM) and AP-GP18 (suspect near-surface spill around AP-GP8, which exhibited a TCE concentration of 122 mg/kg from two to four feet BGS).
- Analytical results from AP-GP3 and AP-GP22 indicated elevated adsorbed TCE concentrations were also observed south of the UST, along the southern portion of the former main site structure. However, concentrations above the RCG Residential Direct Contact Screening Level (RDCSL)

were not detected in this area shallower than 10 feet depth, and the highest concentrations were detected within or immediately above the water-bearing zone in these areas, which suggests the contaminants may have migrated to this area via groundwater movement from an upgradient location, as opposed to a surface spill. Analytical data obtained from the base and sidewalls of the UST during the closure activities further support this conclusion since no TCE exceedances were documented during the closure activities, thus the UST did not appear to be a significant source of the TCE detected in the vicinity. Due to limited sampling, and/or limited sampling depth in this area, the full extent of this contaminant plume is not well delineated in any direction. It is also possible some of the contaminants have migrated to the AP-GP22 vicinity via an upgradient offsite source (OFM) since MW-22 is hydraulically upgradient from AP-GP22 and is known to have both soil and groundwater TCE impacts.

- Based on all available data (including results from the nearby OFM investigation), concentrations of TCE in soil exceed the RCG IDCSL to a minimum depth of 12 feet BGS, exceed the RCG RDCSL to a minimum depth of 16 feet BGS, and exceed the RCG MTGSL to a minimum depth of 20 feet BGS.
- Arsenic was historically detected in multiple samples above the RCG RDCSL (9.5 mg/kg), but less than the corresponding RCG IDCSL (30 mg/kg). Native Indiana soils often have naturally occurring arsenic concentrations in excess of the aforementioned RDCSL but below the RCG IDCSL. However, the highest arsenic concentrations were found within the shallow cinders/fill material beneath the northwestern portion of the site, and as such, these concentrations are not believed to be indicative of naturally occurring background concentrations. Consequently, any encountered shallow cinder fill material should be properly characterized prior to excavating/removing the material from the Site.
- Groundwater flow direction, based on historical investigations, is directed to the southwest.
- Analytical results confirm the presence of high adsorbed TCE concentrations (> RCG IDCSL) in the northern portion of the main site structure and the full lateral extent of TCE above the RCG IDCSL has not been defined west/southwest of AP-GP8, AP-GP17, and AP-GP18; however, sufficient data exists to develop this RWP and implement an appropriate remediation program at the site.
- The UST at the site was emptied (3,300 gallons of hazardous fluid and 1,500 gallons of non-hazardous residual tank bottoms) and properly closed/removed in January 2021.
- Due to the presence of cyanide in multiple historical soil samples, and prior generation of F008 (cyanide) listed hazardous waste at the site, any future remediation activities involving soil/groundwater removal with documented concentrations of cyanide will require acquisition of a contained-in determination, or any cyanide-containing waste will need to be classified as hazardous.
- Sub-slab vapor samples obtained from beneath the northern building slab during the OFM investigation exhibited TCE concentrations in excess of the calculated sub-slab Commercial/ Industrial VE screening level. Dissolved TCE concentrations in excess of the RCG Commercial/Industrial VE GWSL were also historically present in groundwater at the Site. If the property is re-developed for either residential or commercial/industrial use, then vapor intrusion is a possible exposure pathway. Consequently, if a structure is constructed directly over or within 50 to 100 feet of a known TCE exceedance, then the developer should pre-emptively install a

vapor mitigation system or conduct additional vapor intrusion sampling to rule out this potential exposure pathway prior to occupation of the new building.

- A June 2020 investigation identified friable asbestos and lead based paint in the main building. Asbestos abatement and building (all onsite structures) demolition activities occurred between March 21 and April 25, 2022, but the building slabs were left in place to minimize rainwater infiltration.
- The friable asbestos was properly abated prior to the demolition activities and any lead painted surfaces were properly disposed at a landfill. The onsite historical water supply well was also properly abandoned by a licensed well driller.
- Elevated concentrations of total metals were historically found in the water present in two (2) sumps inside the building. The fluids (1,031 gallons) within the sumps were removed and disposed offsite as hazardous waste, along with one roll-off box of concrete (top covering of the two (2) underground historical plating bath vaults) which was impacted with chromium and cyanide. The sumps were then covered with plywood or metal plates and then covered with gravel. This approach minimizes immediate access to these sumps while reducing future costs associated with properly removing and decommissioning these sumps in the future.
- Additional stained concrete is present at the Site and will require removal, characterization, and disposal offsite in the future when the remaining portion of the vaults and sump pits are removed and when the building foundation is removed. This will need to occur prior to Site redevelopment or as part of the Site redevelopment activities. Based upon visual observations (staining) and results obtained during the building demolition activities, this material will likely need to be disposed as categorically listed (F008) hazardous waste.
- Dissolved concentrations of hexavalent chromium historically exceeded the RCG Residential Tap GWSL at AP-GP10. However, additional assessment inside the building was not feasible at the time of the investigations due to the collapsing nature of the building. Additional hexavalent chromium sampling under the chrome plating area in the northwest quarter of the building should be considered now that the building has been razed.

Remediation Goals

The IDEM RCG was in place during all of the prior investigations, but IDEM transitioned to the Risk based Closure Guide (R2) in July 2022. The R2 provides the framework for characterizing a release, evaluating risk, and when necessary, selecting appropriate remedies to minimize risk and to mitigate any potentially complete exposure pathways. The R2 also provides numeric values in the form of published levels (PLs) for the relevant exposure routes and land uses. The primary driver for site remediation is the adsorbed and dissolved TCE concentrations, and the new R2 has only established short-term excavation PLs for TCE (100 mg/kg) in the soil and long-term PLs for residential groundwater use (5 µg/L). In order to effectively and expeditiously remediate the impacted shallow groundwater, targeted source removal of the most highly impacted soil (area where excavation PL is exceeded and the area immediately surrounding it containing characteristically hazardous TCE concentrations) should be completed in conjunction with in-situ groundwater treatment/injection activities. Such remediation should also assist in lowering soil vapor concentrations which historically exceeded the R2 Commercial/Industrial sub-slab vapor PLs by up to several orders of magnitude.

Land use at the Site is currently zoned commercial/industrial, and is expected to remain so for the foreseeable future. Assuming an Environmental Restrictive Covenant (ERC) restricting water and land use is instituted as a partial corrective action alternative, then remedial efforts will not be necessary for groundwater concentrations which exceed only a R2 Groundwater Published Level (GWPL) or soil concentrations which only exceed a R2 Residential Soil Published Level (RSPL). Even with the ERC restrictions for groundwater usage, groundwater remediation may be necessary in order to reduce the contaminant concentrations to levels which do not pose a threat to downgradient off-site properties and to minimize the possibility of the dissolved contaminants volatilizing at high concentrations, creating a potential inhalation risk via vapor intrusion. Remediating the source area in the soil, even if it is below the applicable PL, will assist in reducing the dissolved contaminant concentrations and accelerate natural attenuation processes at the Site, and downgradient of the Site, since the source area will no longer be leaching into the underlying shallow groundwater table.

Unless all of the impacted soil with concentrations exceeded the applicable PLs, and/or containing concentrations of a listed hazardous waste, and/or exhibiting a characteristic of hazardous waste (for example containing contaminant concentrations exhibiting the Federal toxicity characteristic [40 CFR 261.24 D-List]) is actively remediated, the ERC should also incorporate the requirement for development of a Soil Management Plan (SMP), which will provide instructions on how to safely handle and properly characterize any disturbed soil during redevelopment activities and provide instructions on how to properly relocate or dispose of the soil at an offsite location. These protective steps are necessary since shallow and subsurface soil (0-13 feet BGS) located in various locations throughout the Site has exhibited the presence of adsorbed contaminants of concern at varying concentrations. Given the documented soil gas and groundwater concentrations, the ERC should also require active vapor mitigation activities or further evaluation of the potential VE pathway prior to occupation of any newly constructed buildings.

Based on the results of previous Site investigations. soil, groundwater, and/or vapor media exceeding applicable PLs include the following:

1. Surface, and near surface, soil media to depths of up to thirteen (13) feet BGS which exceed one (1) or more R2 RSPL or Excavation Soil PL (XSPL), or exhibiting a characteristic of hazardous waste.
2. Groundwater media at depths of approximately 5 to 14 feet BGS which exceed one (1) or more R2 GWPL.
3. Subsurface soil vapor media which exceed one (1) or more R2 Commercial/Industrial Sub-slab Vapor PLs.

The objective of this RWP is to implement a focused remedial program which targets the areas of the Site exhibiting the highest Volatile Organic Compound (VOC) impacts and to remediate the above referenced media to levels at or below the applicable R2 PLs. Areas of soil impacts which only exceed the R2 Residential Soil PL (if applicable), can be managed in-situ through use of an ERC. However, active soil remediation activities are warranted in areas which exceed an R2 XSPL.

In summary, the proposed corrective actions will incorporate both active remediation and institutional controls (ERC) in order to adequately address any potential exposure pathways and to render the Site redevelopment ready. A summary of the corrective action objectives per media type is as follows:

Soil: R2 CSPL or XSPL (if IDEM has not established a CSPL)
Groundwater: R2 GWPL at the downgradient Property line
Soil Gas: Applicable R2 Commercial Soil Gas PLs onsite and at the downgradient Property line.

In addition to the RWP proposed work activities, three (3) additional tasks should be completed prior to redeveloping the Site:

- Characterization and disposal of the stained concrete building foundation, sump pits, and underground plating bath vaults and potentially any limited areas of underlying media/debris subject to transmission of contaminants through the concrete.
- During any future redevelopment activities, any shallow cinder fill encountered should be properly characterized prior to excavating/removing/relocating, in accordance with the site-specific SMP.
- Although this RWP is treating the groundwater beneath the formerly inaccessible (collapsing) portion of the main warehouse building (northwest corner), additional assessment in this area could assist with planning when redeveloping this area of the Site, specifically how to handle any shallow soil disturbed during the redevelopment activities.

Proposed Active Remediation Activities

Based on current Site conditions and the field observations and analytical results obtained during the Site investigation activities completed to date, near-surface soils (0-4 feet BGS) have been adversely impacted with TCE above the R2 XSPL. Soils up to 13 feet BGS contain TCE concentrations potentially in excess of the toxicity characteristic of Hazardous Waste. Shallow cinders/fill are impacted with arsenic in excess of the R2 RSPL. Also, groundwater and/or sump water has been impacted with naphthalene, methylnaphthalenes, TCE (and degradation daughter products), cyanide, antimony, nickel, and hexavalent chromium in excess of R2 GWPLs.

The selected cleanup alternatives are Targeted Excavation and Hazardous Disposal along with Site Wide Injections with Upgradient and Downgradient PRBs. Following completion of remedial activities, quarterly groundwater monitoring will be conducted for up to 12 quarters. In preparation for the post-remediation sampling, seven monitoring wells will be installed at the site and baseline groundwater sampling will be conducted after the excavation activities but prior to the injection work. A copy of the Site-specific Health and Safety Plan (HASP) is included in **Appendix A**.

An ERC restricting land use to non-residential and prohibiting groundwater extraction (except for assessment and remediation purposes) should also be instituted on the Site. A more detailed description of the proposed remediation activities is provided in the following sections.

IWM Consulting will also contact the Indiana Underground Plant Protection Service (IUPPS) in order to identify, mark, and map public utilities located on, or adjacent to, the Site prior to initiating any subsurface work activities. IWM Consulting will conduct the soil excavation, PRB installation, and site-wide injection activities and will prepare and submit a Remediation Completion Report following the completion of the soil and groundwater remediation activities.

Proposed Analytical Parameters

Existing analytical results will be used to satisfy part of the permitted landfill's requirements for disposal of hazardous solid waste. However, the landfill has confirmed additional testing will be required to satisfy all their profiling requirements. Consequently, the following analytical methods will be utilized during the course of this phase of the project:

Waste Characterization (Pre-Excavation) Soil Samples:

- Two (2) samples from the AP-GP8 vicinity (2-4' and 10-12') for:
  - Barium by SW-846 Method 6010,
- Three (3) samples from the rest of the proposed excavation area for:
  - Total Resource Conservation and Recovery Act (RCRA) eight metals plus antimony, beryllium, nickel, and thallium using the appropriate SW-846 Methods. Toxicity Characteristic Leaching Procedure (TCLP) analysis by EPA Method 1311/6010/7470 will be necessary if any analyte exceeds the 20x dilution rule of thumb for the toxicity characteristic;
  - Total Cyanide by SW-846 Method 335.4/9012;
- All waste characterization samples will also be analyzed for:
  - pH using SW-846 Method 9045;
  - Ignitability by SW-846 Method 1030;
  - Total Sulfide by SM 4500S2D
  - Total Semi-Volatile Organic Compounds (SVOCs) by SW-846 Method 8270;
  - Herbicides by SW-846 Method 8151;
  - Organochlorine Pesticides by SW-846 Method 8081;
  - Total PCBs by SW-846 Method 8082;
  - Percent moisture by Standard Method 2540.

Additional Excavation Volume/Perimeter Characterization (4 borings)

- Volatile Organic Compounds (VOCs) by SW-846 Method 8260,
- Percent Moisture by Standard Method 2540; and
- Total Cyanide by SW-846 Method 335.4/9012.

Post In-situ Conditioned Soil Prior to Disposal:

- VOCs by SW-846 Method 8260 (Per landfill requirements, 1 soil sample/100 tons of treated soil); and
- Percent Moisture by Standard Method 2540.

Excavation Confirmation Soil Samples:

- Shortlist Total VOCs (PCE, TCE, cis and trans-1,2-DCE, and vinyl chloride) using SW-846 Method 8260; and
- Percent Moisture by Standard Method 2540;

Well Installation Confirmation Soil Samples:

- VOCs by SW-846 Method 8260; and
- Percent Moisture by Standard Method 2540.

Groundwater Samples:

- VOCs by SW-846 Method 8260 (full list initially, but may be pared down to a shortlist after the first couple quarterly monitoring events);
- Methane, ethane, and ethene using RSK 175;
- Total organic carbon using SW-845 Method 415.2 (this constituent will be analyzed on a yearly basis during the post-remediation quarterly monitoring events); and
- Total and dissolved iron using SW-846 Method 6010 (for the pre-injection "baseline" event, and at least the first post-injection event).

The soil and groundwater samples will be obtained in accordance with the site-specific Quality Assurance Project Plan (QAPP), which is pending review and approval. It should be noted that all of the soil samples obtained for VOC analysis will be obtained in general accordance with EPA Sampling Method 5035.

Utility Identification

As mentioned above, IWM Consulting will contact IUPPS in order to identify, mark, and map public utilities located on, or adjacent to, the Site at least 72-hours prior to performing any Site activities which require the disturbance of surface and/or subsurface soils, structures, or debris. Additionally, a limited geophysical survey will be completed in the northwestern portion of the main warehouse building, west of AP-GP14 and AP-GP17 and north of AP-GP7 in an effort to identify the location and extent of a potential crawlspace or shallow utility tunnel reportedly located beneath this portion of the building.

Waste Characterization Sampling and Source Removal (Soil Excavation) Activities

Prior to initiation of the excavation activities, utility identification and waste characterization sampling activities will be performed. Two waste characterization soil samples will be obtained from the proposed excavation area (**Figure 5**) for the first 500 tons, and one additional sample will be collected for each additional 500 tons (or fraction thereof) of material which will be hauled for disposal (total of five samples). The waste characterization samples will be submitted to the laboratory for the analyses specified above. Unless otherwise specified by the landfill (or as noted above for AP-GP8), the waste characterization soil samples will be obtained as a composite from the 0-13 feet BGS sampling interval.

In addition, prior reports have discussed the historical inability to assess/delineate under the northwest portion of the building, since the building was collapsing. This limited the historical delineation activities for the southwestern extent of the elevated TCE soil concentrations. Now that the building has been demolished, limited additional characterization of the vertical and horizontal extent of the anticipated excavation area will be conducted during the waste characterization phase of this project. Four soil borings will be advanced in this area to a target depth of 12 feet BGS. Multiple samples (up to 6 samples/boring) will be collected per boring for laboratory analysis of VOCs using SW-846 Method

8260, and total cyanide by SW-846 Method 335.4/9012. Results of this additional characterization sampling should allow the total volume of the proposed excavation area and/or volume of soil requiring in-situ treatment to be refined prior to initiating the excavation activities.

As previously noted, a void space (possible crawlspace or utility corridor) was observed beneath the northwest portion of the building, which was previously inaccessible. The full size or potential historical use for this void space is unknown. The entrance was intentionally blocked by bricks during the demolition to prevent trespassers or animals from entering into this void space. If inconclusive results are obtained during the geophysical survey (during the pre-excavation phase), an attempt may need to be made to clear the opening to this void space in order to further evaluate the size and location of this void space.

Disposal requirements essentially create two separate levels of hazardous waste. Concentrations which meet the 10x LDR can be disposed of in a properly licensed hazardous waste landfill. Concentrations in excess of the 10x LDR must be incinerated prior to disposal. Incineration is a much more expensive disposal option. For TCE, the 10x LDR is 60 mg/kg. Consequently, approximately 500 tons of soil with TCE concentrations in excess of 60 mg/kg will be conditioned in-situ to reduce TCE concentrations to less than 60 mg/kg. Conditioned soil will then be re-sampled (a minimum of one sample per 100 tons for total VOC analysis are required by the landfill) to verify concentrations meet 10x LDR requirements prior to excavation, hauling and offsite disposal as hazardous waste. It should be noted the 10x LDR for cyanide (300 mg/kg) is much higher than any historically observed concentrations at the Site, and as such, no in-situ conditioning will be necessary for cyanide concentrations in order to meet the 10x LDR threshold.

After the landfill receives the results for the in-situ conditioned soil and issues final approval, soils will be removed from an estimated 75x38 square foot area 13 feet deep in the vicinity of historical sample locations AP-GP8, AP-GP13, AP-GP16, AP-GP17, and AP-GP18. IWM Consulting will supervise the removal of the TCE-impacted soil at the Site for disposal. As per the Analysis of Brownfield Cleanup Alternatives (ABCA), approximately 1,810 tons of environmentally impacted soils are anticipated to be excavated. This tonnage estimate includes the estimated 500 tons of TCE-impacted soil which will be conditioned in-situ to meet the 10x LDR requirement. These tonnage estimates may be revised based on the results of the pre-excavation waste characterization and additional excavation area characterization sampling activities.

In addition, surface and near-surface soils which have not been impacted (estimated at 225 tons) with TCE concentrations greater than 10 mg/kg, will be temporarily stockpiled on-Site and will be re-used as backfill following excavation and disposal activities. The tonnage estimates assume approximately 1.8 tons per cubic yard for any material treated in-situ, and 1.7 tons per cubic yard for the rest of the material. Actual tonnage is expected to vary based on actual soil density. The estimated tonnages listed above are subject to change depending on the results of additional delineation and waste characterization sampling.
The soil will be excavated, direct-loaded, transported, and disposed as hazardous waste at an approved RCRA Subtitle C hazardous waste landfill approximately 63 miles from the site (Heritage Landfill in Roachdale, Indiana). This is the closest Subtitle C hazardous waste landfill. Heritage Transportation or a licensed hazardous waste hauler subcontracted by Heritage Transportation will be used for the project and

should supply enough trucks to transport 16 loads to the landfill in a single day. Temporary chain link fencing will be used to secure the excavation area and ensure safety. A map displaying the anticipated excavation area is included as **Figure 5 – Estimated Over Excavation**.

Confirmatory soil samples will be obtained during the remediation activities at a rate of one sample per every 20 linear feet along the sidewalls and one sample for every 400 square feet on the base of the excavation. The confirmatory soil samples will be analyzed in accordance with the Site-specific analytical suite. The confirmation soil samples will be collected directly from the walls and base of the excavation using the bucket of the excavator then IWM Consulting personnel will transfer the samples to the laboratory provided sampling containers by hand while wearing dedicated, disposal nitrile gloves. For Quality Assurance/Quality Control (QA/QC) measures, one duplicate and one matrix spike/matrix spike duplicate soil sample will be obtained during sampling activities at a rate of one per every 20 confirmation soil samples. The QA/QC samples will be analyzed per the Site-specific analytical suite.

To help address potential future migration to groundwater issues, and in preparation for the subsequent groundwater treatment, a suitable volume of ZVI will be applied and mixed with the soil at the base of the excavation area using the bucket of the excavator. The excavation area will then be backfilled with general fill material (granular fill material such as pit run or certified clean soil) which will be compacted to the extent possible with the excavation equipment. As the size of the excavation area will preclude optimal compaction, any structure placed over the excavation area will need to consider optimal compaction issues prior to installing structural components.

The remediation activities are tentatively scheduled to start in July or August 2024. This start date is dependent upon when the USEPA required 30-day public comment period for the proposed remediation activities has been met, when appropriate responses to the public comments have been made, whether additional characterization during the waste characterization phase necessitates any alterations to this RWP, and contractor availability.

Confirmation Monitoring Well – Installation and Sampling Activities

Prior to treatment of the groundwater via injection of remedial amendments, seven permanent monitoring wells will be installed at the Site in order to monitor groundwater quality prior to and after the injection activities. The borings for the wells will be installed utilizing the direct push drilling technology, continuously sampled at every 2-foot interval (unless inside the recent excavation area), and are anticipated to extend to approximate depths of up to 20 feet BGS. The soil samples will be visually inspected and field screened for VOCs using a photoionization detector (PID) and one confirmation soil sample (interval exhibiting the highest PID reading above the water table or immediately above the observed water table if elevated PID readings are not encountered) will be selected for laboratory analysis of VOCs and percent moisture. The proposed well locations are shown on **Figure 6 – Proposed Sampling Locations**. Please note that the final well locations may need to be adjusted in the field based upon surface (trees/bushes/shrubs) or subsurface (utilities, crawlspace/utility tunnel) features present at the Site.

In addition, IWM Consulting anticipates (if access is granted) three of the four existing wells (MW-20, MW-22 and MW-27) installed for the OFM investigation will also be utilized for monitoring purposes. Due to location and historical concentrations, IWM Consulting does not anticipate utilizing OFM's MW-25 for groundwater monitoring at this time since it is outside of the treatment area and has always historically exhibited non-detectable dissolved cVOC concentrations. Based on historical gauging data from the existing OFM wells, the proposed new monitoring wells will be installed to an approximate depth of 20 feet BGS. Wells will be installed with 2-inch diameter schedule 40 flush-threaded polyvinyl chloride (PVC) screens (10-feet in length) and casing (variable lengths). The monitoring wells will be installed and developed by an Indiana-licensed well driller. Soil cuttings and purge water generated during monitoring well installation and groundwater sampling activities will be containerized onsite for subsequent disposal at an approved off-site facility. It is assumed that all investigation-derived waste will be non-hazardous for disposal purposes.

The monitoring wells are anticipated to be installed to approximate depths of up to 20 feet BGS or less and will be installed within the unconsolidated formation. One The screens of the monitoring wells will intersect the first aquifer encountered and IWM Consulting anticipates that the wells will be constructed with approximately 10 feet of 2-inch diameter PVC factory slotted 0.010-inch screen (potentially pre-packed screen). No. 5 silica sand will be manually installed and extended to at least one foot above the well screen interval (pre-packed wells will have the additional one foot manually installed only). Then a minimum 2-foot-thick bentonite chip seal will be placed immediately above the sand interval. The monitoring wells will be completed with a flush-mounted protective cover (locking manhole cover) and associated concrete pad. Following well installation, all wells (including existing wells MW-20, MW-22, and MW-27) will be surveyed to the nearest one-hundredth (1/100) of a foot to a common benchmark in order to determine groundwater flow direction. The groundwater monitoring well locations will also be surveyed in with a GPS unit for mapping purposes.

After allowing sufficient time for the annular materials and concrete pad to cure, the wells will be sampled using the low flow sampling technique. The first sampling event will take place prior to the remedial injections in order to establish baseline concentrations at the new wells. Confirmatory quarterly groundwater sampling of the entire monitoring well network will be conducted after the in-situ injection activities for three years, with the first event starting approximately 6-months after the conclusion of the injection activities. However, a limited groundwater sampling event will be conducted within two months of the injections to evaluate the progress of the injectate.

The monitoring wells will be sampled via low-flow sampling methods in accordance with the QAPP. Please note that the groundwater monitoring points will only be purged for a maximum of one hour while ensuring minimal drawdown (<0.33 feet) prior to sample collection. Typical field parameters (temperature, pH, conductivity, dissolved oxygen, and oxygen reduction potential) will be recorded. Purge water generated during groundwater sampling activities will be stored in labeled 55-gallon drums pending future characterization and disposal.

Standard protocols will be observed for sample collection, sample handling and preservation, and chain-of-custody documentation in accordance with the QAPP. Personnel will utilize clean, disposable, nitrile gloves for each sample obtained. The groundwater samples will be collected from the wells and will be

placed into the appropriate laboratory provided containers. Prior to use, the sample containers will be inspected for cracks, chips, cleanliness and preservative (as appropriate). Container threads will be wiped clean before sealing (if applicable) to ensure proper sealing. The sample containers will be labeled with the appropriate project name and/or number, sampling identification designation, date, time, and sampler's name or initials. Samples will be placed in a cooler containing ice and maintained at a temperature of approximately less than six (6) degrees Celsius prior to analysis.

Laboratory QA/QC samples will be collected in accordance with the approved QAPP. For QA/QC purposes, one field duplicate, one matrix spike/matrix spike duplicate (MS/MSD), and one equipment blank will be collected at a rate of one sample per every 20 field samples per sampling media and will be analyzed for the same sample analytical parameters. Field duplicate samples will utilize generic unidentifiable designations. Additional sample volume will be collected for the MS/MSD samples, as applicable. One trip blank for VOC analysis will accompany each cooler shipment which contains samples for VOC analyses.

Samples will be delivered to the laboratory under chain-of-custody control. Groundwater samples will be submitted for analysis of short-list VOCs using SW-846 Method 8260; methane, ethane, and ethene using RSK 175; and total organic carbon using SW-845 Method 415.2. For the pre-injection "baseline" event, and at least the first post-injection event, samples will also be analyzed for total and dissolved iron using SW-846 Method 6010. Depending on results, iron analysis may, or may not, be included in any subsequent sampling event.

Permeable Reactive Barriers - In-situ Injection Activities

Permeable reactive barriers consist of a subsurface area with an added remedial amendment which reacts with contaminants in the groundwater as groundwater migrates through the barrier area. Typically, enough remedial amendments are added to a PRB to degrade the chemicals present in the PRB area, and the mass of contaminants which are expected to migrate through the PRB for a certain period of time in the future. PRBs are typically a linear feature oriented perpendicular to the groundwater flow direction. For this project, two (2) PRBs will be installed via direct push injections:

- One upgradient PRB (~300 feet in length) will be installed along the north and east property lines. This PRB will contain 60 injection locations. Each injection location is assumed to have about a 3.3-foot radius of influence. In general, the injection depth would be from 10 to 20 feet BGS. The upgradient PRB would cover about 2,100 square feet and use 23,600 pounds of PlumeStop and 2,000 pounds of S-MZVI™. This PRB will remediate contaminants migrating onto the Site from the hydraulically upgradient source (OFM).
- One downgradient PRB (~210 feet long) with 42 injection locations will be installed along the western property line. This PRB will cover about 1,470 square feet. In general, the injection depth for this PRB would also be from 10 to 20 feet BGS. This PRB would utilize 16,800 pounds of PlumeStop and 2,000 pounds of S-MZVI™. This PRB will provide a treatment barrier along the hydraulically downgradient edge of the Site.

PlumeStop is a colloidal form of activated carbon with a surface treatment which allows the material to move more readily through the soil pores, increasing the distribution, and effectively the sorptive potential, of the PlumeStop. PlumeStop will result in immediate reductions in the dissolved cVOC concentrations since the contaminants will adsorb to the carbon. Once the contaminants are concentrated on the surface of the carbon, the contaminants could be readily destroyed by the supplemental S-MZVI™.

S-MZVI™ is a colloidal, sulfidated zero-valent iron product which is suspended in glycerol using proprietary environmentally acceptable dispersants. S-MZVI promotes the destruction of many organic pollutants, including chlorinated solvents, pesticides, and haloalkanes. This product provides reactivity with chlorinated hydrocarbons (such as TCE and tetrachloroethylene [PCE]) and generates beta-elimination of chlorinated compounds, which bypasses the formation of daughter products like cis-1,2-dichloroethylene and vinyl chloride. Instead, this abiotic degradation process results in the production of ethenes and ethanes. The passivation technique of sulfidation of the zero valent iron will also increase the stability of the S-MZVI™ and provide long-term [designed to last at least ten (10) years] degradation of chlorinated hydrocarbons.

Anaerobic reductive dechlorination is a treatment process which has been successfully used to remediate soil and groundwater contaminated with chlorinated solvents. Reductive dechlorination only occurs in the absence of oxygen; and the chlorinated solvent actually substitutes for oxygen in the physiology of the microorganisms carrying out the process.

Proposed locations of the PRBs are included on **Figure 7 – Proposed PRB and Plume-Wide Injection Areas**. The final location of the PRBs may be adjusted slightly in the field to account for any surface vegetation, subsurface obstructions, etc. During injections, a drill rig and injection equipment will be required. The PRB injections are estimated to be completed over a 12-day period. Please refer to **Appendix B** for more details on the PRB injections.

Plume-Wide In-situ Injection Activities

In only two PRBs (upgradient and downgradient) are selected as the sole remedy for groundwater concentrations, then given site characteristics, the ABCA estimated it would take about 16 years for TCE-impacted groundwater on the downgradient side of the upgradient PRB to reach the downgradient PRB, and it would take more years for TCE concentrations between the two barriers to reach default screening levels. Addition of plume-wide injections would not only eliminate the transit time between PRBs (and the resulting monitoring and maintenance timeframe) but would also increase the mass of remedial amendments emplaced in the subsurface. As such, plume-wide injections have a lower chance of being overwhelmed by continued migration/leaching of the contaminants from on and off-site. Consequently, IWM Consulting is proposing to implement a plume-wide injection program between the two PRBs.

The plume-wide injections will be installed via a direct push drill rig, and will consist of the following:

- Separation of the Site into two (2) separate treatment areas: upgradient treatment Area A and central/downgradient Treatment Area B.

- Installation of 99 injection points into upgradient Treatment Area A, which is designed to remediate contaminants detected in the northeastern portion of the Site which have already migrated onto the Site from the hydraulically upgradient source (OFM). Each injection location is assumed to have about a 3.2-foot radius of influence. In general, the injection depth would be from 10 to 20 feet BGS. Upgradient Treatment Area A would cover about 17,200 square feet and use 6,000 pounds of 3-DME, 4,500 pounds of S-MZVI™, and 37 liters of BDI Plus.
- Installation of 216 injection points into central/downgradient Treatment Area B, which is designed to remediate the area of the Site where the VOCs from the suspected on-Site source area and the hydraulically upgradient source (OFM) are comingled. Each injection location is assumed to have about a 3.5-foot radius of influence. In general, the injection depth would be from 10 to 20 feet BGS. Treatment Area B would cover about 35,100 square feet and use 12,000 pounds of 3-DME, 9,000 pounds of S-MZVI™, and 79 liters of BDI Plus.

This remedial treatment technology will introduce 3DME, S-MZVI, and BDI Plus for plume-wide in-situ treatment at this Site. 3DME is a pH neutral, slow-release electron donor which is delivered on-site as an injection ready emulsion. The neutral pH makes 3DME ideal for use with pH-sensitive bioaugmentation cultures. The BDI Plus culture includes Dehalococcoides to ensure complete dechlorination of the chlorinated ethenes. The bioaugmentation culture will be applied in conjunction with the pH neutral 3DME to avoid the added cost of applying each of these technologies in separate application events. Please refer to the prior section for a description of S-MZVI.

No long-term equipment or maintenance will be required, and because no waste streams will be generated, no disposal permitting will be required during the injection phase of the remediation. During injections, a drill rig and injection equipment will be required. The plume-wide injections are estimated to be completed over a 17-day period plus two days for setup/breakdown. Proposed locations of the PRBs are included on **Figure 7 – Proposed PRB and Plume-Wide Injection Areas**. Please refer to **Appendix B** for more details on the plume-wide injections.

Reporting

IWM Consulting will obtain approval from the IBP project manager (PM) for this RWP, the Site-specific ABCA, and Community Relations Plan (CRP), prior to initiating the field work. At the conclusion of the remediation field work and first limited groundwater sampling event, a Remediation Completion Report will be submitted to the IBP PM. The Remediation Completion Report will summarize the implemented remediation activities, confirmation soil analytical results, pre-injection monitoring well installation and sampling activities, the baseline groundwater sampling results and the results of initial limited groundwater sampling event conducted approximately two months after the conclusion of the injection activities. The completion report will also include scaled maps, tabulated analytical results, and waste disposal manifests. Following completion of the remedial excavation and injections, supplemental quarterly monitoring reports will be submitted to document the field activities and results of the quarterly monitoring events.

Proposed Timeline

IWM Consulting anticipates the following timeline in relationship to completing this project:

Proposed Timeline Former Advance Plating Facility Indianapolis, Indiana		
Task	***Estimated Timeline***	***Comments***
Submittal of Draft RWP & ABCA	April 29, 2024	Both documents will be reviewed by the IBP and USEPA
Submit Final Draft RWP & ABCA	May 14, 2024	Incorporates IBP & USEPA comments
Public Comment Period	May 20, 2024 – June 20, 2024	Anticipated date and actual date may be different depending upon when the IBP & USEPA approves the draft ABCA & RWP
Finalize & Submit RWP	July 2, 2024	Includes addressing public comments and new comments received by the IBP or USEPA
Waste Characterization Sampling/Source Area Sampling	July 2024	Estimate 4-6 weeks for scheduling, sample collection, analysis, and preliminary landfill approval. Start date dependent upon when the final RWP is approved
In-situ conditioning of ~500 tons of TCE-impacted soil, confirmation sampling of conditioned soil, excavation of ~1,810 tons of soil, application of ZVI to base of excavation, & backfilling	August 2024	Estimate up to ~2.5-weeks to complete the work activities. Estimated volumes may be adjusted based upon the results of the source area sampling activities
Install and sample permanent monitoring wells	August 2024	Estimate 1-1.5 weeks to install, develop and sample the wells
PRB installation activities	September 2024	Estimate 2-2.5 weeks (weather dependent) to install the PRBs
Plume-wide injection activities	September/October 2024	Estimate 3.5-4 weeks (weather dependent) to complete plume-wide injections
Limited post-injection groundwater sampling	November/December 2024	Sampling will be conducted within two months of completion of injections.
Submittal of Remediation Completion Report	January 2025	Remediation Completion Report submitted within 45-days of completion of last phase of remediation & limited post-injection groundwater sampling event
Quarterly groundwater sampling of monitoring wells and reporting	1st event 1st Qtr 2025, 1/quarter thereafter for up to 11 more quarters	Estimate two days to complete each groundwater sampling event. Progress report submitted 30-45 days after each sampling event.

IWM Consulting appreciates the opportunity to provide the Indiana Brownfields Program with this RWP. If you have any questions regarding this transmittal, please contact the undersigned at 317-347-1111.

Sincerely,

IWM CONSULTING GROUP, LLC

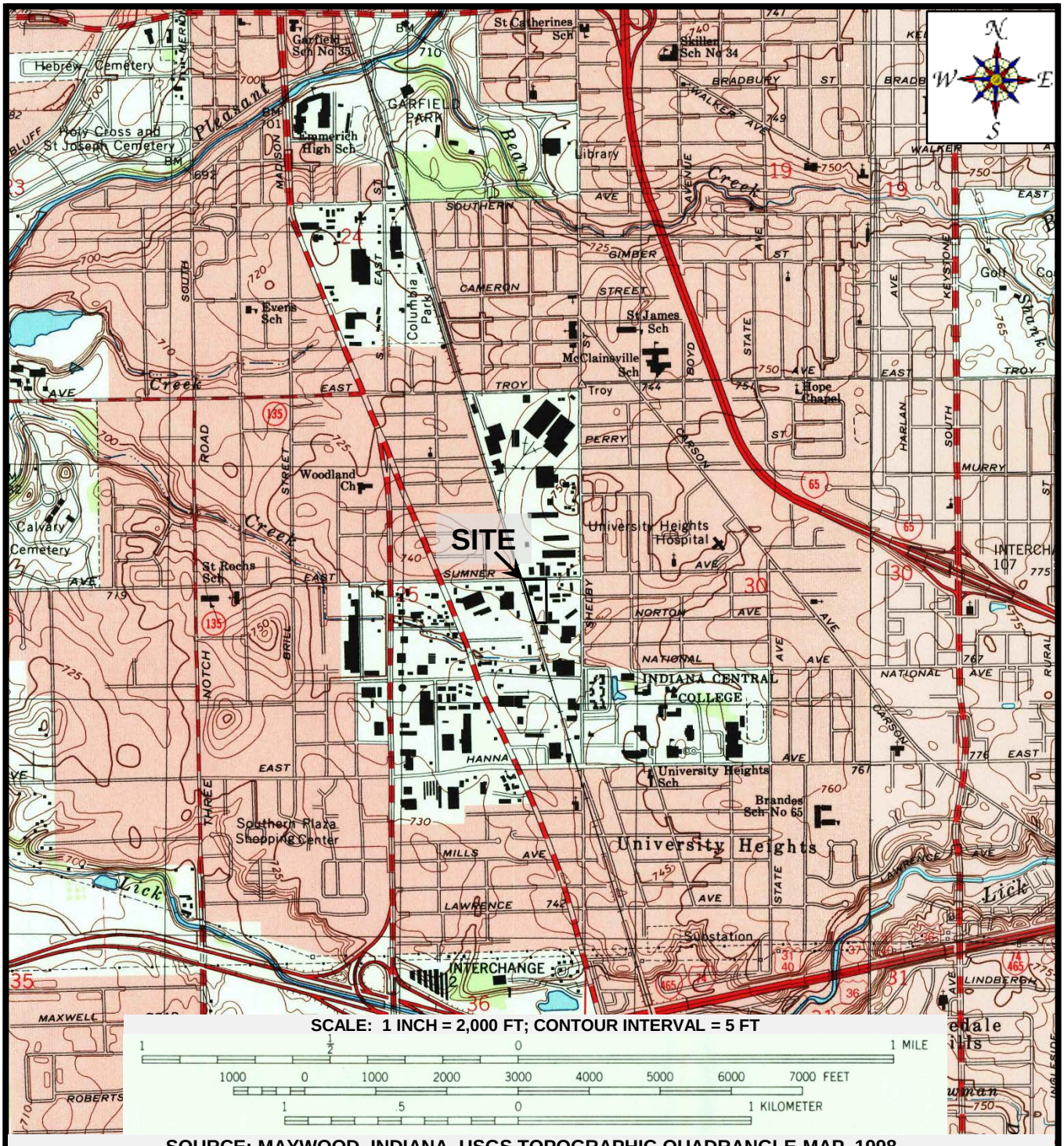
William E. Ackland, LPG #2526
Project Manager

Christopher D. Parks, LPG #2169
Technical Manager

Bradley E. Gentry, LPG #2165
Vice President/Brownfield Coordinator

cc: John Jurevis, USEPA Region 5 Project Manager (Cleanup Grant)
Ashley Green, USEPA Region 5 Project Manager (RLF Grant)
Margarette Webb, City of Indianapolis

FIGURES



SOURCE: MAYWOOD, INDIANA, USGS TOPOGRAPHIC QUADRANGLE MAP, 1998

iWM CONSULTING GROUP

□□□□ Rock□i□e Road□Indiana□o is□Indiana □□□□□
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FIGURE □

Site Location Map
Former Advance Plating Facility
1005 E. Sumner Avenue
Indianapolis, Indiana

C□IENT

THE CITY OF INDIANAPOLIS
INDIANAPOLIS, INDIANA

□ro□ect	Task	Si□e	□ate
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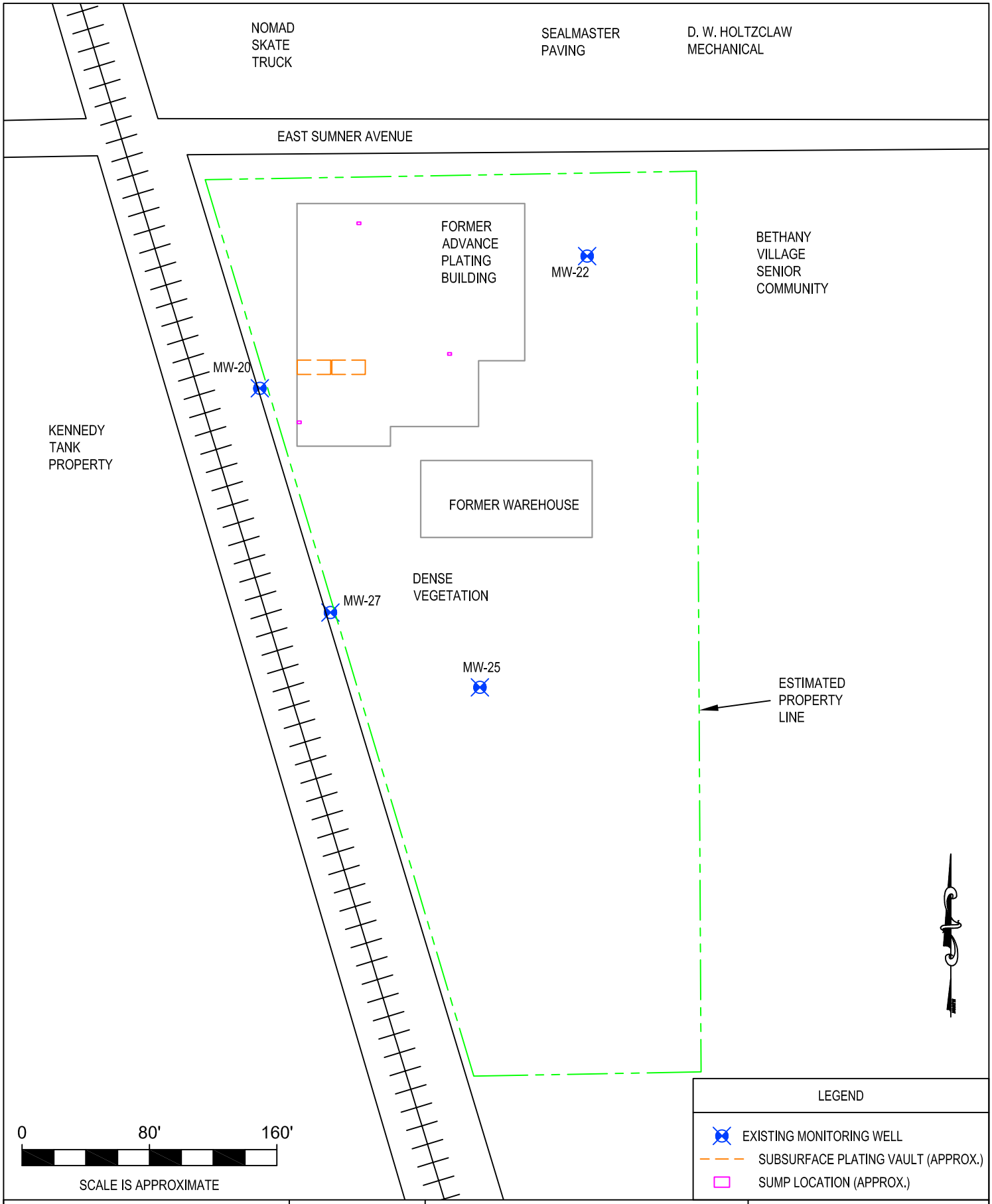


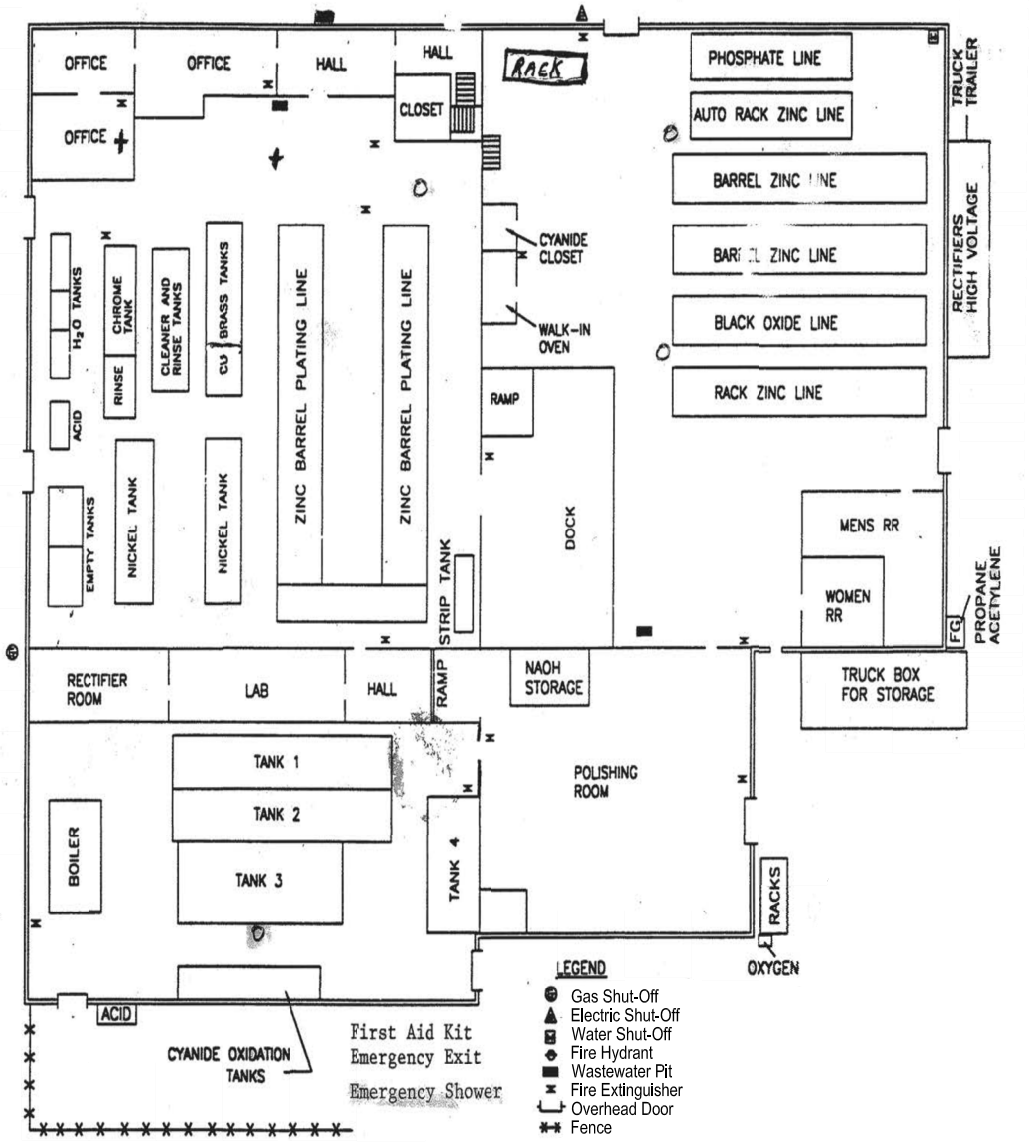
FIGURE 2
SITE MAP

DRAWN BY: WEA
DATE: 3/21/17
REVISED: 4/18/24
IN23109
#Figure 1 - Site Map.dwg

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP

FIRST FLOOR



0 30' 60'

SCALE IS APPROXIMATE

LEGEND
WASTEWATER SUMP

FIGURE 3 HISTORICAL BUILDING LAYOUT	DRAWN BY: WEA DATE: 11/29/16 REVISED: 4/18/24 IN23109 #Figure 3 Historical...dwg	FORMER ADVANCE PLATING FACILITY 1005 EAST SUMNER AVENUE INDIANAPOLIS, INDIANA	IWM CONSULTING GROUP

EAST SUMNER AVENUE

AP-GP1

T2-4

FORMER
ADVANCE
PLATING

AP-GP13

AP-GP14

AP-GP15

T2-2

AP-GP2

AP-GP16

MW-22

T2-3

AP-GP17

AP-GP8

T2-1

SS-1

AP-GP19

AP-GP18

T3-7

T2-5

AP-GP9

SS-3

AP-GP7

AP-GP20

SS-2

MW-20
T3-3

AP-GP12

AP-GP10

AP-GP11

AP-GP21

T2-6

T3-5

FORMER UST

AP-GP22

AP-GP3

AP-GP23

FORMER WAREHOUSE

T3-2

AP-GP4

DENSE
VEGETATION

MW-27

T3-6

MW-25

T3-1

T3-4

KENNEDY
TANK
PROPERTY

ESTIMATED
PROPERTY
LINE

100' to
AP-GP5

NORTH

LEGEND

- FURNITURE MART BORING
- IWM SOIL BORING
- EXISTING MONITORING WELL
- SUB-SLAB VAPOR SAMPLE LOCATION
- SUBSURFACE PLATING VAULT (APPROX.)
- SUMP LOCATION (APPROX.)
- FORMER UST LOCATION (APPROX.)
- RAILROAD

*BUILDINGS WERE REMOVED IN 2022,
ONLY FOUNDATIONS REMAIN

0' 30' 60'

FIGURE 4

HISTORICAL SAMPLE LOCATIONS

DRAWN BY: WEA
DATE: 8/31/20
REVISED: 4/23/24
IN23109
#TCE Slice Maps.dwg

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

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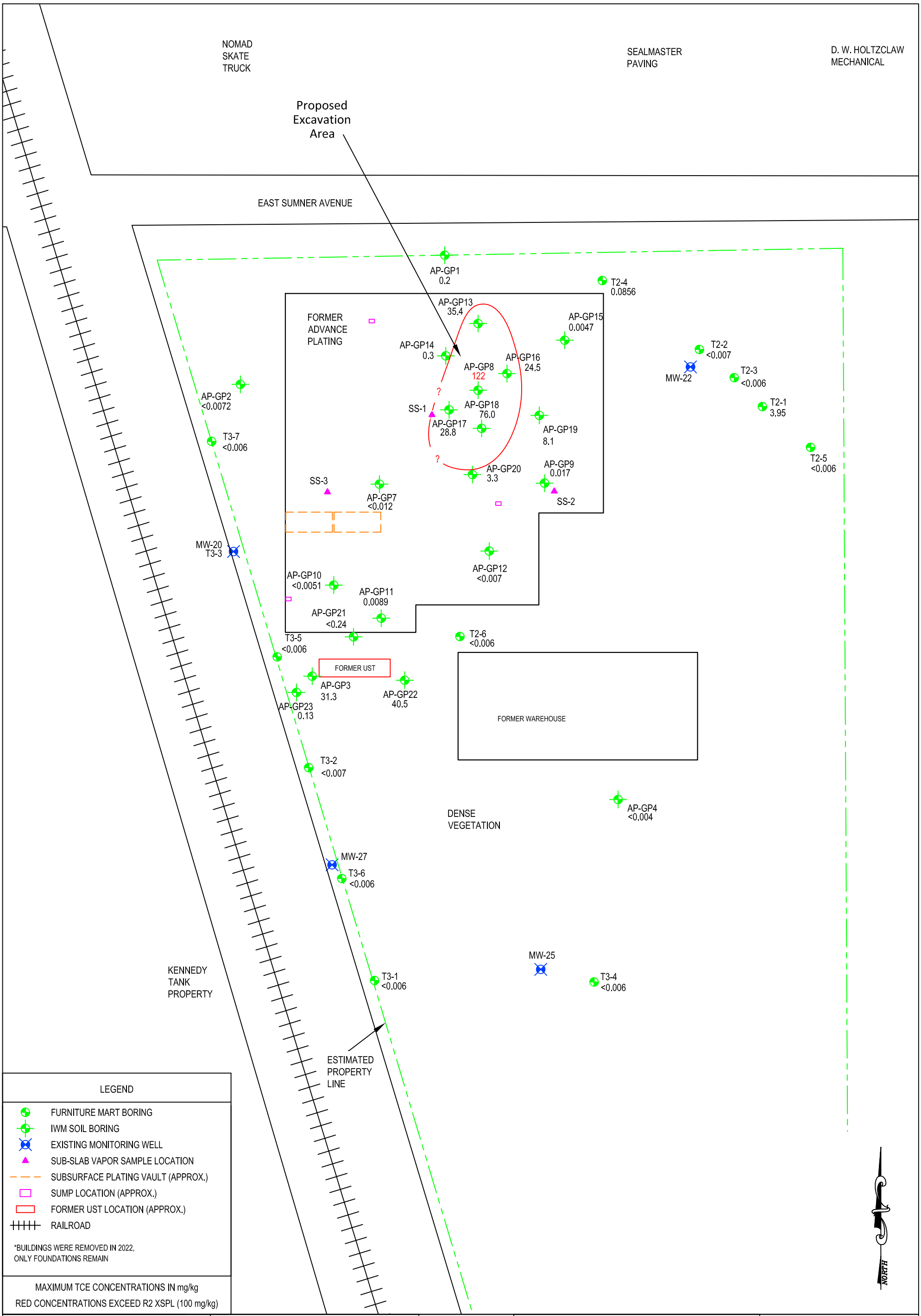


LEGEND

- FURNITURE MART BORING
- IWM SOIL BORING
- EXISTING MONITORING WELL
- SUB-SLAB VAPOR SAMPLE LOCATION
- SUBSURFACE PLATING VAULT (APPROX.)
- SUMP LOCATION (APPROX.)
- FORMER UST LOCATION (APPROX.)
- RAILROAD

*BUILDINGS WERE REMOVED IN 2022, ONLY FOUNDATIONS REMAIN

MAXIMUM TCE CONCENTRATIONS IN mg/kg

RED CONCENTRATIONS EXCEED R2 XSPL (100 mg/kg)

0' 40' 80'

FIGURE 5

ESTIMATED OVER-EXCAVATION

DRAWN BY: WEA	
DATE: 8/31/20	
REVISED: 4/23/24	
IN23109	
#TCE Slice Maps.dwg	

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP

NOMAD
SKATE
TRUCK

SEALMASTER
PAVING

D. W. HOLTZCLAW
MECHANICAL

Proposed
Excavation
Area

EAST SUMNER AVENUE

AMW-1

FORMER
ADVANCE
PLATING

AP-GP25

AP-GP26

AMW-3

?

MW-22

AMW-2

AMW-5

AP-GP27

AP-GP24

?

AMW-4

MW-20
T3-3

AMW-6

FORMER UST

AMW-7

FORMER WAREHOUSE

DENSE
VEGETATION

MW-27

MW-25

KENNEDY
TANK
PROPERTY

ESTIMATED
PROPERTY
LINE

LEGEND

- PROPOSED MONITORING WELL
- PROPOSED ASSESSMENT BORING
- EXISTING MONITORING WELL
- SUBSURFACE PLATING VAULT (APPROX.)
- FORMER UST LOCATION (APPROX.)
- RAILROAD

*BUILDINGS WERE REMOVED IN 2022,
ONLY FOUNDATIONS REMAIN

NORTH

0' 40' 80'

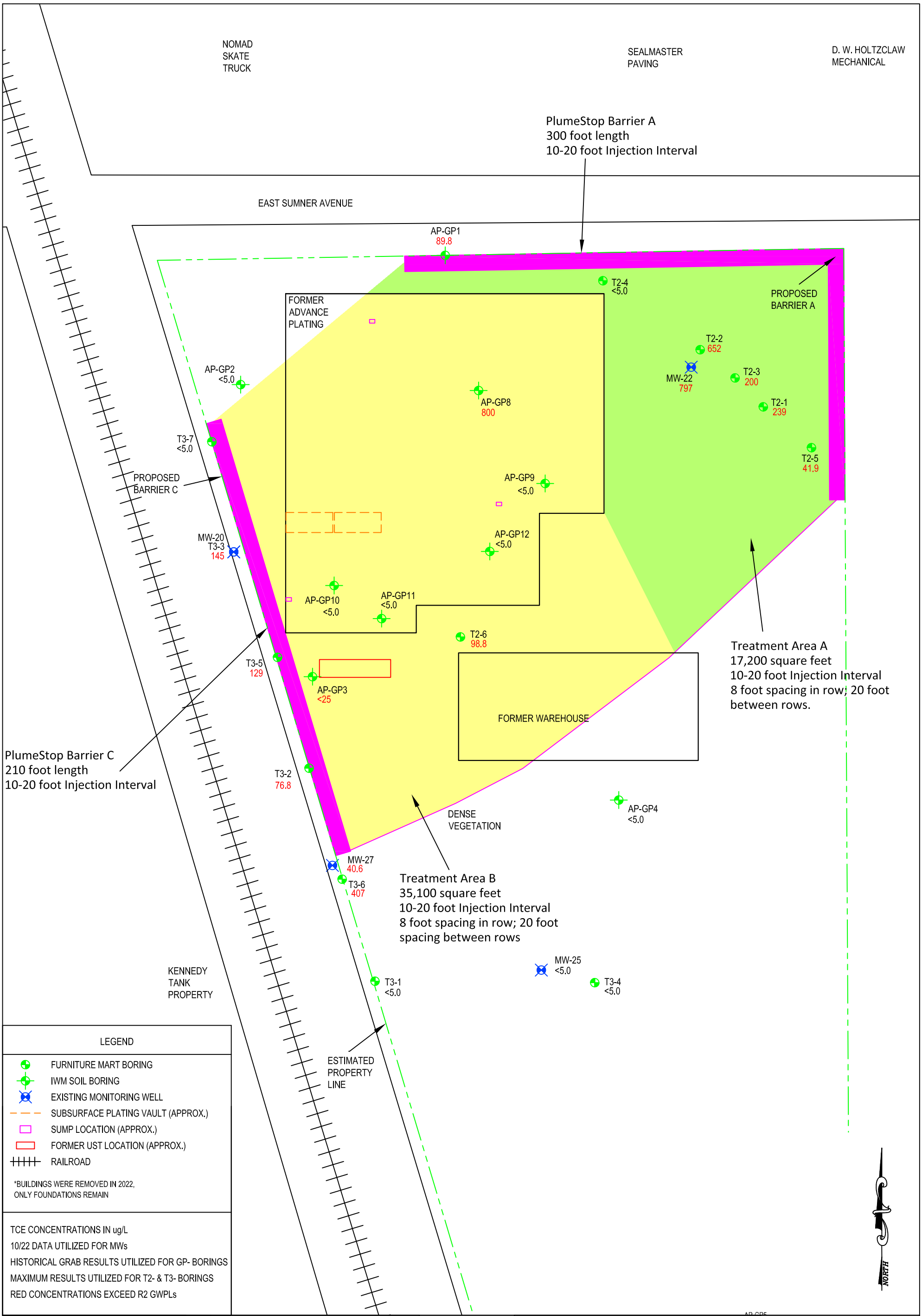
FIGURE 6

PROPOSED SAMPLING LOCATIONS

DRAWN BY: WEA
DATE: 4/18/24
REVISED: 4/23/24
IN23109
#TCE Slice Maps.dwg

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP



0' 40' 80'

FIGURE 7

PROPOSED PRB AND PLUME-WIDE INJECTION AREAS

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REVISED: 4/23/24	
IN23109	
#TCE Slice Maps.dwg	

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP

APPENDIX A

HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN

PREPARED FOR:

Former Advance Plating Facility
1005 East Sumner Avenue
Indianapolis, Marion County, Indiana
Indiana Brownfields Program Site No. 4200507
EPA ACRES ID: 226781
USEPA Cleanup Cooperative Agreement (CA) # 4B-00E03568-0
USEPA Remediation Loan Fund CA #4B-00E03232

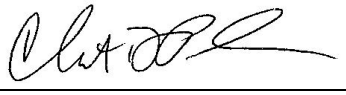
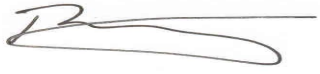
PREPARED BY:

IWM Consulting Group, LLC
7428 Rockville Road
Indianapolis, Indiana

Project No. IN19032

June 1, 2024	Ongoing
(Project Start Date)	(Project End Date)

Approved By:

Chris Parks	Office H&S Coordinator		4/29/2024
(Print Name)	(Title)	(Signature)	(Date)
Bradley Gentry	Project Manager		4/29/2024
(Print Name)	(Title)	(Signature)	(Date)

Purpose: This document defines the Health and Safety considerations for the on-site management activities by IWM personnel and contractors. This document is required by IWM policies and programs and OSHA 29 CFR 1910.120. The basic requirements for the health and safety of the project workers are delineated in the IWM Health and Safety procedures. All personnel on-site will be informed about the pertinent sections of the Health and Safety Plan.

TABLE OF CONTENTS

Page

APPENDICES

I. TYPE OF PROJECT

Check appropriate categories (more than one may apply):

- □ Tank Decontamination
- □ Tank Excavation and Removal
- ■ Soil Excavation
- □ Filter Press Operation/Dewatering
- □ Drum Sampling & Management
- □ Other
- ■ Geophysical/GPR Survey/Utility Locating
- ■ Chemical Application/Injections
- ■ Drilling/Soil Sampling
- ■ Groundwater Gauging/Sampling
- □ Well Abandonment
- □ Other – System Operation and Maintenance

_____ _____

_____ _____

A. Scope of Work

Source Removal (Soil Excavation) Activities. An excavator will be mobilized to the Site in order to remove up to 1,810 tons of soil. IWM personnel will oversee the excavation work and will collect confirmatory soil samples at a rate of one sample per every linear 20 feet of sidewall and one sample for every 400 square feet from the floor. Up to 500-tons of TCE impacted soil is anticipated to need in-situ soil conditioning with a chemical oxidant before the material can be excavated and removed from the Site.

Confirmation Monitoring Well – Installation and Sampling Activities. IWM Consulting will oversee the installation of seven (7) monitoring wells downgradient from historical source areas. The first sampling event will take place after the excavation activities but prior to the remedial injections in order to establish baseline concentrations at the new wells. Confirmatory quarterly groundwater sampling will follow in-situ injection activities for three years. The newly installed wells will be sampled via low flow sampling methods.

Permeable Reactive Barriers – In-situ Injection Activities. Two (2) PRBs will be installed via direct push injections: One upgradient PRB will be installed along the north and east property lines. This PRB will contain 60 injection locations. One downgradient PRB with 42 injection locations will be installed along the western property line.

Plume-Wide – In-situ Injection Activities. Separation of the Site into two (2) separate treatment areas: upgradient treatment Area A and central/downgradient Treatment Area B. Installation of 99 injection points into upgradient Treatment Area A, which is designed to remediate contaminants detected in the northeastern portion of the Site which have already migrated onto the Site from the hydraulically upgradient source (OFM). Installation of 216 injection points into central/downgradient Treatment Area B, which is designed to remediate the area of the Site where the VOCs from the suspected on-Site source area and the hydraulically upgradient source (OFM) are comingled.

Appendix A contains a site map(s), which indicates the subject site location, facility layout, work zones, evacuation routes, and other pertinent information for this HASP.

B. Site Location Information

The subject Site is located at 1005 Sumner Avenue Street, Indianapolis, Marion County, Indiana, which is on the south side of Sumner Avenue. The subject Site is situated in a commercial and industrial area of Indianapolis. The Site and surrounding area are relatively flat.

Site History

Based on standard historical sources, previous Phase I Environmental Site Assessments (ESA) discovered the Site was used as a cannery in 1914, residential purposes in the 1930's, soap manufacturing in the 1940's and 1950's, a manufacturing warehouse in the 1960's, and Advance Plating Works from the 1970's through 2009. The Site was abandoned by 2010. From February to March 2012, the U.S. EPA conducted emergency hazardous waste removal activities at the Site. The fire department responded to numerous fires for the main structure between 2016 and 2021. Both buildings were razed by the City of Indianapolis in March/April 2022 due to the dilapidated and unsafe condition of the buildings. The building foundations (concrete slabs) and paved parking lot still remain at the Site.

Area of Concern

Based upon the historical information obtained regarding the subject Site, the area of concern is limited to the northwestern portion of the Site, beneath and adjacent to the former main warehouse building, including the pave parking lot east and south of the warehouse

Neighborhood Description

The area surrounding the subject site can be characterized as a mixed commercial and residential setting.

North of site:	Expert Restoration Solutions Indianapolis, SealMaster
East of site:	Bethany Village
South of site:	Wooded Area, then First Onsite Property Restoration
West of site:	Railroad tracks then Kennedy Tank & Manufacturing

Topography and Site Access

The Site and surrounding area have a relatively flat topography. The primary access point to access the Site is from the north off of Sumner Avenue.

II. HAZARD EVALUATION

Physical Hazards (trenches, utilities, noise, biological, etc.) Check appropriate categories (more than one may apply):

- □ Auto and Plant Traffic
- ■ Slip and Fall
- ■ Overhead Utilities
- ■ Underground Utilities
- □ Biological
- □ Other: (Describe below)
- □ Uneven Terrain
- □ Trenches
- ■ Noise
- □ Explosion
- ■ Drilling Equipment

Appendix B contains copies a hazard evaluation for each task that summarizes work tasks, associated risks and hazards, and control measures.

A. Chemical Hazards

The following substances, are known or suspected to have historically been used on-site or have historically been detected during previous site investigation activities. The primary hazard of each is identified below.

Contaminant Group	Exposure Information		
	Chemicals	PEL[1] (ppm/ ug/m^3)	Exposure Routes[2]
Petroleum Products	Gasoline	300^V	Inh/Ing/Con
	Benzene	10	Inh/Ing/Con
	Toluene	200	Inh/Ing/Con
	Ethylbenzene	100	Inh/Ing/Con
	Xylenes	100	Inh/Ing/Con
	N-Hexane	500	Inh/Ing/Con
	MTBE	50^A	Inh/Ing/Con
	Diesel	100^A	Inh/Ing/Con
	Naphthalene	10	Inh/Ing/Con
	Fuel Oil #1	100 mg/m$^{3\ N}$	Inh/Ing/Con
	Motor Oil	---	Ing/Con
	Stoddard Solvent	500	Inh/Ing/Con
	PAHs (benzene soluble)	0.2 mg/m^3	Inh/Ing/Con
Chlorinated VOCs	TCE	100	Inh/Ing/Con
	cis-1-2-DCE	200	Inh/Ing/Con
	Vinyl Chloride	0.5	Inh/Ing/Con
	PCE	100	Inh/Ing/Con
	Chloroform	50	Inh/Ing/Con
Metals	Lead	30 ug/m^3	Inh/Ing/Con

Contaminant Group	Exposure Information		
	Chemicals	PEL[1] (ppm/ ug/m^3)	Exposure Routes[2]
Metals	Hexavalent Chromium	2.5 ug/m^3	Inh/Ing/Con
	Antimony	0.5 mg/m^3	Inh/Ing/Con
	Arsenic	5 ug/m^3	Inh/Ing/Con
	Beryllium	2 ug/m^3	Inh/Ing/Con
	Cadmium	0.2 mg/m^3	Inh/Ing/Con
	Chromium	1 mg/m^3	Inh/Ing/Con
	Copper	1 mg/m^3	Inh/Ing/Con
	Mercury	0.1 mg/m^3	Inh/Ing/Con
	Nickel	1 mg/m^3	Inh/Ing/Con
	Selenium	0.2 mg/m^3	Inh/Ing/Con
	Silver	0.01 mg/m^3	Inh/Ing/Con
	Tin	2 mg/m^3	Inh/Ing/Con
	Thallium	0.1 mg/m^3	Inh/Ing/Con
	Zinc (oxide)	15 mg/m^3	Inh/Ing/Con
Other	Total Cyanide	5 mg/m^3	Inh/Ing/Con

[1]OSHA or ACGIH Permissible Exposure Level in ambient air per 8-hour work day per 40-hour week
[2]Inh = inhalation, Abs = dermal absorption, Ing = ingestion, Con = skin/eye contact
[V] = June 1993 vacated PEL, [N] = NIOSH REL, A = ACGIH time weighted average (TWA)

Common Symptoms of exposure include: Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; and/or liver injury.

First aid step following exposure include: irrigate and/or water flush immediately, soap wash immediately, seek medical attention immediately, move to fresh air and/or artificial respiration (as applicable).

Appendix C contains copies of Material Safety Data Sheets (MSDSs) and/or other public health statements for the expected Contaminants of Concern (COC).

B. Medical Monitoring

Has the entire crew received baseline physicals? □ YES ■ NO

If No, why not? Not applicable.

List any special tests required and frequency: None required.

III. MANPOWER

A. IWM Personnel Requirements

Crew Personnel	Crew Size	Names
Project Manager	1	Bradley Gentry
H&S Officer	1	Chris Parks
Geologist/Engineer	1	IWM - Various
Field Technicians	1-3	IWM - Various
Other	NA	

B. Subcontractor Requirements

Subcontractor Information:

Name: TBD
Address: TBD
Contact Info: TBD

Scope of Work: Excavation
Training Required: 40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? □ YES □ NO ■ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? □ Yes □ No ■ N/A

Has training been documented? □ Yes □ No ■ N/A

If NO, why? Not Applicable

Subcontractor Information:

Name: SCS Environmental Contracting
Address: 7120 Venture Lane, Fort Wayne, IN 46818
Contact Info: Phone: 260-497-9006

Scope of Work: Drilling – injection activities
Training Required: 40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? □ YES □ NO ■ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? □ Yes □ No ■ N/A

Has training been documented? □ Yes □ No ■ N/A

If NO, why? Not Applicable

Subcontractor Information:

Name: TBD
Address: TBD
Contact Info: TBD

Scope of Work: Geoprobe drilling/ well installation
Training Required: 40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? □ YES □ NO ■ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? □ Yes □ No ■ N/A

Has training been documented? □ Yes □ No ■ N/A

If NO, why? Not Applicable

Subcontractor Information:

Name: Regenesis
Address: 1011 Calle Sombra, San Clemente, CA 92673
Contact Info: Phone: 949-366-8000

Scope of Work: Injections
Training Required: 40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? □ YES □ NO ■ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? □ Yes □ No ■ N/A

Has training been documented? □ Yes □ No ■ N/A

If NO, why? Not Applicable

IV. EQUIPMENT

A. Check Equipment Needed Below. More than one may apply.

- ■ Drill Rig
- ■ Excavators
- ■ Skid Loaders
- □ Vacuum Tanker
- □ Torches
- □ Jackhammer
- ■ Pumps
- □ Other: (Describe below)
- ■ Geoprobe Rig
- ■ Dump Trucks
- □ Fork Trucks
- □ Man Lift
- □ Chop Saws/Chain Saws
- □ Compressor/Compressed Air

Is any special training required? 40-Hour OSHA

Is any task being performed for which an SOP is in place? ■ Yes □ No □ N/A

If YES, list SOP training below:

Task	Applicable?	Training Required?	Training Completed?
Locating Utilities	Yes	Yes	Yes
Trenching & Excavating	Yes	Yes	Yes
Confined Space Entry	No		
Grounding & Bonding	No		
Line Breaking	No		

Task	Applicable?	Training Required?	Training Completed?
Lockout/Tagout/Tryout	No		
Labelling	No		
Pressure Washer Operation	No		
Container Management	No		
Heavy Equipment Decontamination	No		
Scrap Metal Decontamination	No		
PCB Wipe Sampling	No		
Manifesting Procedures	Yes	Yes	Yes

Task	Applicable?	Training Required?	Training Completed?
Vacuum Truck Operation	No		
Operation of Squeeze Filter Presses	No		
Project File Management	No		
Scaffolding	No		
Mundutank Setup	No		

V. LEVELS OF PERSONAL PROTECTION

A. Special protective equipment for each level of protection is as follows:

Level A

- Fully-encapsulating chemical resistant suit
- Pressure demand atmosphere supplying respirator
- Inner chemical resistant gloves
- Radio communications
- Chemical resistant safety boots/shoes
- Disposable gloves and boot covers
- Cooling Unit
- Coveralls
- Hard hat

Level B

- Chemical resistant, protective clothing
- Pressure demand atmosphere supplying respirator
- Inner and outer chemical resistant gloves
- Radio communications
- Chemical resistant safety boots/shoes
- Disposable and boot covers
- Long cotton underwear
- Coveralls
- Hard hat, face shield[1]

Level C

- Chemical resistant, protective clothing
- Full face piece air purifying respirator
- Inner and outer chemical resistant gloves
- Chemical resistant safety boots/shoes
- Disposable gloves and boot covers
- Escape mask
- Long cotton underwear
- Coveralls
- Hard hat, Face shield

Level D

- Inner and outer chemical resistant gloves
- Chemical resistant safety boots/shoes
- Safety glasses or goggles
- Hard hat
- Ear plugs
- Escape mask[1]
- Coveralls[1]
- Face shield[1]

[1] Optional.

Safety boots are required on all sites, without respect to the work being performed. Hardhats are required during well installation, construction, drilling and when other overhead hazards are present. Earplugs are required during drilling, jackhammering, and during other such loud activities. In addition, safety glasses and safety vests are advised (and may be required) during gauging and/or sampling activities.

B. Check equipment needed below.

Complete the following form for each work task. Note: this page may be duplicated for separate work tasks.

1. Task Description: Oversee Excavation

2. Level of Protecting Required: □ Level A □ Level B □ Level C ■ Level D

3. Respiratory Protection Required:

Air Purifying		Supplied Air	
□	Full/Half Mask (circle one if applicable)	□	SCBA
	Cartridge Type (e.g., magenta for asbestos)	□	Airline
□	Dust Mask	□	Escape Bottle
■	Respiratory Protection Not Required For This Task		

Breathing air certificate on file? □ Yes □ No ■ N/A
If No, breathing air tested? □ Yes □ No ■ N/A Explain: _____

4. Protective Clothing Required:

□	Tyvek	□	Hooded	□	Sewn Seam
□	Polytyvek	□	Hooded	□	Sealed Seam
□	Saranex/CPF	□	Hooded	□	Strapped Seam
□	Proshield (polypropylene)	□	Rain Gear (PVC)	□	Reflective Safety Vest
□	Chemical Resistant Goggles	□	Face Shield	■	Safety Glasses
□	Tyvek Booties	□	PVC Booties	□	Poly Booties
□	Latex (Nuke) Booties	□	Rubber Slush Booties	□	Leather Boots
■	Steel Toed Footwear	□	Silvershield Gloves	□	Viton Gloves
□	Butyl Rubber Gloves	□	PVC Gloves	□	Neoprene Gloves
■	Nitrile Gloves	□	Latex Gloves	□	Cotton Gloves
■	Leather Gloves (For Manual Handling of Equipment)			■	Ear Plugs/Ear Muffs
■	Other (e.g., Outer Gloves):	Hardhat; however, hardhat is only required if working in the immediate vicinity of excavator (i.e. within 5 or 10 feet).			

1. Task Description: Soil Boring/Monitoring Well Installation

2. Level of Protecting Required: □ Level A □ Level B □ Level C ■ Level D

3. Respiratory Protection Required:

Air Purifying		Supplied Air	
□	Full/Half Mask (circle one if applicable)	□	SCBA
	Cartridge Type (e.g., magenta for asbestos)	□	Airline
□	Dust Mask	□	Escape Bottle

■ Respiratory Protection Not Required For This Task

Breathing air certificate on file? □ Yes □ No ■ N/A
If No, breathing air tested? □ Yes □ No ■ N/A Explain: _____

4. Protective Clothing Required:

□ Tyvek	□ Hooded	□ Sewn Seam
□ Polytyvek	□ Hooded	□ Sealed Seam
□ Saranex/CPF	□ Hooded	□ Strapped Seam
□ Proshield (polypropylene)	□ Rain Gear (PVC)	□ Reflective Safety Vest
□ Chemical Resistant Goggles	□ Face Shield	■ Safety Glasses
□ Tyvek Booties	□ PVC Booties	□ Poly Booties
□ Latex (Nuke) Booties	□ Rubber Slush Booties	□ Leather Boots
■ Steel Toed Footwear	□ Silvershield Gloves	□ Viton Gloves
□ Butyl Rubber Gloves	□ PVC Gloves	□ Neoprene Gloves
■ Nitrile Gloves	□ Latex Gloves	□ Cotton Gloves
■ Leather Gloves (For Manual Handling of Equipment)		■ Ear Plugs/Ear Muffs

■ Other (e.g., Outer Gloves): Hardhat; however, hardhat is only required if working in the immediate vicinity of a drill rig (i.e. within 5 or 10 feet).

1. Task Description: Oversee Injections

2. Level of Protecting Required: □ Level A □ Level B □ Level C ■ Level D

3. Respiratory Protection Required:

Air Purifying	**Supplied Air**
□ Full/Half Mask (circle one if applicable)	□ SCBA
Cartridge Type (e.g., magenta for asbestos)	□ Airline
□ Dust Mask	□ Escape Bottle

■ Respiratory Protection Not Required For This Task

Breathing air certificate on file? □ Yes □ No ■ N/A
If No, breathing air tested? □ Yes □ No ■ N/A Explain: _____

4. Protective Clothing Required:

□ Tyvek	□ Hooded	□ Sewn Seam

□	Polytyvek	□	Hooded	□	Sealed Seam
□	Saranex/CPF	□	Hooded	□	Strapped Seam
□	Proshield (polypropylene)	□	Rain Gear (PVC)	□	Reflective Safety Vest
□	Chemical Resistant Goggles	□	Face Shield	■	Safety Glasses
□	Tyvek Booties	□	PVC Booties	□	Poly Booties
□	Latex (Nuke) Booties	□	Rubber Slush Booties	□	Leather Boots
■	Steel Toed Footwear	□	Silvershield Gloves	□	Viton Gloves
□	Butyl Rubber Gloves	□	PVC Gloves	□	Neoprene Gloves
■	Nitrile Gloves	□	Latex Gloves	□	Cotton Gloves
■	Leather Gloves (For Manual Handling of Equipment)			■	Ear Plugs/Ear Muffs

■ Other (e.g., Outer Gloves): Hardhat; however, hardhat is only required if working in the immediate vicinity of a drill rig (i.e. within 5 or 10 feet).

1. Task Description: Soil and groundwater sampling

2. Level of Protecting Required: □ Level A □ Level B □ Level C ■ Level D

3. Respiratory Protection Required:

	Air Purifying		**Supplied Air**
□	Full/Half Mask (circle one if applicable)	□	SCBA
	Cartridge Type (e.g., magenta for asbestos)	□	Airline
□	Dust Mask	□	Escape Bottle

■ Respiratory Protection Not Required For This Task

Breathing air certificate on file? □ Yes □ No ■ N/A
If No, breathing air tested? □ Yes □ No ■ N/A Explain: _____

4. Protective Clothing Required:

□	Tyvek	□	Hooded	□	Sewn Seam
□	Polytyvek	□	Hooded	□	Sealed Seam
□	Saranex/CPF	□	Hooded	□	Strapped Seam
□	Proshield (polypropylene)	□	Rain Gear (PVC)	□	Reflective Safety Vest
□	Chemical Resistant Goggles	□	Face Shield	■	Safety Glasses
□	Tyvek Booties	□	PVC Booties	□	Poly Booties
□	Latex (Nuke) Booties	□	Rubber Slush Booties	□	Leather Boots

■ Steel Toed Footwear	□ Silvershield Gloves	□ Viton Gloves
□ Butyl Rubber Gloves	□ PVC Gloves	□ Neoprene Gloves
■ Nitrile Gloves	□ Latex Gloves	□ Cotton Gloves
■ Leather Gloves (For Manual Handling of Equipment)		■ Ear Plugs/Ear Muffs

■ Other (e.g., Outer Gloves): Hardhat; however, hardhat is only required if working in the immediate vicinity of heavy equipment (i.e. within 5 or 10 feet).

VI. CONTAMINATION REDUCTION AND DECONTAMINATION

A. Work Zones

The subject Site will be delineated with traffic cones and/or work vehicle. The work area will be defined as the immediate area in the vicinity of the excavation, monitoring well installation, injections, and/or groundwater sampling.

B. Decontamination Procedures

Personnel and equipment leaving an identified Exclusion Zone (see section VI. A. above), shall be thoroughly decontaminated.

The standard Level "C" decontamination protocol shall be used with the following decontamination approach:

a. Wash equipment, gloves, and/or boot covers using decon wash and water rinse
b. Remove securing tape from wrists and ankles
c. Remove disposable Tyvek/or coverall (without boots)
d. Remove boot covers and/or outer gloves
e. Remove respirator face mask
f. Remove inner gloves

For Level "D" dress-down, follow steps a, d, and f (as applicable to the equipment used/worn).

Describe personnel/equipment decontamination procedures if the procedures described above are not used or do not apply. Disposable sampling equipment and/or gloves will be removed and disposed of in a plastic trash bag.

Describe equipment decontamination procedure. Non-disposable equipment will be cleaned with an alconox wash, followed by a water rinse and/or followed by a DI water rinse (if applicable).

Describe how contaminated equipment is disposed. Disposable sampling equipment and/or gloves will be removed and disposed of in a plastic trash bag.

Describe storage of usable protective equipment. Stored in gear bags.

Describe laundering procedure for uniforms. Not Applicable.

Is a locker room facility provided? □ Yes ■ No

Will a decon trailer be on-site? □ Yes ■ No If NO, how will crew change clothing and shower? At home after shift.

Describe provisions for drinking water. Available locally or brought on-site in a cooler.

Describe provisions for restrooms. Portable restrooms will be onsite during excavation and injection activities. If not available on-site during soil boring/well installations or groundwater sampling, will use local vendors.

Note: Respirator cleaning and inspection procedures may be found in the Respiratory Protection Program.

VII. SAFETY EQUIPMENT

Check the safety equipment items that will be available for, or on, the project.

□ Safety Showers	□ Emergency Oxygen Mask	□ Portable Eyewash
■ First Aid Kit	■ Barriers/Cones (fencing during excavation)	□ Fume Hood
□ Warning Signs	□ Air Horns	□ Barrier Tape
□ Lifeline/Harness	□ Decon Trailer	□ Decon Equipment
□ Extraction Devise	□ Portable Lighting	□ Ladders
□ Portable Ventilation Units	□ Air Horns	□ Ground/Bonding Cables

□ Spill Control Supplies (list):

■ Fire Extinguishers (types & sizes): 5 – 10 lb. ABC (In Vehicle)

□ Other (list):

VIII. COMMUNICATION SYSTEMS

Describe on-site communication systems. Telephone and verbal communications and hand signals.

IX. AMBIENT AIR MONITORING

The following equipment will be used on-site for air monitoring.

□ Radiation Meter	□ Combustible Gas	□ Oxygen Meter
□ Colorimetric Tubes	□ Photo-Ionization Detector	□ Flame-Ionization Detector
□ OVA/FID	□ H_2S Monitor	□ CO Monitor

□ Dust Monitor (type):

□ Personal Monitors (describe):

■ Ambient Air Monitoring Not Required For Any of these Tasks

Frequency of air monitoring. □ Continuously □ Hourly □ Twice daily ■ N/A

Describe methodology and frequency of air monitoring. Not applicable

Calibration. Daily as per manufacturer

List of air permits required. Not applicable

Guidelines for Air Monitoring Hazards			
Monitoring Instrument	**Potential Hazards**	**Measurement Level**	**Action**
GCI[1] - % LEL[2] of Combustible Gases	Explosive atmosphere in immediate work area	< 10% LEL	Investigate with caution
		> 10% LEL	Explosion hazard, leave area immediately
GCI[1] - % Oxygen	Oxygen Concentration	< 19.5% [3]	Monitor while wearing SCBA [3]
		19.5% - 23.0%	Continue investigation with caution
		> 23.0%	Discontinue investigation monitoring, fire hazard potential, consult H&S Coordinator
Photo-ionization (Hnu)/ Flame-ionization (OVA) meter readings of breathing zone	Volatile Contaminants	Background to 100 ppm	Level D protection [4, 5]
		100 to 300 ppm over background	Level C protection [4, 5]
		300 to 500 ppm over background	Level B protection [4, 5]
		> 500 ppm over background	Evaluate exposure source, consult H&S Coordinator [4, 5]

[1] GCI denotes Combustible Gas Indicator.
[2] LEL denotes Lower Explosive Limit.
[3] Note: combustible gas readings are not valid in atmospheres with < 19.5% oxygen.
[4] Meter readings are not the sole criteria for selecting the level of protection. These are only generalized guidelines and are project specific.
[5] Action taken are based upon sustained and/or frequent readings.

Appendix D contains site specific monitoring results (if applicable).

X. HAZARDOUS WASTE OPERATION CONTINGENCY PLAN

Generator's/Site Name: City of Indianapolis / Former Advance Plating

Location, description, and route to the site: 1005 Sumner Avenue, Indianapolis, Indiana

Head east on Rockville Road, then take I-465 S ramp to exit 2A (East Street), go north on East Street then turn right onto Sumner Ave, destination will be on the right.

Site Contact/Phone: Brad Gentry (317) 435-8877

Client Project Manager: Brad Gentry

A. Emergency Information

Police: 911 Alternate Number: Not applicable
Fire: 911 Alternate Number: Not applicable
Ambulance: 911 Alternate Number: Not applicable

Hospital Name: **IU Health Methodist Hospital**
Hospital Address: **1701 Senate Boulevard, Indianapolis, IN 46202**
Hospital Phone: **(317) 962-2000**

Route to Hospital: From the Advance Plating site:

- Head east on Sumner Avenue to Shelby Street. Turn left (north) onto Shelby St for ~1.5 miles. Turn right (east) on Raymon Street, then merge onto I-65 North. Continue north on I-65 until exit 113 (Meridian/ Pennsylvania Street). Travel west off the exit along E. 12th street (~0.2 miles), then turn right onto N. Illinois St. Take Illinois St north for ~0.3 miles until 16th Street, then turn left on W. 16th St. The hospital will then be on the right in ~0.2 miles.

Appendix G depicts a map to the local hospital and/or local medical providers.

Office Resources: Key Personnel Phone Numbers		
Name	**Position**	**Phone**
IWM Fort Wayne Office		260-497-9620
IWM Indianapolis Office		317-347-1111
Bradley Gentry	IWM Project Manager	Ext.: 123 Direct: 317-968-9256 Cell: 317-435-8877
Chris Parks	H&S Coordinator	Ext.: 136 Direct: 317-565-1618 Cell: 317-441-7839
Greg Scarpone	Operations Manager	Ext.: 124 Direct: 317-968-9257 Cell: 317-385-2670
IDEM Emergency Response	24 Hour Action Hotline	317-233-7745
Poison Information Center		(800) 962-1253

Has a copy of the contingency plan been received by the hospital? □ Yes ■ No ■ NA

If NO, explain. Not required for the proposed work activities.

Is receipt of the contingency plan by local authorities documented? □ Yes ■ No ■ NA

If NO, explain. Not required for the proposed work activities.

Has the hospital been notified of job site activities and chemical hazards? □ Yes ■ No ■ NA

If NO, explain. Not required for the proposed work activities.

B. Evacuation Route/Emergency Procedures

See attached map in **Appendix A.**

Describe evacuation alarm procedure. Verbal warning to all immediate personnel. Follow with phone call(s) to key personnel if necessary.

Evacuation route description. Away from area of danger. Evacuation route map in **Appendix A**.

Assembly Area description. Assemble on the commercial property (Seal Master) to the north, across Sumner Avenue.

C. Safety Plan Amendments

Amendments to this HASP and Contingency Plan are maintained in **Appendix E.**

D. HASP and Contingency Plan Sign-Off

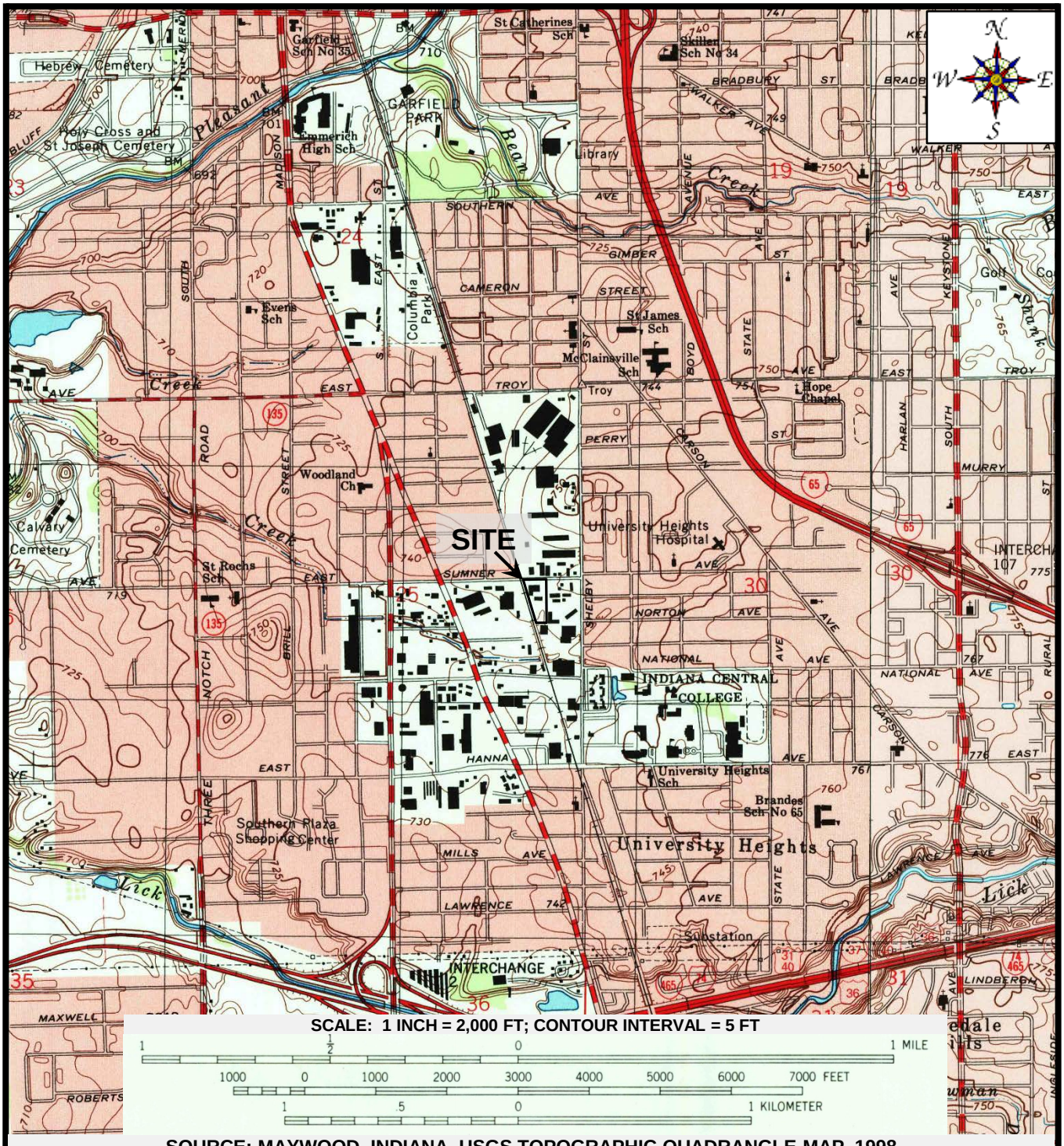
All site personnel (employees and their subcontractors) will review this HASP and Contingency Plan. This plan provides site personnel with an orientation to the job task including:

- ■ Site Overview
- ■ Emergency Response Procedures
- ■ Potential Physical & Health Hazards of on-site hazardous materials
- ■ PPE Requirements
- ■ Site Security
- □ Hazards of Confined Spaces
- □ Site-specific environmental regulatory requirements

Appendix F contains a plan sign-off sheet.

APPENDIX A

SITE MAP(S)



SOURCE: MAYWOOD, INDIANA, USGS TOPOGRAPHIC QUADRANGLE MAP, 1998

iWM CONSULTING GROUP

□□□□ Rock□i□e Road□Indiana□o is□Indiana □□□□□
□□□□□□□□-□□□□ Fa□ □□□□□□□□-□□□□

FIGURE □

Site Location Map
Former Advance Plating Facility
1005 E. Sumner Avenue
Indianapolis, Indiana

C□IENT

THE CITY OF INDIANAPOLIS
INDIANAPOLIS, INDIANA

□ro□ect	Task	Si□e	□ate
IN23109	01	A	12□□□□□6

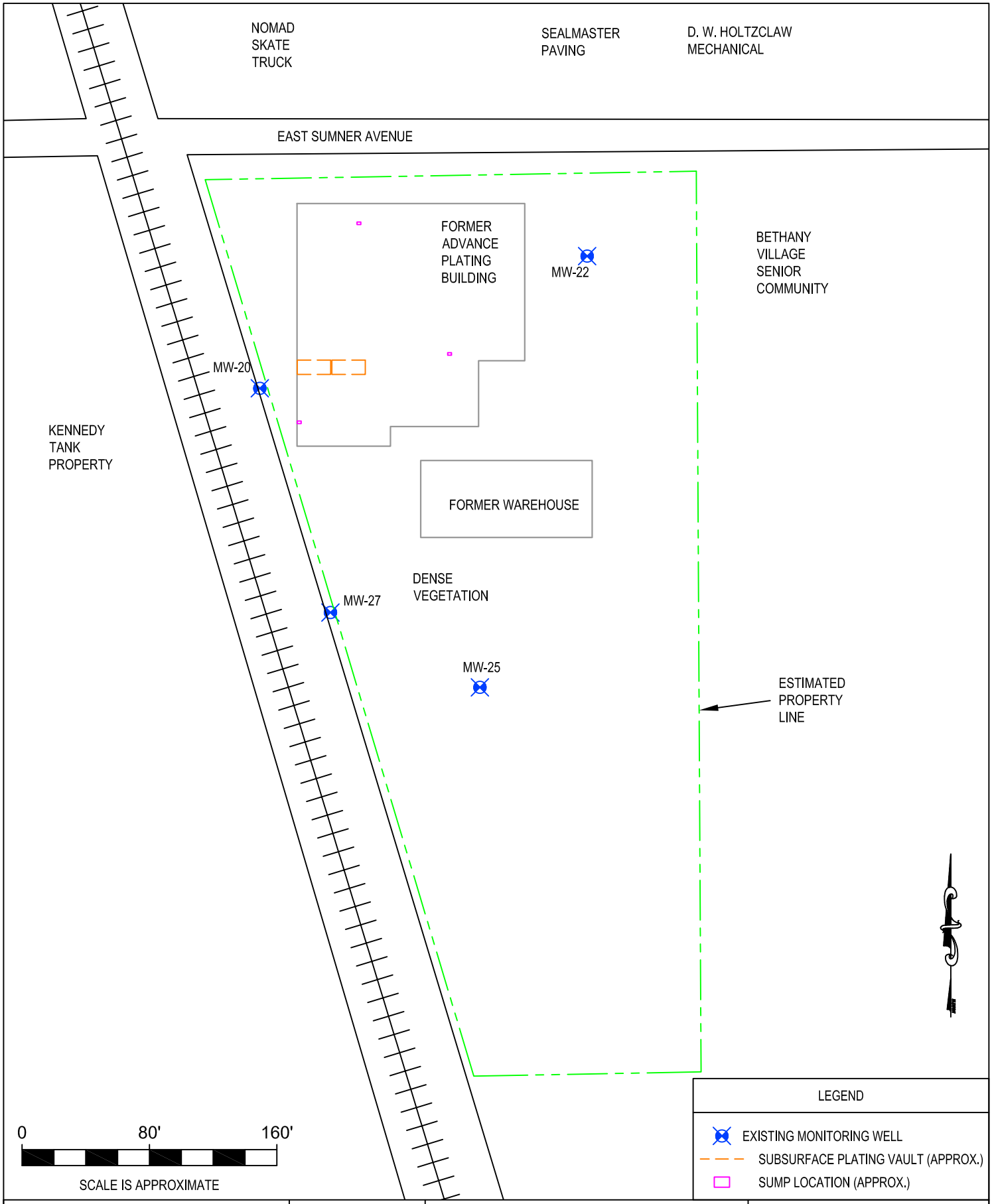
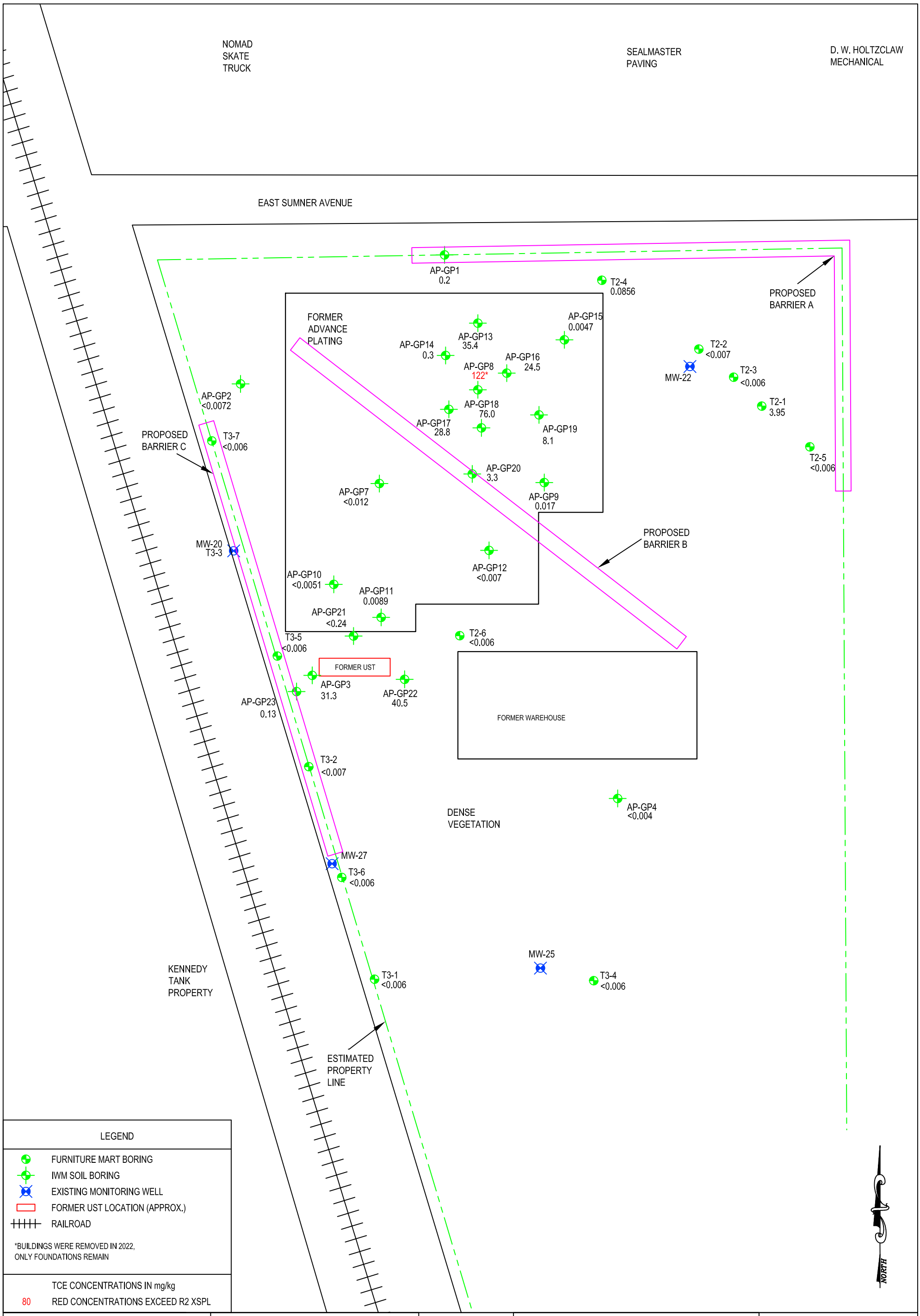


FIGURE 2
SITE MAP

DRAWN BY: WEA
DATE: 3/21/17
REVISED: 4/18/24
IN23109
#Figure 1 - Site Map.dwg

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP



LEGEND

- FURNITURE MART BORING
- IWM SOIL BORING
- EXISTING MONITORING WELL
- FORMER UST LOCATION (APPROX.)
- RAILROAD

*BUILDINGS WERE REMOVED IN 2022, ONLY FOUNDATIONS REMAIN

TCE CONCENTRATIONS IN mg/kg

80 RED CONCENTRATIONS EXCEED R2 XSPL

0' 40' 80'

FIGURE 6

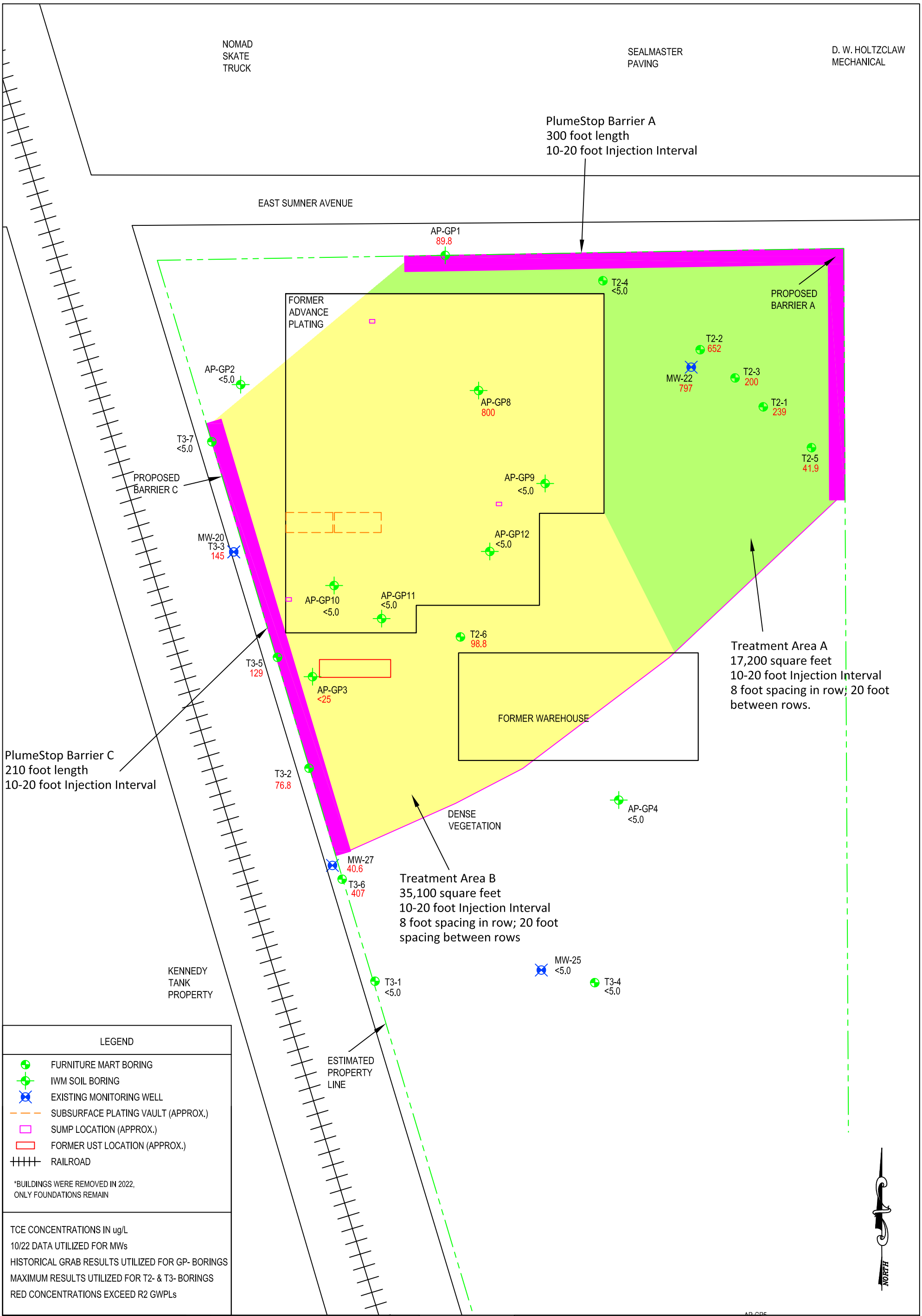
PROPOSED PRBs

(GROUNDWATER ALTERNATIVE 3)

DRAWN BY: WEA	
DATE: 8/31/20	
REVISED: 2/9/24	
IN23109	
#TCE Slice Maps.dwg	

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP



0' 40' 80'

FIGURE 7

PROPOSED PRB AND PLUME-WIDE INJECTION AREAS

DRAWN BY: WEA	
DATE: 8/31/20	
REVISED: 4/23/24	
IN23109	
#TCE Slice Maps.dwg	

FORMER ADVANCE PLATING FACILITY
1005 EAST SUMNER AVENUE
INDIANAPOLIS, INDIANA

IWM CONSULTING GROUP

FIGURE 1 Evacuation Route AERIAL SITE MAP 2022	DRAWN BY: WEA DATE: 3/21/17 REVISED: 02/5/2024 IN19032.08 #Figure 4.dwg	FORMER ADVANCE PLATING FACILITY 1005 EAST SUMNER AVENUE INDIANAPOLIS, INDIANA	IWM CONSULTING GROUP

APPENDIX B

HAZARD ASSESSMENT/ATTACHMENTS

HAZARD ASSESSMENT/ATTACHMENTS

Former Advance Plating 1005 E. Sumner Avenue Indianapolis, Marion County, Indiana		
Major Tasks/Activities	**Hazards**	**Precautionary Measures/ Controls**
Drilling/ Well Installation	See Attached JSA	See Attached JSA
Soil Sampling	See Attached JSA	See Attached JSA
Groundwater Gauging and Sampling	See Attached JSA	See Attached JSA
Excavation	See Attached JSA	See Attached JSA
In-situ Injection	See Attached JSA	See Attached JSA

Job Safety Analysis
Drilling / Well Installation

Principal Steps	Potential Hazards	Recommended Controls
Review H&S plan and put on PPE	Neighborhood and weather conditions, traffic	Prepare away from traffic. If weather is unsuitable for work then reschedule. Be aware of your surroundings.
Establish traffic controls	Auto traffic	Block Entrances
Make sure that utilities are marked and disconnected	Explosion, electrocution	If utilities are not marked, call in for immediate marking.
Perform Push Probe Soil Sampling	See Soil Sampling/Push Probe Sampling JSA	See Soil Sampling/Push Probe Sampling JSA: Follow Subsurface Disturbance Protocol
Perform Well Installation	Lifting Injuries, Hand Abrasions; Injuries From Equipment – Turning Augers; Loose clothing, lack of gloves, eye protection; equipment position; Falling trees, brush, slip trip fall, poison ivy.	Determine the perimeter with ground crew. Maintain eye protection, hand protection hard hat and steel toe boot requirements. All personnel must maintain proper clearance during drilling activities. Maintain proper clearance from swing radius. Operator and ground crew must be diligent of each other. Work slowly. Operator must face in the direction that the drill rig is moving. Ground personnel must stay out of the forward and reverse paths of the drill rig while moving. No one can approach the drill rig without acknowledgement from the operator. No one is to approach the drill rig while out of view of the operator.
Housekeeping	Auto traffic and drill rig, and pinch hazard for hands, debris, abrasions from debris, slip, trip and fall, back strain	Handle one container at a time. Wear safety glasses, steel toed boots, and gloves. Maintain traffic control and awareness. Work deliberately. Do not overexert yourself when lifting.
Installation of well tops and manholes.	Auto traffic and pinch hazard for hands and feet.	Maintain traffic control and awareness. Methodically seal off and lock well head. Place, lock and bolt down manhole covers.
Prepare field reports	Auto traffic and neighborhood conditions.	Complete paperwork in vehicle and away from traffic area. Maintain neighborhood awareness.
Staging Drums	Equipment injury, Back Injury, Foot injury, Hand Injury	

Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Drill Rig/Push Probe Sampler	Check hydraulics for leaks. Check condition of tracks. Check controls for proper operation. Emergency Shut offs	
Lifting cables or straps	Make sure it has sufficient load rating to carry the object; Inspect for frays prior to use	

Job Safety Analysis

Soil Sampling

Principal Steps	Potential Hazards	Recommended Controls
Work Zone Set-Up	Traffic	Traffic control (barricades and/ or cones) Face flow of traffic and use appropriate cones, flags, and/or tape per client and/or Handex protocols. Block off designated sampling area.
	Overhead utilities	Look up before setting up equipment, spotter
	Sharp debris in sample	Wear thick gloves
Excavation	Overhead, underground utilities	Look up/hand clear holes
	Noise	Ear plugs or ear muffs
	Debris	Hard hat, safety glasses, steel toes
Sample collection	Chemical contact with skin	Nitrile gloves
Clean Up	Traffic, slip trip fall,	See above. Be aware of surroundings and use good housekeeping methods.
	Weather	Pay attention to predicted and current weather conditions
	Hot weather	Drink plenty of fluids (preferably water and/or sports drinks) wear light colored clothing, take rest breaks when necessary
	Cold weather	Wear plenty of clothing, take breaks when necessary
	Severe weather Thunderstorms	Take shelter, lower any raised equipment,
	Tornado	Move inside building or vehicle, take appropriate shelter in building or ditch
Equipment to be Used	**Inspection Requirements**	**Training Requirements**

Job Safety Analysis
Groundwater Gauging & Sampling

Principal Steps	Potential Hazards	Recommended Controls
Groundwater Gauging	Auto Traffic	Follow Traffic Control SOP; wear Hi-Visibility safety vests; utilize buddy system; remain aware of surroundings.
	Dissolved hydrocarbons on the electronic water level indicator	Wear appropriate PPE. Utilize decon solutions to clean water level indicator of all hydrocarbons.
	Pinch (hand); debris (cuts/puncture); Biological	Use tools to open the well vault and clear wellhead area of debris liquids or biological hazards. Wear leather gloves while opening vault and clearing debris.
Groundwater Bailing	Exposure; Back Strain; Hand injury	Use even footing on firm ground. Avoid twisting body. Stand close to and over the well. Handle rope slowly, coil rope away from feet.
	Spill/Splash	Wear nitrile gloves and eye protection.
	Repetitive Stress	Ergonomics - adjust hand position to avoid repetitive motion. Take breaks.
	Bailer Lodged in Well	Do not use excessive force. Free bailer by dropping further into well and then pulling upwards.
	Slip, trip & fall; back strain	When transporting and disposing purge water, use proper lifting techniques and avoid twisting the body.
Groundwater Sampling	Breakage and acid	Work slowly and handle only one container at a time. Wear safety glasses and gloves. Inspect sample containers for cracks prior to handling and removing/installing the lid. Do not over tighten the sample container.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Electronic Water Level Indicator	Inspect water level indicator to verify that there are no frayed wires or loose connections.	Not applicable

Job Safety Analysis

Trenching and Excavating

Principal Steps	Potential Hazards	Recommended Controls
Preparing to Trench and/or Excavate	Underground Utilities	Mark-out must be called for and performed prior to breaking ground
	Overhead Utilities	Work area must be assessed before moving heavy machinery, if overhead utilities present a hazard, operator will plan the work to avoid the lines
	Machine malfunction	Heavy machinery will be inspected before and after each use to prevent malfunction
Excavating and/or Trenching	Personal injury	Employees are to wear proper PPE at all times, including ANSI approved steel toe boots, hard hat, gloves, safety vest, and safety glasses. Operator must wear seat belt when operating heavy equipment. Operator must be trained and certified No employee may enter a trench greater than foot in depth without notifying the HSO, obtaining a confined space permit, and obeying the confined space permit
	Working with and near heavy machinery	Spotter required to stay in the operator's field of vision at all times when digging or moving soil (spotter wearing reflective safety vest) Universal hand signals are to be agreed upon by operator and spotter prior to work commencing Work area needs to be barricaded or employee needs to be stationed to keep all other employees, pedestrians, and vehicles out of the work area

	Trench collapse	Keep all equipment and spoil piles at least 4 feet from the excavation Use planks for walking/working surfaces around the excavation to distribute the weight of equipment and employees No employee may enter a trench greater than foot in depth without notifying the HSO, obtaining a confined space permit, and obeying the confined space permit Before any work is performed in a trench (after proper CSE permit is obtained, see above), the soil must be analyzed by a competent person and the trench must be sloped or shored to OSHA specifications The Competent Person will make the determination if additional protective measures such as shoring or trench box will be required prior to start of work. Employees not working directly next to the trench should keep their work area away from the open hole
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Excavator	Prior to start of each day	Certification
Shoring/Trench box	Regularly throughout the day and after every change in weather	Engineer approval
Hand tools	Inspect all parts of tool prior to each use	

Job Safety Analysis
In-Situ Injection via GeoProbe

Principal Steps	Potential Hazards	Recommended Controls
Review H&S plan and put on PPE	Neighborhood and weather conditions, traffic	Prepare away from traffic. If weather is unsuitable for work then reschedule. Be aware of your surroundings.
Establish traffic controls	Auto traffic	Block Entrances
Make sure that utilities are marked and disconnected	Explosion, electrocution	If utilities are not marked, call in for immediate marking.
Perform Push Probe Soil Sampling	See Soil Sampling/Push Probe Sampling JSA	See Soil Sampling/Push Probe Sampling JSA: Follow Subsurface Disturbance Protocol
Material Mixing and Material Injection	Eye and Respiratory Injury During Injection; Injuries From Equipment – moving parts.	Material can be delivered as a fine powder or liquid. Operator should work upwind of the product or have adequate ventilation as well as use appropriate safety equipment - Maintain eye protection, hand protection, hard hat and steel toe boot requirements. All personnel must maintain proper clearance during injection activities. Operator and ground crew must be diligent of each other. Operator must be observant and monitor injection rate and control equipment. Ground personnel must maintain reasonable distance from injection point.
Housekeeping	Auto traffic and drill rig, and pinch hazard for hands, debris, abrasions from debris, slip, trip and fall, back strain	Handle one container at a time. Wear safety glasses, steel toed boots, and gloves. Maintain traffic control and awareness. Work deliberately. Do not overexert yourself when lifting.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Drill Rig/Push Probe Sampler	Check hydraulics for leaks. Check condition of tracks. Check controls for proper operation. Emergency Shut offs	
Injection Material	Ensure proper product to be injected has been received.	Experienced with injection material and injection procedures.

APPENDIX C

MATERIAL SAFETY DATA SHEETS

And/Or

PUBLIC HEALTH STATEMENTS FOR COMPOUNDS OF INTEREST

Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **SODIUM CYANIDE**

Other name(s): Sodium cyanide solid

Recommended Use of the Chemical and Restrictions on Use Extraction of gold and silver from ores; electroplating; heat treatment of metals; chemical intermediate.

Supplier: Orica Australia Pty Ltd
ABN: 99 004 117 828
Street Address: 1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency Telephone: **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:
Corrosive to Metals - Category 1
Acute Dermal Toxicity - Category 1
Acute Inhalation Toxicity - Category 2
Acute Oral Toxicity - Category 2
Skin Irritation - Category 2
Eye Damage - Category 1
Specific target organ toxicity (repeated exposure) - Category 1
Acute Aquatic Toxicity - Category 1
Chronic Aquatic Toxicity - Category 1

SIGNAL WORD: DANGER

Hazard Statement(s):
H290 May be corrosive to metals.
H300+H310+H330 Fatal if swallowed, in contact with skin or if inhaled.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H372 Causes damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statement(s):

Prevention:
P234 Keep only in original container.
P260 Do not breathe mist, vapours, spray.
P262 Do not get in eyes, on skin, or on clothing.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P280 Wear protective gloves, protective clothing, eye and face protection.
P284 Wear respiratory protection.

Response:
P310 Immediately call a POISON CENTER or doctor/physician.
P320 Specific treatment is urgent (see First Aid Measures on this Safety Data Sheet).
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P330 Rinse mouth.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P361 Take off immediately all contaminated clothing.
P363 Wash contaminated clothing before re-use.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P314 Get medical advice/attention if you feel unwell.
P390 Absorb spillage to prevent material damage.
P391 Collect spillage.

Storage:
P403+P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P406 Store in corrosive resistant container with a resistant inner liner.

Disposal:
P501 Dispose of contents and container in accordance with local, regional, national, international regulations.

Other Hazards:
AUH029 Contact with water liberates toxic gas.
AUH032 Contact with acids liberates very toxic gas.

Poisons Schedule (SUSMP): S7 Dangerous Poison.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: May contain colouring agent/dye.

Components	CAS Number	Proportion	Hazard Codes
Sodium cyanide	143-33-9	97-99%	H290 H300 H310 H330 H315 H318 H372 H410
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor at once. Urgent hospital treatment is likely to be needed.

May be fatal if inhaled, swallowed or absorbed through skin.

At all places where there is a risk of cyanide poisoning, items to facilitate the prompt and effective treatment of cyanide poisoning (as determined by the treatment protocol to be employed) (CYANIDE EMERGENCY KIT) should be kept in an accessible and convenient location.

Recommended items include:

An oxygen resuscitator, and a source of oxygen, and a clearly marked CYANIDE ANTIDOTE box containing:

- An approved airway, elasticised tourniquet, 5 mL sterile disposable syringe and needles for blood samples, fluoride heparinised blood sample tubes, skin prep swabs, dressing and adhesive tape
- Either:
  2 Cyanokits containing hydroxocobalamin 5g x 2 amps, saline for use with hydroxocobalamin, and the prescribing information outlining side effects and precautions
OR
  2 Ampoules of Kelocyanor (Dicobalt edetate), including the prescribing information outlining side effects and precautions
- Intravenous injection equipment
- A copy of the appropriate Safety Data Sheet and
- A written copy of the relevant treatment protocol

Protect the rescuer

Prior to any attempt at rescue, an assessment of the dangers must be undertaken and measures including the use of appropriate personal protective equipment must be applied to protect the rescuer. Personal protective equipment may include:

- Protective gloves to avoid contact with contaminated skin, clothing and equipment
- Chemical goggles to protect the eyes
- Suitable respiratory protective equipment (minimum full face cannister mask) to prevent inhalation of sodium cyanide dust or hydrogen cyanide gas.

Inhalation:
Shout and send for help.
Remove the person from the source of exposure and ideally to a source of fresh air.
Look for verbal and physical responses from the person suffering from poisoning. Check that they are breathing.

If Patient is Breathing: Oxygen, preferably 100% oxygen if available, should be administered by a qualified person. If the person has collapsed or is unconscious, lie on their side, ensuring airway is clear and open.

If Patient is not Breathing: Ensure airway is clear and open and commence resuscitation using a resuscitation bag or mask connected to an oxygen source (or 100% oxygen via a non rebreathing facemask). Do not use mouth-to-mouth resuscitation. Oxygen, preferably 100% oxygen if available, should be administered by a qualified person. Check for pulse. If pulse is absent start external cardiac massage.

Transport promptly to hospital or medical centre. Transport with CYANIDE EMERGENCY KIT if available.

Skin Contact:
If skin or hair contact occurs, immediately remove any contaminated clothing and place in a sealed bag for decontamination or disposal. Wash skin and hair thoroughly with running water. Contact with water can result in the formation of toxic hydrogen cyanide, take care when handling contaminated clothing. Transport promptly to hospital or medical centre.
Treat as for 'Inhaled'.

Eye Contact:
Immediately wash in and around the eye area with large amounts of water for at least 15 minutes. Eyelids to be held apart. Remove clothing if contaminated and wash skin. Urgently seek medical assistance. Transport promptly to hospital or medical centre. Contact with water can result in the formation of toxic hydrogen cyanide, take appropriate precautions when handling contaminated clothing.
Treat as for 'Inhaled'.

Ingestion:
Do not give anything by mouth.
Treat as for 'Inhaled'.

Indication of immediate medical attention and special treatment needed:
Be certain that victims have been decontaminated properly. Victims who have undergone decontamination pose no serious risks of secondary contamination to rescuers or medical staff treating the victim. In such cases, Support Zone personnel require no specialized protective gear.

Upon presentation, immediately assess the need or otherwise for assisted ventilation, administer 100% oxygen, insert intravenous lines and institute cardiac and blood pressure monitoring if available.

Assess and monitor level of consciousness.

Obtain arterial/venous blood gas as metabolic acidosis, often severe, combined with a small difference between the arterial and venous oxygen saturation levels (<10 mmHg) suggests cyanide poisoning: Correct any severe metabolic acidosis (pH below 7.20) and concurrent electrolyte imbalances (for example, hyperkalaemia, hypercalcaemia).

Take a blood sample in a fluoride heparinised tube for analysis of blood cyanide levels to confirm poisoning, but do not delay treatment while awaiting results. Treatment decisions must be made on clinical grounds.

Symptoms of fear and anxiety about possible cyanide poisoning may mimic those of mild, or the early stages, of cyanide poisoning. It is therefore important to establish cyanide poisoning has actually occurred before administering an antidote as some cyanide antidotes have severe side effects if administered in the absence of cyanide poisoning or if the dose is too great.

If a history of exposure to cyanide has been confirmed and the patient presents with, or develops, severe symptoms of cyanide poisoning (particularly if the patient has lost consciousness, is lapsing into unconsciousness or enters cardiac arrest) then antidote administration may be required.

Antidotes

There are two main antidotes for severe cyanide poisoning

- Hydroxocobalamin (preferred) OR
- Dicobalt edetate (Kelocyanor)

Hydroxocobalamin

Reconstitute the hydroxocobalamin by diluting one flask (5g) of the freeze-dried with 200mL of 0.9% saline and shake rigorously. Administer 5 grams of reconstituted solution via a fast intravenous drip over 15 minutes (approximately 15mL/ min). A further (5g) dose may be given if necessary at a slower rate of infusion - 30 min - 2 hours (or alternatively I.V. sodium thiosulphate 12.5g (50mL) may be given by slow intravenous injection) through a separate IV line . Hydroxocobalamin should not be administered if person has known hypersensitivity to Vitamin B12.

Dicobalt edetate (Kelocyanor)

Note: Overzealous administration of the antidote is contraindicated and may result in serious adverse reactions of an anaphylactic (allergic) nature. The antidote should not be given unless the patient is unconscious, or has alternating conscious state. Adverse reactions reported include gross oedema of the face and neck, urticaria, palpitations, hypotension, convulsions, vomiting, chest pains, difficulty in breathing, and collapse.

Administer one ampoule containing 300mg Dicobalt edetate in 20mL glucose solution (Kelocyanor) intravenously by slow injection. The initial effect is a fall in blood pressure, rise in pulse rate, and sometimes retching. Immediately after this phase, lasting about one minute, the patient should recover. The injection should be discontinued if allergic adverse effects are noted. A second dose may be given if the response is inadequate and allergic adverse effects have not been observed (or alternatively I.V. sodium thiosulphate 12.5g (50mL) may be given by slow intravenous injection through a separate IV line.

If cyanide has been swallowed, gastric lavage, charcoal and cathartics may be used after antidote treatment if less than two hours have elapsed since ingestion if recommended by an appropriately qualified specialist physician in a specific case although the effectiveness of this measure is not strongly supported by evidence.

Cases of proven and symptomatic cyanide poisoning should be monitored for at least 24 hours and longer if antidote administration had been required for severe poisoning. Eye splashes should be assessed by an ophthalmologist within 24 hours (as cyanide is a severe eye irritant). Persons without symptoms but with significant areas of skin contact should be observed for at least 6 hours to ensure there are no delayed effects.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:
Not combustible, however, if material is involved in a fire use: Water fog (or if unavailable fine water spray).
For small fires: Smother fire with dry sand, dry clay or dry limestone, or use dry chemical powder extinguisher.

Unsuitable Extinguishing Media:
Water jet. Carbon dioxide. Foam. Sodium cyanide will react with carbon dioxide and many foams which contain acidic agents, releasing highly toxic and flammable hydrogen cyanide.

Hazchem or Emergency Action Code: 2X

Specific hazards arising from the chemical:
Toxic substance. Non-combustible material, however, intense heat may cause decomposition releasing highly toxic and flammable hydrogen cyanide gas. Contact with water or acids may generate hydrogen cyanide gas. Evacuate area immediately.

Special protective equipment and precautions for fire-fighters:
Decomposes on heating emitting toxic fumes, including those of hydrogen cyanide , and ammonia . If safe to do so, remove containers from path of fire. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition. Full body protective equipment should be worn.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:
Immediate action is required. Clear area of all unprotected personnel. Isolate spill or leak area immediately. Shut off all possible sources of ignition. Work up wind or increase ventilation. If contamination of sewers or waterways has occurred advise local emergency services. For large spills notify the Emergency Services.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Limited (Telephone: 0800 734 607 -- 24 hour service) or Orica International: (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:
Avoid breathing in dust. Work up wind or increase ventilation. Wear protective equipment to prevent skin and eye contact and breathing in vapours/dust. DO NOT allow material to get wet. Contain - prevent run off into drains and waterways. Spillage area and contaminated solids can be detoxified by treatment with an excess of dilute sodium hypochlorite, calcium hypochlorite, or ferrous sulfate after the addition of soda ash or lime to raise the pH to greater than 10.5. Allow 1 hour for complete decomposition before washing spillage area down with large quantities of water to ensure maximum dilution. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

This material is a Scheduled Poison S7 and must be stored, maintained and used in accordance with the relevant regulations.

Precautions for safe handling:
Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. Keep out of reach of children.

Conditions for safe storage, including any incompatibilities:
Store in the closed, original container in a dry, cool, well-ventilated area out of direct sunlight. Store in a locked room or place away from children, animals, food, feedstuffs, seed and fertilisers. Keep dry - reacts with water. Protect from moisture. Store away from acids. Can release toxic and flammable hydrogen cyanide gas on contact with moisture or acids. Store away from foodstuffs. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters: No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s) and decomposition product(s):

Cyanides (as CN): 8hr TWA = 5 mg/m^3, Sk
Decomposition product(s):
Hydrogen cyanide: Peak Limitation = 11 mg/m^3 (10 ppm), Sk
Ammonia: 8hr TWA = 17 mg/m^3 (25 ppm), 15 min STEL = 24 mg/m^3 (35 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

`Sk' (skin) Notice - absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

Peak Limitation - a maximum or peak airborne concentration of a particular substance determined over the shortest analytically practicable period of time which does not exceed 15 minutes.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:
Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Avoid generating and breathing in dusts. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Orica Personal Protection Guide information (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):
The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, CHEMICAL GOGGLES, RUBBER BOOTS, AIR MASK , GLOVES (Long), APRON.
* Not required if wearing air supplied mask.

Wear overalls, chemical goggles, full face shield, elbow-length impervious gloves, splash apron or equivalent chemical impervious outer garment, and rubber boots. Use with adequate ventilation. If determined by a risk assessment an inhalation risk exists, wear an air-supplied mask meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Immediately decontaminate clothing and protective equipment or seal in plastic bags for later decontamination or possible disposal.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Solid
Colour:	White
Odour:	Faint 'Bitter almonds' (not detectable by 100% of population)
Molecular Formula:	NaCN
Solubility:	Soluble in water. Slightly soluble in alcohol.
Specific Gravity:	1.6-1.62 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Solubility in water (g/L):	480-520 g/L @ 20°C
Melting Point/Range (°C):	ca. 560
Decomposition Point (°C):	Not available
pH:	Not available
Viscosity:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Contact with acids liberates very toxic gas. Contact with water liberates toxic gas. The toxic gas produced is hydrogen cyanide, which is also flammable, and may explode.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Absorbs moisture from the air.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur. Risk of explosion if water comes into contact with molten cyanides. Corrosive to aluminium.
Conditions to avoid:	Avoid exposure to moisture. Avoid exposure to heat. Avoid contact with acids. Avoid contact with incompatible materials.
Incompatible materials:	Incompatible with acids , acid salts , water , moisture , carbon dioxide , oxidising agents , metals , halogens .

Hazardous decomposition products: Hydrogen cyanide. Ammonia.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion: Highly toxic. Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain, convulsions and loss of consciousness. May cause cyanosis (blueness of the skin) due to lack of oxygen in the blood. May cause a weak or irregular heart beat, drop in blood pressure or cardiac arrest. Collapse and possible death may occur.

Eye contact: Causes serious eye damage. A severe eye irritant. Contamination of eyes can result in permanent injury.

Skin contact: Contact with skin will result in irritation. Toxic in contact with skin. Can be absorbed through the skin. Effects can include those described for 'INGESTION'.

Inhalation: Breathing in high concentrations may result in the same symptoms described for 'INGESTION'. High inhaled concentrations may lead to a feeling of suffocation and cause difficulty in breathing, headaches, dizziness and loss of consciousness. Can cause suffocation. Material is toxic - inhalation may be fatal.

Acute toxicity:
Oral LD50 (rat): 6440 ug/kg
Dermal LD50 (rabbit): 10400 ug/kg

Skin corrosion/irritation: Causes skin irritation.
Serious eye damage/irritation: Causes serious eye damage.

Chronic effects: Repeated or prolonged skin contact may lead to irritant contact dermatitis - 'cyanide rash' - characterised by itching and skin eruptions.
Chronic and subchronic exposure to cyanide is known to induce thyroid effects due to the cyanide metabolite, thiocyanate. Thiocyanate adversely affects the thyroid gland via competitive inhibition of iodide uptake and perturbation of the homeostatic feedback mechanisms that regulate the synthesis and secretion of essential thyroid hormones.
Other chronic effects reported include headache, eye irritation, fatigue, shortness of breath and nose bleeds.

Mutagenicity: Not classified.
Carcinogenicity: Not classified.
Reproductive toxicity: No information available.
Specific Target Organ Toxicity (STOT) - single exposure: No information available.
Specific Target Organ Toxicity (STOT) - repeated exposure: Causes damage to organs through prolonged or repeated exposure. thyroid
Aspiration hazard: Not an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways. Avoid release to the environment.

Bioaccumulative potential: This material shows a low bioaccumulation potential. Biomagnification in aquatic and terrestrial food chains is not expected.

Mobility in soil: Toxic to the soil environment. Medium mobility in soil.

Aquatic toxicity: Very toxic to aquatic organisms. May cause long lasting harmful effects to aquatic life.

Terrestrial toxicity: Toxic to bees.

13. DISPOSAL CONSIDERATIONS

Disposal methods:
Refer to Waste Management Authority. Dispose of contents and container in accordance with local, regional, national, international regulations. Dispose of material through a licensed waste contractor. Residues must not be allowed to enter drains, sewers or watercourses or to contaminate the groundwater.

14. TRANSPORT INFORMATION

Road and Rail Transport
Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN No:	1689
Transport Hazard Class:	6.1 Toxic
Packing Group:	I
Proper Shipping Name or Technical Name:	SODIUM CYANIDE, SOLID
Hazchem or Emergency Action Code:	2X

Marine Transport
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN No:	1689
Transport Hazard Class:	6.1 Toxic
Packing Group:	I
Proper Shipping Name or Technical Name:	SODIUM CYANIDE, SOLID
IMDG EMS Fire:	F-A
IMDG EMS Spill:	S-A
Marine Pollutant	Yes

Air Transport
Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS. TRANSPORT PROHIBITED under the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air in Passenger and Cargo Aircraft; may be transported by Cargo Aircraft Only.

UN No:	1689
Transport Hazard Class:	6.1 Toxic

Packing Group: I
Proper Shipping Name or Technical Name: SODIUM CYANIDE, SOLID
Special precautions for user: NOT TO BE TRANSPORTED WITH ACIDS

15. REGULATORY INFORMATION

Classification:
This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:
Corrosive to Metals - Category 1
Acute Dermal Toxicity - Category 1
Acute Inhalation Toxicity - Category 2
Acute Oral Toxicity - Category 2
Skin Irritation - Category 2
Eye Damage - Category 1
Specific target organ toxicity (repeated exposure) - Category 1
Acute Aquatic Toxicity - Category 1
Chronic Aquatic Toxicity - Category 1

Hazard Statement(s):
H290 May be corrosive to metals.
H300+H310+H330 Fatal if swallowed, in contact with skin or if inhaled.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H372 Causes damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

Poisons Schedule (SUSMP): S7 Dangerous Poison.

This material is listed on the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

`Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinatti, 2019.
Guide for Preventing and Responding to Cyanide Poisoning in the Workplace; Safe Work Australia, April 2013
US EPA Tox review of HCN and CN-salts 2010-09.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:
5 Yearly Revised Primary SDS
Alignment to Safe Work Australia requirements
Alignment to NZ EPA requirements
Alignment to GHS requirements

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SELECTIVE PLATING

Material Safety Data Sheet

Section 1 Identification

Product Name: Nickel plating on metallic strip substrate
General: Metal with Metal Additives
Formula: Ni
C.A.S.: 7440-02-0
Health: 1 Flammability: 0 Reactivity: 0
Hazard Scale: Least Slight Moderate High Extreme
0 1 2 3 4

Section 2 Component Mixture

Component	CAS #	%	Exposure Limits
Nickel Metal	7440-02 -0	99.99	OSHA PEL 1mg/mf
Plating Additive	N/A	<0.01	N/A

Section 3 Hazard Identification (Also see section 11)

Generally not hazardous in normal handling; however, good laboratory practices should always be used. Avoid long term exposure to skin or by inhalation of dusts formed during cutting/grinding/etc.

Section 4 First Aid Measures

Skin – Wash skin immediately with soap & water. Remove contaminated clothing. Avoid prolonged/repeated contact with skin. Not a route of entry to body. Contact physician if irritation persists.
Eyes - Mild Irritant; wash eyes exposed to dust with plenty of water for at least 15 minutes, lifting eyelids occasionally. Seek medical attention.
Inhalation - Irritant; remove to fresh air if exposed to excessive dust. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Ingestion Conscious & Alert: Induce vomiting. Spontaneous Vomiting: Keep head below hips, rinse mouth, give ½-1 cup water or milk. Unconscious: Do NOT induce vomiting. Never give anything by mouth to an unconscious person.

Section 5 Fire Fighting Measures

Fire Extinguisher Type: Consistent with other substances involved.
Fire/Explosion Hazards Not combustible/fire hazard.
Fire Fighting Procedure: Consistent with other substances involved. Wear self-contained breathing device.

The information contained herein is believed to be accurate and is offered in good faith for the user's consideration and investigation. No warrantee is expressed or implied regarding the completeness or accuracy of this information, whether originating from Selective Plating Inc. or from an alternative source. Users of this material should satisfy themselves by independent investigation of current scientific and medical information that this material may be safely handled.

Section 6 Accidental Release Measures

Sweep up and place in suitable containers for reclamation or later disposal per Federal, State, and Local regulations..

Section 7 Handling and Storage

Store in a cool, dry, well ventilated area. Keep away from heat and flame. Do not get dusts in eyes, on skin, or on clothing.

Section 8 Exposure Controls/ PPE

Respiratory Protection: NIOSH approved dust mask.
Hand Protection: Gloves to prevent skin exposure.
Eye Protection: Appropriate safety glasses/goggles.

Section 9 Stability and Reactivity

Stability: Stable Conditions to Avoid: Acids.
Materials to Avoid: Nickel can react with acids can create hydrogen gas which can form explosive mixtures in air. Hazardous Decomposition Products: Hydrogen gas when contacted with acids.

Section 10 Physical & Chemical Properties

Melting Point: 1453°C Boiling Point: 2730° C
Vapor Pressure: N/A Evaporation Rate: N/A
Vapor Density: N/A
Solubility in Water: Dusts are insoluble
Evaporation Standard: N/A
Auto Ignition Temperature: N/A
Flash Point: N/A
Lower Flammability Limit in Air: N/A
Upper Flammability Limit in Air: N/A
Appearance: Silvery matte or bright finish over rigid or semi-rigid substrate.

Section 11 Additional Information

Effects of overexposure, Acute and Chronic:
Edges of base material may cause cuts to unprotected skin, no other effects expected to skin. Prolonged inhalation of dust or fume may result in a benign pneumoconiosis, producing distinctive changes in the lungs with no apparent disability or complications.

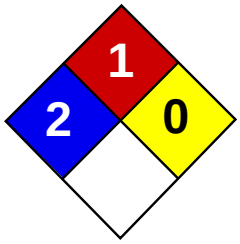
RCRA Hazardous Waste: F006
SARA Toxic Chemical: Section 313
Sara Extremely Hazardous Substance: Not Listed
DOT Classification: Not Regulated
DOT regulations may change; please consult the most recent version of the relevant regulations.

Revision: Original Date: 5/10/11

An ISO 9001 :2008 registered company

Selective Plating Inc. 240 S Lombard Road Addison IL 60101 Tel 630-543-1380 Fax 630-543-1392

www.SelectivePlatingInc.com



Material Safety Data Sheet
Antimony MSDS

Section 1: Chemical Product and Company Identification

Product Name: Antimony

Catalog Codes: SLA1453, SLA4462

CAS#: 7440-36-0

RTECS: CC4025000

TSCA: TSCA 8(b) inventory: Antimony

CI#: Not available.

Synonym: Stibium

Chemical Name: Not available.

Chemical Formula: Sb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Antimony	7440-36-0	100

Toxicological Data on Ingredients: Antimony: ORAL (LD50): Acute: 7000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In

case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 121.75 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 1635°C (2975°F)

Melting Point: 630°C (1166°F)

Critical Temperature: Not available.

Specific Gravity: 6.691 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 7000 mg/kg [Rat].

Chronic Effects on Humans: Causes damage to the following organs: blood, kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Antimony powder UNNA: UN2871 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Antimony Massachusetts RTK: Antimony TSCA 8(b) inventory: Antimony

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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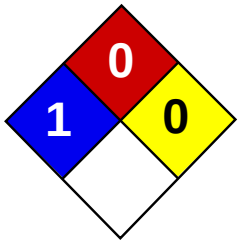
Last Updated: 05/21/2013 12:00 PM



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

pH (1% soln/water): Not applicable.

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

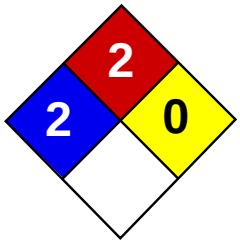
Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 06/09/2012 12:00 PM



Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Israel: TWA: 10 (ppm) TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995] Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 01:30 PM

Last Updated: 05/21/2013 12:00 PM

Material Safety Data Sheet
2-Methylnaphthalene, 99% (gc)

MSDS# 69451

Section 1 - Chemical Product and Company Identification

MSDS Name:	2-Methylnaphthalene, 99% (gc)
Catalog Numbers:	AC414550000, AC414550050, AC414551000, AC414555000
Synonyms:	
Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	91-57-6
Chemical Name:	2-Methylnaphthalene
%:	99.0
EINECS#:	202-078-3

Hazard Symbols: XN

Risk Phrases: 22

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning! May cause respiratory tract irritation. May cause allergic skin reaction. May be harmful if swallowed. Causes eye and skin irritation. Target Organs: Eyes, skin.

Potential Health Effects

Eye:	Causes eye irritation.
Skin:	Causes skin irritation. May cause photosensitive skin reactions in certain individuals.
Ingestion:	May be harmful if swallowed.
Inhalation:	Inhalation of dust may cause respiratory tract irritation.
Chronic:	No information found.

Section 4 - First Aid Measures

Eyes:	Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:	Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion:	If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation:	Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician:	

Section 5 - Fire Fighting Measures

General Information:	As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media:	Use water spray, dry chemical, carbon dioxide, or chemical foam.
Autoignition Temperature:	Not available
Flash Point:	Not available
Explosion Limits: Lower:	Not available
Explosion Limits: Upper:	Not available
NFPA Rating:	health: 1; flammability: 1; instability: 0;

Section 6 - Accidental Release Measures

General Information:	Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:	Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling:	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage:	Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
2-Methylnaphthalene	0.5 ppm; Skin - potential significant contribution to overall exposure by the cutaneous r oute	none listed	none listed

OSHA Vacated PELs: 2-Methylnaphthalene: None listed

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Personal Protective Equipment

Eyes:	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:	Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Color: Not available
Odor: none reported
pH: Not available
Vapor Pressure: < 1 mm Hg @25c
Vapor Density: Not available
Evaporation Rate: Not available
Viscosity: Not available
Boiling Point: 241.1 deg C (465.98°F)
Freezing/Melting Point: 37-38c
Decomposition Temperature: Not available
Solubility in water: Insoluble
Specific Gravity/Density: 1.0000g/cm3
Molecular Formula: C11H10
Molecular Weight: 142.20

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation, strong oxidants.
Incompatibilities with Other Materials: Not available
Hazardous Decomposition Products: Carbon monoxide, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#: CAS# 91-57-6: QJ9635000

RTECS:

LD50/LC50: **CAS# 91-57-6:** Oral, rat: LD50 = 1630 mg/kg;

.

Carcinogenicity: 2-Methylnaphthalene - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Other: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Not available

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: Please contact Fisher Scientific for shipping information
Hazard Class:
UN Number:
Packing Group:
Canada TDG
Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN

Risk Phrases:

R 22 Harmful if swallowed.

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 91-57-6: Not available

Canada

CAS# 91-57-6 is listed on Canada's DSL List

Canadian WHMIS Classifications: Not available

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 91-57-6 is not listed on Canada's Ingredient Disclosure List.

US Federal

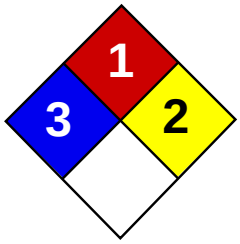
TSCA

CAS# 91-57-6 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 7/15/1998

Revision #5 Date 7/20/2009



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

Last Updated: 06/09/2012 12:00 PM

Material Safety Data Sheet
Chromium(VI) oxide

MSDS# 95984

Section 1 - Chemical Product and Company Identification

MSDS Name:	Chromium(VI) oxide
Catalog Numbers:	AC196610000, AC196610010, AC196610025, AC196610250, AC196612500, AC214100000 AC214100000, AC214100010, AC214100050, AC214101000, AC405230000, AC405230025 AC405230025, 40523-5000, A100-100, A100-212, A100-500, A98-212, A98-500, NC9210244, NC9780480, NC9782688
Synonyms:	Chromic acid; Chromic anhydride; Chromium(VI) oxide; Chromium trioxide.

Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	1333-82-0
Chemical Name:	Chromium trioxide
%:	>98
EINECS#:	215-607-8

Hazard Symbols: T+ O N



Risk Phrases: 45 46 24/25 26 35 42/43 48/23 50/53 62 9

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! Strong oxidizer. Contact with other material may cause a fire. Harmful if swallowed. Cancer hazard. Causes burns by all exposure routes. May cause allergic respiratory and skin reaction. Toxic if swallowed, inhaled or absorbed through the skin. Possible risk of impaired fertility. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. May cause heritable genetic damage. Target Organs: Blood, kidneys, liver, lungs, respiratory system, gastrointestinal system, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes severe eye burns. May cause irreversible eye injury. Causes redness and pain. May cause permanent corneal opacification.

Harmful if absorbed through the skin. Causes skin burns. May cause skin sensitization, an allergic reaction, which

Skin:	becomes evident upon re-exposure to this material. May cause deep, penetrating ulcers of the skin. Causes redness and pain. Chronic exposure to water insoluble hexavalent chromium compounds has been shown to be associated with lung cancer and gastrointestinal tract tumors. Substance is readily absorbed through the skin.
Ingestion:	Harmful if swallowed. May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause liver and kidney damage. Exposure may cause anemia and other blood abnormalities. May cause cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood). May cause systemic effects.
Inhalation:	May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. May cause asthmatic attacks due to allergic sensitization of the respiratory tract. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Prolonged exposure to dusts, vapors, or mists may result in the perforation of the nasal septum. May cause systemic effects.
Chronic:	Prolonged or repeated inhalation may cause nosebleeds, nasal congestion, erosion of the teeth, perforation of the nasal septum, chest pain and bronchitis. Prolonged or repeated eye contact may cause conjunctivitis. Prolonged or repeated skin contact may cause sensitization dermatitis and possible destruction and/or ulceration. Chronic ingestion may cause effects similar to those of acute ingestion. May cause liver and kidney damage. Chronic exposure to water insoluble hexavalent chromium compounds has been shown to be associated with lung cancer and gastrointestinal tract tumors. Adverse reproductive effects have been reported in animals. Possible risk of harm to the unborn child. Confirmed Human Carcinogen. May impair fertility.

Section 4 - First Aid Measures

Eyes:	Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin:	Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion:	Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation:	Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician:	

Section 5 - Fire Fighting Measures

General Information:	As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with other material may cause fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media:	Use extinguishing media most appropriate for the surrounding fire. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out. May require flooding with water in order to eliminate hazardous reactions since the materials generate their own oxygen.
Autoignition Temperature:	None available.
Flash Point:	250 deg C (482.00 deg F)
Explosion Limits: Lower:	Not available
Explosion Limits: Upper:	Not available
NFPA Rating:	; instability: OX

Section 6 - Accidental Release Measures

General Information:	Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:	Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty

conditions. Provide ventilation. Do not use combustible materials such as paper towels to clean up spill.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Avoid contact with clothing and other combustible materials. Do not ingest or inhale. Use with adequate ventilation. Discard contaminated shoes.

Storage: Do not store near combustible materials. Keep container closed when not in use. Store in a cool, dry, well-ventilated location. Separate from combustible materials, halogens, sulfides, metals. See also NFPA 430, Code for the Storage of Liquid and Solid Oxidizers.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chromium trioxide	0.05 mg/m3 TWA (as Cr) (listed under Chromium (VI) compounds-water soluble).	0.001 mg/m3 TWA (as Cr) 15 mg/m3 IDLH (as Cr(VI))	5 æg/m3 TWA (listed under Chromium (VI) compounds).2.5 æg/m3 Action Level (as Cr.); 5 æg/m3 TWA (as Cr, Cancer hazard - see 29 CFR 1910.1026) (listed under Chromium (VI) compounds).

OSHA Vacated PELs: Chromium trioxide: None listed

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear a chemical apron. Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear a chemical apron. Wear appropriate protective gloves to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Color: dark red to purple

Odor: odorless

pH: <1.0 (50g/l aq. sol.)

Vapor Pressure: Not available

Vapor Density: 3.4

Evaporation Rate: Neglible

Viscosity: No information

Boiling Point: 250 deg C (482.00°F)

Freezing/Melting Point: 196.1 deg C (384.98°F)

Decomposition Temperature:

Solubility in water: Soluble

Specific Gravity/Density: 2.7 (Water=1)

Molecular Formula: CrO3

Molecular Weight: 99.99

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures. Hygroscopic: absorbs moisture or water from the air.
Conditions to Avoid:	Incompatible materials, dust generation, moisture, excess heat.
Incompatibilities with Other Materials	Metals, reducing agents, bases, acetic acid, acetic anhydride, alcohols, alkali metals, ammonia, chlorine trifluoride, finely powdered metals, halogens, phosphorus, diethyl ether, dimethyl formamide, acetone, diethyl formamide, methanol, glycerol, organics, ethanol, camphor, pyridine, hydrocarbons, ketones, turpentine, combustible materials, attacks metals in the presence of moisture, Aqueous solution is strongly acidic., Can ignite organic matter on contact., sulfides.
Hazardous Decomposition Products	Chromium fumes, possible trivalent chromium formation with liberated oxygen..
Hazardous Polymerization	Has not been reported.

Section 11 - Toxicological Information

RTECS#:	CAS# 1333-82-0: GB6650000
LD50/LC50:	RTECS: **CAS# 1333-82-0:** Oral, mouse: LD50 = 127 mg/kg; Oral, rat: LD50 = 80 mg/kg; . Other: TDLO/TCLO-LOWEST PUBLISHED TOXIC DOSE/CONC. Human TCLo: ROUTE: Inhalation: DOSE: 110ug/m3.
Carcinogenicity:	Chromium trioxide - California: carcinogen, initial date 2/27/87 (Chromium (VI) compounds). NTP: Known carcinogen IARC: Group 1 carcinogen
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Fish: Pseudomonas putida:

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: CHROMIUM TRIOXIDE, ANHYDROUS
Hazard Class: 5.1
UN Number: UN1463
Packing Group: II
Canada TDG
Shipping Name: CHROMIUM TRIOXIDE, ANHYDROUS
Hazard Class: 5.1892
UN Number: UN1463
Packing Group: II

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T+ O N

Risk Phrases:

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 24/25 Toxic in contact with skin and if swallowed.

R 26 Very toxic by inhalation.

R 35 Causes severe burns.

R 42/43 May cause sensitization by inhalation and skin contact.

R 48/23 Toxic : danger of serious damage to health by prolonged exposure through inhalation.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R 62 Possible risk of impaired fertility.

R 9 Explosive when mixed with combustible material.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 60 This material and its container must be disposed of as hazardous waste.

WGK (Water Danger/Protection)

CAS# 1333-82-0: 3

Canada

CAS# 1333-82-0 is listed on Canada's DSL List

Canadian WHMIS Classifications: C, D1A, D2A, E

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 1333-82-0 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 1333-82-0 is listed on the TSCA Inventory.

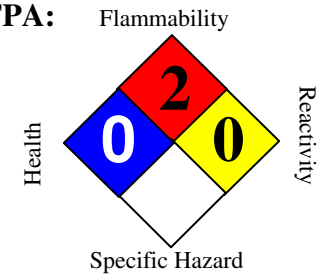
Section 16 - Other Information

MSDS Creation Date: 6/02/1998

Revision #13 Date 7/20/2009

Material Safety Data Sheet
Fuel Oil

NFPA:



HMIS III:

HEALTH	1
FLAMMABILITY	2
PHYSICAL	0

0 = Insignificant, 1 = Slight, 2 = Moderate, 3 = High, 4 = Extreme

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Fuel Oil

Synonyms : Bunkers, Black Fuel Oil, MFO, Industrial Fuel Oil, 6 Oil, Slurry Fuel Oil, RFO, Refinery Fuel Oil, High Sulfur Fuel Oil, HSFO, IFO-30, IFO-180, IFO-380, IFO-510, IFO-700, Bunker C, Bunker Fuel Oil, Marine Fuel Oil, Decant Oil, Utility Fuel Oil, LSFO, Six Oil, 888100008793

MSDS Number : 888100008793 **Version** : 1.17

Product Use Description : Fuel, Intermediate Stream

Company : For: Tesoro Refining & Marketing Co.
19100 Ridgewood Parkway, San Antonio, TX 78259

Tesoro Call Center : (877) 783-7676 **Chemtrec (Emergency Contact)** : (800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Regulatory status : This material is considered hazardous by the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Signal Word : WARNING

Hazard Summary : Combustible Liquid Slight to moderate irritant. Affects central nervous system. Skin cancer hazard. Hot liquid may cause thermal burns.

Potential Health Effects

Eyes : May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

Skin : May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Exposure may cause a phototoxicity reaction: liquid or mist on the skin may produce a painful sunburn reaction when exposed to sunlight. Product may be hot which could cause 1st, 2nd, or 3rd degree thermal burns.

Ingestion : This material has a low order of acute toxicity. If large quantities are ingested, nausea, vomiting and diarrhea may result. Ingestion may also cause effects similar to inhalation of the product. Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death.

Inhalation : Because of its low vapor pressure, this product presents a minimal inhalation hazard at ambient temperature. Upon heating, fumes may be evolved. Inhalation of fumes or mist may result in respiratory tract irritation and central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.

Chronic Exposure : Similar products produced skin cancer and skin tumors in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11, Toxicological Information. Petroleum industry experience indicates that a program providing for good personal hygiene, proper use of personal protective equipment, and minimizing the repeated and prolonged exposure to liquids and fumes, as outlined in this MSDS, is effective in reducing or eliminating the carcinogenic risk of high boiling aromatic oils (polynuclear aromatic hydrocarbons) to humans.

Target Organs : Skin, Eyes, Central nervous system

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	100%
Polycyclic aromatic compounds (PACs or PNAs)		Typically 1.5%
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8	Trace to 0.2%
Hydrogen Sulfide	7783-06-4	Trace to 0.2%
Sulfur	17704-34-9	Trace to 4.5%

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap

		and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, call a physician.
Eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists, consult a specialist.
Ingestion	:	Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.
Notes to physician	:	Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Liver disorders, Kidney disorders, Aspiration may cause pulmonary edema and pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Form	:	Liquid
Flash point	:	65.5℃ (150℉) Minimum
Suitable extinguishing media	:	Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray.
Specific hazards during fire fighting	:	Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.
Special protective equipment for fire-fighters	:	Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.
Further information	:	Flammable vapor production at ambient temperature in the open is expected to be minimal, as the material is generally wet. However, depending on oil content and conditions, it is possible flammable vapors could accumulate in the headspace of storage containers, presenting a flammability and explosion hazard. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully vacuum, shovel, scoop or sweep up into a waste container for reclamation or disposal.

SECTION 7. HANDLING AND STORAGE

Handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Advice on protection against fire and explosion : Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Dust explosion class : Not applicable

Requirements for storage areas and containers : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Hydrogen sulfide may accumulate in tanks and bulk transport compartments. Consider appropriate respiratory protection (see Section 8). Stand upwind. Avoid vapors when opening hatches and dome covers. Confined spaces should be ventilated and gas tested prior to entry.

Advice on common storage : Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

Other data : No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Polycyclic aromatic compounds (or coal tar pitch volatiles – benzene soluble)		PEL	0.2 mg/m3
	Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	PEL	5 mg/m3 (as mineral oil mist)

	Hydrogen Sulfide	7783-06-4	STEL	20 ppm
ACGIH	Hydrogen Sulfide	7783-06-4	TWA	1 ppm
		7783-06-4	STEL	5 ppm
	Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	TWA	0.2 mg/m3 (as mineral oil) Sum of 15 NTP-listed polynuclear aromatic hydrocarbons 0.005 mg/m3
	Polycyclic aromatic compounds (or coal tar pitch volatiles – benzene soluble)		TWA	0.2 mg/m3

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended.

Skin and body protection : Chemical protective clothing such as DuPont Tyvek QC, TyChem® or equivalent, recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.

Respiratory protection : If hydrogen sulfide concentration may exceed permissible exposure limit, a positive-pressure SCBA or Type C supplied air respirator with escape bottle is required as respiratory protection. If hydrogen sulfide concentration is below H2S permissible exposure limit a NIOSH/ MSHA-approved air-purifying respirator with acid gas cartridges may be acceptable for odor control, but continuous air monitoring for H2S is recommended. Protection provided by air-purifying respirators is limited. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form : Liquid

Appearance : Dark brown to black

Odor	:	Petroleum asphalt odor
Flash point	:	65.5°C (150°F) Minimum
Thermal decomposition	:	No decomposition if stored and applied as directed.
pH	:	Not applicable
Boiling point	:	343 - 538 °C(649 - 1,000 °F)
Vapor Pressure	:	1.33 hPa at 37.78 °C (100.00 °F)
Density	:	1.01 - 1.1 g/cm3
Water solubility	:	Insoluble
Percent Volatiles	:	100 %
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)		Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers.
Materials to avoid	:	Strong oxidizing agents. Peroxides.
Hazardous decomposition products	:	Carbon monoxide, carbon dioxide and noncombusted hydrocarbons (smoke).
Thermal decomposition	:	No decomposition if stored and applied as directed.
Hazardous reactions	:	Keep away from oxidizing agents, and acidic or alkaline products.

SECTION 11. TOXICOLOGICAL INFORMATION

Carcinogenicity

NTP	:	Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
IARC	:	Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
OSHA	:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause cancer. Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
Skin irritation	:	Irritating to skin.
Eye irritation	:	Irritating to eyes.
Further information	:	This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Studies have shown that similar products produce skin cancer or skin tumors in

laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.
The presence of carcinogenic PNAs indicates that precautions should be taken to minimize repeated and prolonged inhalation of fumes or mists.
Dermal application of gas oil to rats resulted in limited evidence of liver damage (i.e., increased liver weight and changes in hepatic serum enzyme activity) and bone marrow toxicity (hypoplasia and decreased hemoglobin.)
Liver and kidney injuries may occur.
Components of the product may affect the nervous system.

Component:

Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	Acute oral toxicity: LD50 rat Dose: 4,320 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: Animal experiments showed a statistically significant number of tumors.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: Not regulated if shipped below 140°F (60°C) Elevated temperature liquid, flammable (if shipped above 140°F (60°C)).
UN-No.	: Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	: 9
Packing group	: III
Hazard inducer	: (Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)

TDG

Proper shipping name	:	Not regulated if shipped below 140°F (60°C) Elevated temperature liquid, flammable (if shipped above 140°F (60°C)).
UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	9
Packing group	:	III
Hazard inducer	:	(Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)

IATA Cargo Transport

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9

IATA Passenger Transport

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9

IMDG-Code

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Description of the goods	:	Elevated temperature liquid, n.o.s. (Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9
Packaging group	:	III
IMDG-Labels	:	9
EmS Number	:	F-A S-P
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

OSHA Hazards	:	Combustible Liquid Moderate skin irritant Moderate eye irritant Probable carcinogen
TSCA Status	:	On TSCA Inventory
DSL Status	:	All components of this product are on the Canadian DSL list.
SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard

Chronic Health Hazard

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

Components	CAS-No.

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components	CAS-No.
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

NJ RTK — US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

California Prop. 65 : WARNING! This product contains a chemical known in the State of California to cause cancer.

Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

SECTION 16. OTHER INFORMATION

Further information

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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Revision Date : 01/23/2012

65, 66, 121, 295, 296, 347, 1003, 1006, 1007, 1009, 1010, 1022, 1054, 1586, 1886

MATHESON TRI-GAS, INC. -- CIS-1,2-DICHLOROETHYLENE -- -

========== Product Identification ==========

Product ID:CIS-1,2-DICHLOROETHYLENE
MSDS Date:Jan 24 1989
MSDS Number: EEEEH
Kit Part:=== Responsible Party ===
Company Name:MATHESON TRI-GAS, INC.
Address:959 ROUTE 46 EAST
City:PARSIPPANY
State:NJ
ZIP:07054-0624
Country:US
Info Phone Num:(USA) 973-257-1100, (WHITBY) 905-668-3570, (EDMONTON)
780-471-4036
Chemtrec Ind/Phone:18004249300
=== Contractor Identification ===
Company Name:MATHESON TRI-GAS, INC.
Address:959 ROUTE 46 EAST
Box:City:PARSIPPANY
State:NJ
ZIP:07054-0624
Country:US
Phone:(USA) 973-257-1100, (WHITBY) 905-668-3570, (EDMONTON)
780-471-4036
CAGE:Company Name:MATHESON TRI-GAS, INC.
Address:530 WATSON STREET
Box:City:WHITBY
State:ZIP:L1N 5R9
Country:ONTARIO, CANADA
Phone:(USA) 973-257-1100, (WHITBY) 905-668-3570, (EDMONTON)
780-471-4036
CAGE:

========== Composition/Information on Ingredients ==========

Ingred Name:CIS-1,2-DICHLOROETHYLENE
CAS:156-59-2
Fraction by Wt: 100.0%

========== Hazards Identification ==========

Reports of Carcinogenicity:NTP:No IARC:No OSHA:No
Health Hazards Acute and Chronic:INHALATION: SHORT TERM EXPOSURE:
irritation, nausea, vomiting, drowsiness, symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT: SHORT TERM EXPOSURE: irritation LONG TERM EXPOSURE:
same as effects reported in short term exposure EYE CONTACT: SHORT
TERM EXPOSURE: irritation LONG TERM EXPOSURE: same as effects
reported in short term exposure INGESTION: SHORT TERM EXPOSURE:
symptoms of drunkenness LONG TERM EXPOSURE: no information on
significant adverse effects
Medical Cond Aggravated by Exposure:

========== First Aid Measures ==========

First Aid: INHALATION: If adverse effects occur, remove to

uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention. SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse. EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention. INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately. NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

========== Fire Fighting Measures ==========

Flash Point:39 F (4 C) (CC)
Lower Limits:9.7%
Upper Limits:12.8%
Extinguishing Media:regular dry chemical, carbon dioxide, water, regular foam Large fires: Use regular foam or flood with fine water spray.
Fire Fighting Procedures:Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material ocombustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.
Unusual Fire/Explosion Hazard:Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

========== Accidental Release Measures ==========

Spill Release Procedures:[Spills may need to be reported to the National Response Center (800/424-8802) DOT Reportable Quantity (RQ) is 1000 pounds] Eliminate and remove all ignition sources. Handling equipment must be grounded to prevent sparking. Ventilate the area of the spill or leak. For large spills, evacuate the hazard area of unprotected personnel. Wear appropriate respirator and protective clothing. Shut off source of leak only if safe to do so. Dike and contain. If vapor cloud forms, water fog may be used to suppress; contain runoff. Remove with vacuum trucks or pump to storage vessels. Soak up residue with an absorbent such as clay, sand or other suitable material; place in non-leaking containers for proper disposal. Flush area with water to remove trace residue; dispose of flush solutions as above. For small spills, take up with an absorbent material and place in non-leaking containers; seal tightly for proper disposal.
Neutralizing Agent:

========== Handling and Storage ==========

Handling and Storage Precautions:Keep liquid and vapor away from heat, sparks and flame. Surfaces that are sufficiently hot may ignite even liquid product in the absence of sparks or flame. Extinguish pilot lights, cigarettes, and other sources of ignition prior to use and until all vapors are gone. Vapors may accumulate and travel to ignition sources distant from the handling site; flash-fire can result. Keep containers closed when not in use. Use with adequate ventilation.

Other Precautions:Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers. Static electricity may accumulate and create a fire hazard. Ground fixed equipment. Bond and ground transfer containers and equipment.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. 1000 ppm Any supplied-air respirator. Any powered, air-purifying respirator with organic vapor cartridge(s). Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). Any air-purifying respirator with a full facepiece and an organic vapor canister. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece. Escape - Any air-purifying respirator with a full facepiece and an organic vapor canister. Any appropriate escape-type, self-contained breathing apparatus. For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

Ventilation:Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

Protective Gloves:Wear appropriate chemical resistant gloves.

Eye Protection:Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Other Protective Equipment:Wear appropriate chemical resistant clothing.

Supplemental Safety and Health

CIS-1,2-DICHLOROETHYLENE: 1,2-DICHLOROETHYLENE (ALL ISOMERS): 200 ppm (790 mg/m3) OSHA TWA 200 ppm ACGIH TWA 200 ppm (790 mg/m3) NIOSH recommended TWA 10 hour(s)

========== Physical/Chemical Properties ==========

Boiling Pt:140 F (60 C)

Melt/Freeze Pt:-114 F (-81 C)

Vapor Pres:400 mmHg @ 41 C

Vapor Density:3.34

Spec Gravity:1.2837

pH:Not available

Evaporation Rate & Reference:Not available

Solubility in Water:insoluble

Appearance and Odor:PHYSICAL STATE:liquid COLOR:colorless ODOR:pleasant

odor
Corrosion Rate:

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.
Stability Condition to Avoid:Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.
Hazardous Decomposition Products:Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon
Conditions to Avoid Polymerization:May polymerize. Avoid contact with incompatible materials.

========== Toxicological Information ==========

Toxicological Information:CIS-1,2-DICHLOROETHYLENE: TOXICITY DATA: 13700 ppm inhalation-rat LC50 LOCAL EFFECTS: Irritant: inhalation, skin, eye ACUTE TOXICITY LEVEL: Slightly Toxic: inhalation TARGET ORGANS: central nervous system MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders MUTAGENIC DATA: Available.

========== Ecological Information ==========

Ecological:Not available

========== Disposal Considerations ==========

Waste Disposal Methods:Destroy by incineration in accordance with all local, county, state and federal regulations.

========== MSDS Transport Information ==========

Transport Information:U.S. DOT 49 CFR 172.101: PROPER SHIPPING NAME: 1,2-Dichloroethylene ID NUMBER: UN1150 HAZARD CLASS OR DIVISION: 3 PACKING GROUP: II LABELING REQUIREMENTS: Flammable liquid

========== Regulatory Information ==========

SARA Title III Information: SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30): Not regulated. SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40): Not regulated. SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21): ACUTE: Yes CHRONIC: No FIRE: Yes REACTIVE: Yes SUDDEN RELEASE: No SARA TITLE III SECTION 313 (40 CFR 372.65): 1,2-DICHLOROETHYLENE (ALL ISOMERS)
Federal Regulatory Information:CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated. OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.
State Regulatory Information: California Proposition 65: Not regulated.

========== Other Information ==========

Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department

*** CHEMICAL IDENTIFICATION ***

RTECS NUMBER : MW4025000
CHEMICAL NAME : Hydrochloric acid
CAS REGISTRY NUMBER : 7647-01-0
OTHER CAS REGISTRY NOS. : 51005-19-7
61674-62-2
113962-65-5
LAST UPDATED : 199712
DATA ITEMS CITED : 61
MOLECULAR FORMULA : Cl-H
MOLECULAR WEIGHT : 36.46
WISWESSER LINE NOTATION : H G
COMPOUND DESCRIPTOR : Tumorigen
Mutagen
Reproductive Effector
Human
Primary Irritant

SYNONYMS/TRADE NAMES :

* Acide chlorhydrique
* Acido cloridrico
* Anhydrous hydrochloric acid
* Chloorwaterstof
* Chlorohydric acid
* Chlorowodor
* Chlorwasserstoff
* Hydrochloride
* Hydrogen chloride
* Muriatic acid
* Spirits of salt

*** HEALTH HAZARD DATA ***

** SKIN/EYE IRRITATION DATA **

TYPE OF TEST : Rinsed with water
ROUTE OF EXPOSURE : Administration into the eye
SPECIES OBSERVED : Rodent - rabbit
DOSE/DURATION : 5 mg/30S
REACTION SEVERITY : Mild
REFERENCE :
TXCYAC Toxicology. (Elsevier Scientific Pub. Ireland, Ltd., POB 85, Limerick, Ireland) V.1- 1973- Volume(issue)/page/year: 23,281,1982

** ACUTE TOXICITY DATA **

TYPE OF TEST : LCLo - Lowest published lethal concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Human
DOSE/DURATION : 1300 ppm/30M
TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
29ZWAE "Practical Toxicology of Plastics," Lefaux, R., Cleveland, OH, Chemical Rubber Co., 1968 Volume(issue)/page/year: -,207,1968

TYPE OF TEST : LCLo - Lowest published lethal concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Human
DOSE/DURATION : 3000 ppm/5M

TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
TABIA2 Tabulae Biologicae. (The Hague, Netherlands) V.1-22, 1925-63. Discontinued. Volume(issue)/page/year: 3,231,1933

TYPE OF TEST : LDLo - Lowest published lethal dose
ROUTE OF EXPOSURE : Unreported
SPECIES OBSERVED : Human - man
DOSE/DURATION : 81 mg/kg
TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
85DCAI "Poisoning; Toxicology, Symptoms, Treatments," 2nd ed., Arena, J.M., Springfield, IL, C.C. Thomas, 1970 Volume(issue)/page/year: 2,73,1970

TYPE OF TEST : LC50 - Lethal concentration, 50 percent kill
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - rat
DOSE/DURATION : 3124 ppm/1H
TOXIC EFFECTS :
Sense Organs and Special Senses (Olfaction) - effect, not otherwise specified
Sense Organs and Special Senses (Eye) - iritis
REFERENCE :
AMRL** Aerospace Medical Research Laboratory Report. (Aerospace Technical Div., Air Force Systems Command, Wright-Patterson Air Force Base, OH 45433) Volume(issue)/page/year: TR-74-78,1974

TYPE OF TEST : LC50 - Lethal concentration, 50 percent kill
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - mouse
DOSE/DURATION : 1108 ppm/1H
TOXIC EFFECTS :
Sense Organs and Special Senses (Eye) - effect, not otherwise specified
Lungs, Thorax, or Respiration - respiratory stimulation
Skin and Appendages - dermatitis, other (after systemic exposure)
REFERENCE :
JCTODH Journal of Combustion Toxicology. (Westport, CT) V.3-9, 1976-82. Volume(issue)/page/year: 3,61,1976

TYPE OF TEST : LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE : Intraperitoneal
SPECIES OBSERVED : Rodent - mouse
DOSE/DURATION : 40142 ug/kg
TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
COREAF Comptes Rendus Hebdomadaires des Seances, Academie des Sciences. (Paris, France) V.1-261, 1835-1965. For publisher information, see CRASEV. Volume(issue)/page/year: 256,1043,1963

TYPE OF TEST : LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE : Oral
SPECIES OBSERVED : Rodent - rabbit
DOSE/DURATION : 900 mg/kg
TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
BIZEA2 Biochemische Zeitschrift. (Berlin, Ger.) V.1-346, 1906-67. For

publisher information, see EJBCAI. Volume(issue)/page/year: 134,437,1923

TYPE OF TEST : LCLo - Lowest published lethal concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - rabbit
DOSE/DURATION : 4413 ppm/30M
TOXIC EFFECTS :
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
Liver - fatty liver degeneration
REFERENCE :
JIHTAB Journal of Industrial Hygiene and Toxicology. (Cambridge, MA) V.18-31, 1936-49. For publisher information, see AEHLAU.
Volume(issue)/page/year: 24,222,1942

TYPE OF TEST : LCLo - Lowest published lethal concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - guinea pig
DOSE/DURATION : 4413 ppm/30M
TOXIC EFFECTS :
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
Liver - other changes
REFERENCE :
JIHTAB Journal of Industrial Hygiene and Toxicology. (Cambridge, MA) V.18-31, 1936-49. For publisher information, see AEHLAU.
Volume(issue)/page/year: 24,222,1942

** OTHER MULTIPLE DOSE TOXICITY DATA **

TYPE OF TEST : TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - rat
DOSE/DURATION : 685 ug/m3/24H/84D-C
TOXIC EFFECTS :
Behavioral - muscle contraction or spasticity
Kidney, Ureter, Bladder - other changes in urine composition
Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - true cholinesterase
REFERENCE :
GISAAA Gigiena i Sanitariya. For English translation, see HYSAAV. (V/O Mezhdunarodnaya Kniga, 113095 Moscow, USSR) V.1- 1936-
Volume(issue)/page/year: 38(3),6,1973

** REPRODUCTIVE DATA **

TYPE OF TEST : TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - rat
DOSE : 450 mg/m3/1H
SEX/DURATION : female 1 day(s) pre-mating
TOXIC EFFECTS :
Reproductive - Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus)
Reproductive - Specific Developmental Abnormalities - homeostasis
REFERENCE :
AKGIAO Akushcherstvo i Ginekologiya (Moscow). (V/O Mezhdunarodnaya Kniga, 113095 Moscow, USSR) No.1- 1936- Volume(issue)/page/year: 53(6),69,1977

** MUTATION DATA **

TYPE OF TEST : DNA repair
TEST SYSTEM : Bacteria - Escherichia coli
DOSE/DURATION : 25 ug/well
REFERENCE :
ENMUDM Environmental Mutagenesis. (New York, NY) V.1-9, 1979-87. For publisher information, see EMMUEG. Volume(issue)/page/year: 3,429,1981

TYPE OF TEST : Sex chromosome loss and nondisjunction
ROUTE OF EXPOSURE : Inhalation
TEST SYSTEM : Insect - Drosophila melanogaster
DOSE/DURATION : 100 ppm/24H
REFERENCE :
THAGA6 Theoretical & Applied Genetics. (Springer-Verlag New York, Inc., Service Center, 44 Hartz Way, Secaucus, NJ 07094) V.38- 1968- Volume(issue)/page/year: 39,330,1969

TYPE OF TEST : Sex chromosome loss and nondisjunction
ROUTE OF EXPOSURE : Oral
TEST SYSTEM : Insect - Drosophila melanogaster
DOSE/DURATION : 100 ppm
REFERENCE :
THAGA6 Theoretical & Applied Genetics. (Springer-Verlag New York, Inc., Service Center, 44 Hartz Way, Secaucus, NJ 07094) V.38- 1968- Volume(issue)/page/year: 39,330,1969

TYPE OF TEST : Cytogenetic analysis
ROUTE OF EXPOSURE : Parenteral
TEST SYSTEM : Insect - grasshopper
DOSE/DURATION : 20 mg
REFERENCE :
NULSAK Nucleus (Calcutta). (Dr. A.K. Sharma, Centre of Advanced Studies in Cell and Chromosome Research, Calcutta, 35 Baliygunge Circular Rd., Calcutta 700 019, India) V.1- 1958- Volume(issue)/page/year: 9,119,1966

TYPE OF TEST : Cytogenetic analysis
TEST SYSTEM : Rodent - hamster Lung
DOSE/DURATION : 30 mmol/L
REFERENCE :
CYTBAI Cytobios. (Faculty Press, 88 Regent St., Cambridge, UK) V.1- 1969- Volume(issue)/page/year: 55,167,1988

TYPE OF TEST : Cytogenetic analysis
TEST SYSTEM : Rodent - hamster Ovary
DOSE/DURATION : 8 mmol/L
REFERENCE :
MUREAV Mutation Research. (Elsevier Science Pub. B.V.; POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1964- Volume(issue)/page/year: 225,55,1989

*** REVIEWS ***

ACGIH TLV-CL 7.5 mg/m3 (5 ppm)
DTLVS* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: TLV/BEI,1997

IARC Cancer Review:Human Inadequate Evidence
IMEMDT IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man. (WHO Publications Centre USA, 49 Sheridan Ave., Albany, NY 12210)

V.1- 1972- Volume(issue)/page/year: 54,189,1992

IARC Cancer Review:Animal Inadequate Evidence
IMEMDT IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man. (WHO Publications Centre USA, 49 Sheridan Ave., Albany, NY 12210) V.1- 1972- Volume(issue)/page/year: 54,189,1992

IARC Cancer Review:Group 3
IMEMDT IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man. (WHO Publications Centre USA, 49 Sheridan Ave., Albany, NY 12210) V.1- 1972- Volume(issue)/page/year: 54,189,1992

TOXICOLOGY REVIEW
ARTODN Archives of Toxicology. (Springer-Verlag, Heidelberger Pl. 3, D-1000 Berlin 33, Fed. Rep. Ger.) V.32- 1974- Volume(issue)/page/year: 39,299,1978

TOXICOLOGY REVIEW
AOHYA3 Annals of Occupational Hygiene. (Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, NY 10523) V.1- 1958- Volume(issue)/page/year: 17,159,1974

TOXICOLOGY REVIEW
EVHPAZ EHP, Environmental Health Perspectives. (U.S. Government Printing Office, Supt of Documents, Washington, DC 20402) No.1- 1972- Volume(issue)/page/year: 11,163,1975

*** U.S. STANDARDS AND REGULATIONS ***

EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
FEREAC Federal Register. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) V.1- 1936- Volume(issue)/page/year: 54,7740,1989

MSHA STANDARD:air-CL 5 ppm (7 mg/m3)
DTLVS* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: 3,129,1971

OSHA PEL (Gen Indu):CL 5 ppm (7 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 29,1910.1000,1994

OSHA PEL (Construc):CL 5 ppm (7 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 29,1926.55,1994

OSHA PEL (Shipyard):CL 5 ppm (7 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 29,1915.1000,1993

OSHA PEL (Fed Cont):CL 5 ppm (7 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 41,50-204.50,1994

*** OCCUPATIONAL EXPOSURE LIMITS ***

OEL-AUSTRALIA:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-AUSTRIA:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-BELGIUM:STEL 5 ppm (7.7 mg/m3) JAN 1993

OEL-DENMARK:STEL 5 ppm (7 mg/m3) JAN 1993

OEL-FINLAND:STEL 5 ppm (7 mg/m3);Skin JAN 1993

OEL-FRANCE:STEL 5 ppm (7.5 mg/m3) JAN 1993

OEL-GERMANY:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-HUNGARY:STEL 5 mg/m3 JAN 1993

OEL-JAPAN:STEL 5 ppm (7.5 mg/m3) JAN 1993

OEL-THE NETHERLANDS:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-THE PHILIPPINES:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-POLAND:TWA 5 mg/m3 JAN 1993

OEL-RUSSIA:STEL 5 ppm (5 mg/m3) JAN 1993

OEL-SWEDEN:STEL 5 ppm (8 mg/m3) JAN 1993

OEL-SWITZERLAND:TWA 5 ppm (7.5 mg/m3);STEL 10 ppm (15 mg/m3) JAN 1993

OEL-THAILAND:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-TURKEY:TWA 5 ppm (7 mg/m3) JAN 1993

OEL-UNITED KINGDOM:TWA 5 ppm (7 mg/m3);STEL 5 ppm (7 mg/m3) JAN 1993

OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV

OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGIH TLV

*** NIOSH STANDARDS DEVELOPMENT AND SURVEILLANCE DATA ***

NIOSH RECOMMENDED EXPOSURE LEVEL (REL) :
NIOSH REL TO HYDROGEN CHLORIDE-air:CL 5 ppm
REFERENCE :
NIOSH* National Institute for Occupational Safety and Health, U.S. Dept. of Health, Education, and Welfare, Reports and Memoranda.
Volume(issue)/page/year: DHHS #92-100,1992

NIOSH OCCUPATIONAL EXPOSURE SURVEY DATA :
NOHS - National Occupational Hazard Survey (1974)
NOHS Hazard Code - 38580
No. of Facilities: 87434 (estimated)
No. of Industries: 360
No. of Occupations: 156
No. of Employees: 824985 (estimated)

NOES - National Occupational Exposure Survey (1983)

NOES Hazard Code - 38580
No. of Facilities: 60309 (estimated)
No. of Industries: 321
No. of Occupations: 183
No. of Employees: 1238572 (estimated)
No. of Female Employees: 388130 (estimated)

*** STATUS IN U.S. ***

EPA GENETOX PROGRAM 1988, Negative: Cell transform.-SA7/SHE

EPA TSCA Section 8(b) CHEMICAL INVENTORY

EPA TSCA Section 8(d) unpublished health/safety studies

EPA TSCA Section 8(e) Risk Notification, 8EHQ-0892-9246

On EPA IRIS database

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JUNE 1998

NIOSH Analytical Method, 1994: Acids, inorganic, 7903

*** END OF RECORD ***

International Chemical Safety Cards

METHANOL

ICSC: 0057

METHANOL
Methyl alcohol
Carbinol
Wood alcohol
CH_4O/CH_3OH
Molecular mass: 32.0

CAS # 67-56-1
RTECS # PC1400000
ICSC # 0057
UN # 1230
EC # 603-001-00-X

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking. NO contact with oxidants.	Powder, alcohol-resistant foam, water in large amounts, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	
• **INHALATION**	Cough. Dizziness. Headache. Nausea.	Ventilation. Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain. Shortness of breath. Unconsciousness. Vomiting (further see Inhalation).	Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Evacuate danger area! Collect leaking liquid in sealable containers. Wash away spilled liquid with plenty of water. Remove vapour with fine water spray (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Fireproof. Separated from strong oxidants, food and feedstuffs. Cool.	Do not transport with food and feedstuffs. F symbol T symbol R: 11-23/25 S: (1/2-)7-16-24-25 UN Hazard Class: 3 UN Subsidiary Risks: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0057

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

METHANOL

ICSC: 0057

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are easily formed.

CHEMICAL DANGERS:
Reacts violently with oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 200 ppm; 262 mg/m^3 as TWA (skin) (ACGIH 1991-1992).
TLV (as STEL): 250 ppm; 328 mg/m^3 (skin) (ACGIH 1992-1993).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and through the skin, and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin and the respiratory tract. The substance may cause effects on the central nervous system , resulting in loss of consciousness. Exposure by ingestion may result in blindness and death. The effects may be delayed. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system , resulting in persistant or recurring headaches and impaired vision.

PHYSICAL PROPERTIES

Boiling point: 65°C
Melting point: -98°C
Relative density (water = 1): 0.79
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 12.3
Relative vapour density (air = 1): 1.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 12°C c.c.
Auto-ignition temperature: 385°C
Explosive limits, vol% in air: 6-35.6
Octanol/water partition coefficient as log Pow: -0.82/-0.66

Effects: The substance is of low toxicity to aquatic and terrestrial organisms.

ENVIRONMENTAL DATA	

N O T E S

Burns with nonluminous bluish flame. Depending on the degree of exposure, periodic medical examination is indicated.

Transport Emergency Card: TEC (R)-36
NFPA Code: H 1; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0057 **METHANOL**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

NITRIC ACID

*** CHEMICAL IDENTIFICATION ***

RTECS NUMBER : QU5775000
CHEMICAL NAME : Nitric acid
CAS REGISTRY NUMBER : 7697-37-2
LAST UPDATED : 199712
DATA ITEMS CITED : 43
MOLECULAR FORMULA : H-N-O3
MOLECULAR WEIGHT : 63.02
WISWESSER LINE NOTATION : H N-O3
COMPOUND DESCRIPTOR : Mutagen
Reproductive Effector
Human

SYNONYMS/TRADE NAMES :
* Acide nitrique
* Acido nitrico
* Aqua fortis
* Azotic acid
* Azotowy kwas
* Hydrogen nitrate
* Kyselina dusicne
* Nitric acid
* Salpetersaure
* Salpeterzuuroplossingen

*** HEALTH HAZARD DATA ***

** ACUTE TOXICITY DATA **

TYPE OF TEST : LDLo - Lowest published lethal dose
ROUTE OF EXPOSURE : Oral
SPECIES OBSERVED : Human
DOSE/DURATION : 430 mg/kg
TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
YAKUD5 Gekkan Yakuji. Pharmaceuticals Monthly. (Yakugyo Jihosha, Inaoka Bldg., 2-36 Jinbo-cho, Kanda, Chiyoda-ku, Tokyo 101, Japan) V.1- 1959- Volume(issue)/page/year: 22,651,1980

TYPE OF TEST : LDLo - Lowest published lethal dose
ROUTE OF EXPOSURE : Unreported
SPECIES OBSERVED : Human - man
DOSE/DURATION : 110 mg/kg
TOXIC EFFECTS :
Details of toxic effects not reported other than lethal dose value
REFERENCE :
85DCAI "Poisoning; Toxicology, Symptoms, Treatments," 2nd ed., Arena, J.M., Springfield, IL, C.C. Thomas, 1970 Volume(issue)/page/year: 2,73,1970

** OTHER MULTIPLE DOSE TOXICITY DATA **

TYPE OF TEST : TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - rat
DOSE/DURATION : 1071 ug/m3/24H/84D-C
TOXIC EFFECTS :
Behavioral - muscle contraction or spasticity
Kidney, Ureter, Bladder - other changes in urine composition
Biochemical - Enzyme inhibition, induction, or change in blood or tissue

levels - true cholinesterase
REFERENCE :
GISAAA Gigiena i Sanitariya. For English translation, see HYSAAV. (V/O Mezhdunarodnaya Kniga, 113095 Moscow, USSR) V.1- 1936-
Volume(issue)/page/year: 38(3),6,1973

TYPE OF TEST : TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE : Inhalation
SPECIES OBSERVED : Rodent - rat
DOSE/DURATION : 50 ug/m3/4H/3D-I
TOXIC EFFECTS :
Lungs, Thorax, or Respiration - respiratory depression
REFERENCE :
INHTE5 Inhalation Toxicology. (Hemisphere Publishing Corp., c/o Taylor & Francis Inc., 1900 Frost Rd., Suite 101, Bristol, PA 19007) V.1- 1989-
Volume(issue)/page/year: 8,595,1996

** REPRODUCTIVE DATA **

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Oral
SPECIES OBSERVED : Rodent - rat
DOSE : 21150 mg/kg
SEX/DURATION : female 1-21 day(s) after conception
TOXIC EFFECTS :
Reproductive - Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus)
REFERENCE :
ZHYGAM Zeitschrift fuer die Gesamte Hygiene und Ihre Grenzgebiete. (VEB Verlag Volk und Gesundheit, Neue Gruenstr. 18, Berlin DDR-1020, Ger. Dem. Rep.) V.1- 1955- Volume(issue)/page/year: 29,667,1983

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Oral
SPECIES OBSERVED : Rodent - rat
DOSE : 2345 mg/kg
SEX/DURATION : female 18 day(s) after conception
TOXIC EFFECTS :
Reproductive - Effects on Newborn - biochemical and metabolic
REFERENCE :
ZHYGAM Zeitschrift fuer die Gesamte Hygiene und Ihre Grenzgebiete. (VEB Verlag Volk und Gesundheit, Neue Gruenstr. 18, Berlin DDR-1020, Ger. Dem. Rep.) V.1- 1955- Volume(issue)/page/year: 29,667,1983

*** REVIEWS ***

ACGIH TLV-STEL 10 mg/m3 (4 ppm)
DTLVS* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: TLV/BEI,1997

ACGIH TLV-TWA 5.2 mg/m3 (2 ppm)
DTLVS* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: TLV/BEI,1997

TOXICOLOGY REVIEW
ANAEA3 Annals of Allergy. (American College of Allergists, POB 20671,

Bloomington, MN 55420) V.1- 1943- Volume(issue)/page/year: 35,165,1975

TOXICOLOGY REVIEW
ARTODN Archives of Toxicology. (Springer-Verlag, Heidelberger Pl. 3, D-1000 Berlin 33, Fed. Rep. Ger.) V.32- 1974- Volume(issue)/page/year: 39,299,1978

*** U.S. STANDARDS AND REGULATIONS ***

MSHA STANDARD-air:TWA 2 ppm (5 mg/m3)
DTLVS* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: 3,181,1971

OSHA PEL (Gen Indu):8H TWA 2 ppm (5 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 29,1910.1000,1994

OSHA PEL (Construc):8H TWA 2 ppm (5 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 29,1926.55,1994

OSHA PEL (Shipyard):8H TWA 2 ppm (5 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 29,1915.1000,1993

OSHA PEL (Fed Cont):8H TWA 2 ppm (5 mg/m3)
CFRGBR Code of Federal Regulations. (U.S. Government Printing Office, Supt. of Documents, Washington, DC 20402) Volume(issue)/page/year: 41,50-204.50,1994

*** OCCUPATIONAL EXPOSURE LIMITS ***

OEL-ARAB Republic of Egypt:TWA 2 ppm (5 mg/m3) JAN 1993

OEL-AUSTRALIA:TWA 2 ppm (5 mg/m3);STEL 4 ppm (10 mg/m3) JAN 1993

OEL-BELGIUM:TWA 2 ppm (5.2 mg/m3);STEL 4 ppm (10 mg/m3) JAN 1993

OEL-DENMARK:TWA 2 ppm (5 mg/m3) JAN 1993

OEL-FINLAND:TWA 2 ppm (5 mg/m3);STEL 5 ppm (13 mg/m3);Skin JAN 1993

OEL-FRANCE:TWA 2 ppm (5 mg/m3);STEL 4 ppm (10 mg/m3) JAN 1993

OEL-GERMANY:TWA 10 ppm (25 mg/m3) JAN 1993

OEL-HUNGARY:STEL 5 mg/m3 JAN 1993

OEL-JAPAN:TWA 2 ppm (5.2 mg/m3) JAN 1993

OEL-THE PHILIPPINES:TWA 2 ppm (5 mg/m3) JAN 1993

OEL-POLAND:TWA 10 mg/m3 JAN 1993

OEL-RUSSIA:TWA 2 ppm;STEL 2 mg/m3;Skin JAN 1993

OEL-SWEDEN:TWA 2 ppm (5 mg/m3);STEL 5 ppm (13 mg/m3) JAN 1993

OEL-SWITZERLAND:TWA 2 ppm (5 mg/m3);STEL 4 ppm (10 mg/m3) JAN 1993

OEL-THAILAND:TWA 2 ppm (5 mg/m3) JAN 1993

OEL-TURKEY:TWA 2 ppm (5 mg/m3) JAN 1993

OEL-UNITED KINGDOM:TWA 2 ppm (5 mg/m3);STEL 4 ppm (10 mg/m3) JAN 1993

OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV

OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGIH TLV

*** NIOSH STANDARDS DEVELOPMENT AND SURVEILLANCE DATA ***

NIOSH RECOMMENDED EXPOSURE LEVEL (REL) :
NIOSH REL TO NITRIC ACID-air:10H TWA 2 ppm;STEL 4 ppm
REFERENCE :
NIOSH* National Institute for Occupational Safety and Health, U.S. Dept. of Health, Education, and Welfare, Reports and Memoranda.
Volume(issue)/page/year: DHHS #92-100,1992

NIOSH OCCUPATIONAL EXPOSURE SURVEY DATA :
NOHS - National Occupational Hazard Survey (1974)
NOHS Hazard Code - 50742
No. of Facilities: 18088 (estimated)
No. of Industries: 197
No. of Occupations: 101
No. of Employees: 132401 (estimated)

NOES - National Occupational Exposure Survey (1983)
NOES Hazard Code - 50742
No. of Facilities: 18239 (estimated)
No. of Industries: 201
No. of Occupations: 120
No. of Employees: 297627 (estimated)
No. of Female Employees: 76316 (estimated)

*** STATUS IN U.S. ***

EPA GENETOX PROGRAM 1988, Negative: Cell transform.-SA7/SHE

EPA TSCA Section 8(b) CHEMICAL INVENTORY

EPA TSCA Section 8(d) unpublished health/safety studies

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JUNE 1998

NIOSH Analytical Method, 1994: Acids, inorganic, 7903

OSHA ANALYTICAL METHOD #ID-127

*** END OF RECORD ***

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the NIOSH Pocket Guide

SEARCH

Enter search terms separated by spaces.

Trichloroethylene

Synonyms & Trade Names Ethylene trichloride, TCE, Trichloroethene, Trilene

CAS No. 79-01-6	**RTECS No.** KX4550000 (/niosh-rtecs/KX456D70.html)	**DOT ID & Guide** 1710 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide160/) (http://www.cdc.gov/Other/disclaimer.html)
Formula $ClCH=CCl_2$	**Conversion** 1 ppm = 5.37 mg/m3	**IDLH** Ca [1000 ppm] See: 79016 (/niosh/idlh/79016.html)
Exposure Limits **NIOSH REL** : Ca See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) **OSHA PEL** † (nengapdxg.html) : TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)		**Measurement Methods** **NIOSH** 1022 (/niosh/docs/2003-154/pdfs/1022.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ; **OSHA** 1001 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.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 (unless dyed blue) with a chloroform-like odor.

MW: 131.4	**BP:** 189°F	**FRZ:** -99° F	**Sol:** 0.1%	**VP:** 58 mmHg	**IP:** 9.45 eV
Sp.Gr: 1.46	**Fl.P:** ?	UEL(77° F): 10.5%	LEL(77° F): 8%		

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

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

Symptoms irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

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

Cancer Site [in animals: liver & kidney cancer]

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:** Soap wash promptly

Wash skin: When contaminated **Remove:** When wet or contaminated **Change:** No recommendation **Provide:** Eyewash, Quick drench	**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: 0081 (/niosh/ipcsneng/neng0081.html) See MEDICAL TESTS: 0236 (/niosh/docs/2005-110/nmed0236.html)

Page last reviewed: April 4, 2011
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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

Material Safety Data Sheet
Trichloroethylene

ACC# 23850

Section 1 - Chemical Product and Company Identification

MSDS Name: Trichloroethylene
Catalog Numbers: AC158310000, AC158310025, AC421520000, AC421520040, AC421520200, AC421525000, 15831-0010, S80327ACS-1, S80327ACS-2, T340-4, T341-20, T341-4, T341-500, T341J4, T403-4
Synonyms: Ethylene trichloride; 1,1,2-Trichloroethylene; TCE.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-01-6	Trichloroethylene	99+	201-167-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 15 max liquid.
Warning! Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment. Breathing vapors may cause drowsiness and dizziness. Possible risks of irreversible effects. Cancer hazard. Causes eye and skin irritation. May cause respiratory tract irritation. May cause liver and kidney damage. May cause central nervous system effects.
Target Organs: Kidneys, central nervous system, liver, spleen, respiratory system, eyes, skin.

Potential Health Effects
Eye: Causes eye irritation. Contact with trichloroethylene causes pain but no permanent injury to the eyes. (Doc of TLV)
Skin: Causes skin irritation. May be harmful if absorbed through the skin.
Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed. May cause central nervous system effects.
Inhalation: May cause respiratory tract irritation. May cause liver and kidney damage. May be harmful if inhaled. May cause central nervous system effects. The chief symptoms of TCE exposure were found to be abnormal fatigue, irritability, headache, gastric disturbances, and intolerance to alcohol. (Doc to TLV)

Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. May cause liver and kidney damage. May cause cancer in humans. Repeated exposure may cause damage to the spleen. Adverse reproductive effects have been reported in animals. Laboratory experiments have resulted in mutagenic effects. Possible risk of irreversible effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: 410 deg C (770.00 deg F)
Explosion Limits, Lower:7.9 Vol %
Upper: 90 Vol %
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Do not get in eyes, on skin, or on clothing. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Store protected from light.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	10 ppm TWA; 25 ppm STEL	1000 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Trichloroethylene: 50 ppm TWA; 270 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear, colorless - APHA: 15 max

Odor: chloroform-like

pH: Not available.

Vapor Pressure: 77.3 mbar @ 20 deg C

Vapor Density: 4.5 (air=1)

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: 87 deg C @ 760 mmHg

Freezing/Melting Point:-86 deg C

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density:1.460

Molecular Formula:C2HCl3

Molecular Weight:131.39

Section 10 - Stability and Reactivity

Chemical Stability: Moisture sensitive. Light sensitive.

Conditions to Avoid: Incompatible materials, light, ignition sources, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Strong oxidizing agents, strong reducing agents, bases, active metals, metals and metal compounds (toxic, e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead).

Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-01-6: KX4550000
LD50/LC50:
CAS# 79-01-6:
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 2 mg/24H Severe;
Inhalation, mouse: LC50 = 8450 ppm/4H;
Inhalation, mouse: LC50 = 220000 mg/m3/20M;
Inhalation, mouse: LC50 = 262000 mg/m3/30M;
Inhalation, mouse: LC50 = 40000 mg/m3/4H;
Inhalation, rat: LC50 = 140700 mg/m3/1H;
Oral, mouse: LD50 = 2402 mg/kg;
Oral, mouse: LD50 = 2400 mg/kg;
Oral, rat: LD50 = 4920 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rabbit: LD50 = 20 mL/kg;

Carcinogenicity:
CAS# 79-01-6:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: Tumorigenic effects have been reported in experimental animals.
Teratogenicity: Teratogenic effects have occurred in experimental animals.
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 41-67 mg/L; 96 hrs.; LC50Daphnia: Daphnia: 2.2-100 mg/L; 48 hrs.; LC50Mollusk Shrimp: 2 mg/L; 96 hrs.; LC50 Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.
Environmental: In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly. Potential for mobility in soil is high.
Physical: No information available.
Other: Bioconcentration potential is low (BCF less than 100).

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations

to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 79-01-6: waste number U228.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TRICHLOROETHYLENE	TRICHLOROETHYLENE
Hazard Class:	6.1	6.1
UN Number:	UN1710	UN1710
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 79-01-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 79-01-6: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 79-01-6: immediate, delayed, reactive.
Section 313
This material contains Trichloroethylene (CAS# 79-01-6, 99+%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR
Clean Air Act:
CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 79-01-6 is listed as a Hazardous Substance under the CWA. CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 79-01-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 79-01-6: 50 æg/day NSRL (oral); 80 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 36/38 Irritating to eyes and skin.
R 45 May cause cancer.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 67 Vapours may cause drowsiness and dizziness.
R 68 Possible risk of irreversible effects.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada - DSL/NDSL

CAS# 79-01-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 79-01-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/01/1999
Revision #9 Date: 6/03/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Centers for Disease Control and Prevention
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Search the NIOSH Pocket Guide

SEARCH

Enter search terms separated by spaces.

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://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide160/) (http://www.cdc.gov/Other/disclaimer.html)
Formula $Cl_2C{=}CCl_2$	**Conversion** 1 ppm = 6.78 mg/m³	**IDLH** Ca [150 ppm] See: 127184 (/niosh/idlh/127184.html)
Exposure Limits **NIOSH REL** : Ca Minimize workplace exposure concentrations. See Appendix A (nengapdxa.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) 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 a mild, chloroform-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
165.8	250°F	-2°F	0.02%	14 mmHg	9.32 eV

Sp.Gr:	Fl.P:	UEL:	LEL:		
1.62	NA	NA	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]

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly

Eyes: Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated **Change:** No recommendation **Provide:** Eyewash, Quick drench	**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: 0076 (/niosh/ipcsneng/neng0076.html) See MEDICAL TESTS: 0179 (/niosh/docs/2005-110/nmed0179.html)

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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

CHEM SERVICE INC -- TETRACHLOROETHENE, 0-663 -- 6810-00N054677

========== Product Identification ==========

Product ID:TETRACHLOROETHENE, 0-663
MSDS Date:07/01/1988
FSC:6810
NIIN:00N054677
MSDS Number: BVYRL
=== Responsible Party ===
Company Name:CHEM SERVICE INC
Box:3108
City:WEST CHESTER
State:PA
ZIP:19381
Country:US
Info Phone Num:215-692-3026
Emergency Phone Num:215-692-3026
CAGE:84898
=== Contractor Identification ===
Company Name:CHEM SERVICE INC
Box:3108
City:WEST CHESTER
State:PA
ZIP:19381
Country:US
Phone:215-692-3026
CAGE:84898
Company Name:CHEM SERVICE, INC
Address:660 TOWER LN
Box:599
City:WEST CHESTER
State:PA
ZIP:19301-9650
Country:US
Phone:610-692-3026
CAGE:8Y898

========== Composition/Information on Ingredients ==========

Ingred Name:ETHYLENE, TETRACHLORO-; (TETRACHLOROETHYLENE) (SARA III)
CAS:127-18-4
RTECS #:KX3850000
OSHA PEL:25 PPM
ACGIH TLV:25 PPM;100 PPM STEL
EPA Rpt Qty:100 LBS
DOT Rpt Qty:100 LBS

Ingred Name:SUPP DATA: RESPS. IF PATIENT IS IN CARD ARREST ADMIN CPR.
CONTINUE LIFE SUPPORTING MEASURES UNTIL MED ASSIST HAS (ING 3)
RTECS #:9999999ZZ
OSHA PEL:N/K
ACGIH TLV:N/K

Ingred Name:ING 2: ARRIVED. INGESTION: CALL MD IMMEDIATELY .
RTECS #:9999999ZZ
OSHA PEL:N/K
ACGIH TLV:N/K

Ingred Name:EYE PROTECTION: FULL LENGTH FACESHIELD .
RTECS #:9999999ZZ
OSHA PEL:N/K
ACGIH TLV:N/K

========== Hazards Identification ==========

LD50 LC50 Mixture:LD50 (ORAL,RAT): 8850 MG/KG.
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:NO
Health Hazards Acute and Chronic:CONT LENSES SHOULD NOT BE WORN IN LAB. ALL CHEMS SHOULD BE CONSIDERED HAZ-AVOID DIRECT PHYS CONT! CAN BE HARMFUL IF ABSORB THRU SKIN. CAN BE HARMFUL IF INHALED. CAN BE FATAL IF ABSORB THRU SKIN! CAN B E FATAL IF INHALED! MAY BE FATAL IF SWALLOWED! SUSPECTED CARCIN-MAY PRDCE CANCER. LACHRYMATOR-CAUSES (EFTS OF OVEREXP)
Explanation of Carcinogenicity:TETRACHLOROETHYLENE: IARC MONOGRAPHS SUPP, VOL 7, PG 355, 1987: GRP 2B. NTP 7TH ANNUAL REPORT ON CARCINS, 1994: (SUPDAT)
Effects of Overexposure:HLTH HAZ: SEV EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE EYE IRRIT. VAPS &/OR DIRECT EYE CONT CAN CAUSE SEV EYE BURNS. CAN CAUSE EYE IRRIT. CAN CAUSE SKIN IRRIT. CAN CAUSE SKIN BURNS. CAN CAUSE SEV SKIN BURNS. CAN BE HARMFUL IF SWALLOWED. CAN CAUSE LIVER INJ. CAN CAUSE KIDNEY INJ. (SUPDAT)
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:AN ANTIDOTE IS SUBSTANCE INTENDED TO COUNTERACT EFT OF POIS. IT SHOULD BE ADMIN ONLY BY PHYS/TRAINED EMER PERS. MED ADVICE CAN BE OBTAINED FROM POIS CNTRL CNTR. EYE: FLUSH CONTINUOUSLY W/WATER FOR AT LST 15-20 MINS. SKIN: FLUSH W/WATER FOR15-20 MINS. IF NO BURNS HAVE OCCURRED-USE SOAP & WATER TO CLEANSE SKIN. INHAL: REMOVE PATIENT TO FRESH AIR. ADMIN OXYGEN IF PATIENT IS HAVING DFCLTY (SUPDAT)

========== Fire Fighting Measures ==========

Flash Point:NON-FLAMMABLE
Extinguishing Media:CARBON DIOXIDE, DRY CHEMICAL POWDER OR SPRAY.
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT .
Unusual Fire/Explosion Hazard:NONE SPECIFIED BY MANUFACTURER.

========== Accidental Release Measures ==========

Spill Release Procedures:EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE OR SIMILAR MATERIAL. SWEEP UP AND PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATE D SURFACES TO REMOVE ANY RESIDUES.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:AVOID CONTACT WITH SKIN, EYES AND CLOTHING. KEEP TIGHTLY CLOSED IN COOL DRY PLACE. STORE ONLY WITH COMPATIBLE CHEMICALS.
Other Precautions:NONE SPECIFIED BY MANUFACTURER.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:WEAR NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN .
Ventilation:CHEMICAL SHOULD BE HANDLED ONLY IN HOOD.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:ANSI APPRVD CHEM WORKERS GOGG & (ING 4)
Other Protective Equipment:USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.EMER EYEWASH & DELUGE SHOWER WHICH MEET ANSI DESIGN CRITERIA .
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
EXPLAN OF CARCIN: ANTIC TO BE CARCIN. ANIMAL: LIVER TUMORS. EFTS OF OVEREXP: CAN BE IRRIT TO MUC MEMB. PRLNGD EXPOS MAY CAUSE NAUS/HDCH, DIZZ &/OR EYE DMG. AVOID CONSUMPTION OF ALCOHOL BEFORE & AFTER HNDLG OF CMPD BECAUSE IT WILL INCR TOX OF CMPD. FIRST AID PROC: BRTHG. IF PATIENT HAS STOPPED BRTHG ADMIN ARTF (ING 2)

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:250F,121C
Melt/Freeze Pt:M.P/F.P Text:71.6F,22C
Vapor Pres:14 @ 20C
Spec Gravity:1.623
Solubility in Water:INSOLUBLE
Appearance and Odor:COLORLESS LIQUID.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG BASES, OXIDIZING AGENTS.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:DECOMPOSITION LIBERATES TOXIC FUMES. DECOMPOSITION PRODUCTS ARE CORROSIVE.

========== Disposal Considerations ==========

Waste Disposal Methods:BURN IN CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS .

International Chemical Safety Cards

SODIUM HYDROXIDE

ICSC: 0360

SODIUM HYDROXIDE
Caustic soda
Sodium hydrate
Soda lye
NaOH
Molecular mass: 40.0

CAS # 1310-73-2
RTECS # WB4900000
ICSC # 0360
UN # 1823
EC # 011-002-00-6

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Contact with moisture or water may generate sufficient heat to ignite combustible substances (see Notes).		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**	Corrosive. Burning sensation. Cough. Laboured breathing.	Local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	Corrosive. Redness. Serious skin burns. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
• **EYES**	Corrosive. Redness. Pain. Blurred vision. Severe deep burns.	Face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Corrosive. Abdominal pain. Burning sensation. Collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into suitable containers. Wash away remainder	Separated from strong acids, metals, food and feedstuffs, combustible	Do not transport with food and feedstuffs.

with plenty of water (extra personal protection: complete protective clothing including self-contained breathing apparatus).	materials. Dry. Well closed (see Notes).	C symbol R: 35 S: 2-26-37/39 UN Hazard Class: 8 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0360

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

SODIUM HYDROXIDE

ICSC: 0360

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
WHITE, DELIQUESCENT SOLID IN VARIOUS FORMS WITH NO ODOUR.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance is a strong base, it reacts violently with acid and is corrosive in moist air to metals like zinc, aluminum, tin and lead forming a combustible/explosive gas (hydrogen) - see ICSC 0001). Attacks some forms of plastics, rubber or coatings. Rapidly absorbs carbon dioxide and water from air. Contact with moisture or water may generate heat.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: ppm; 2 mg/m^3 (ceiling values) (ACGIH 1993-1994).
PDK not established.
MAK: ppm; 2 mg/m^3; I (1992).
MAK: class G (1992).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:
Corrosive. The substance is very corrosive to the eyes, the skin and the respiratory tract. Corrosive on ingestion. Inhalation of an aerosol of the substance may cause lung oedema (see Notes).

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis.

PHYSICAL PROPERTIES

Boiling point: 1390°C
Melting point: 318°C
Relative density (water = 1): 2.1
Solubility in water, g/100 ml at 20°C: 109
Vapour pressure, kPa at 739°C: 0.13

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to water organisms.

NOTES

The applying occupational exposure limit value should not be exceeded during any part of the working exposure. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. NEVER pour water into this substance; when dissolving or diluting always add it slowly to the water. Store in an area having corrosion resistant concrete floor.

Transport Emergency Card: TEC (R)-121
NFPA Code: H 3; F 0; R 1;

ADDITIONAL INFORMATION

ICSC: 0360 **SODIUM HYDROXIDE**

CHEMETRICS INC -- SODIUM HYDROXIDE -- 6550-00F030808

========== Product Identification ==========

Product ID:SODIUM HYDROXIDE
MSDS Date:12/17/1991
FSC:6550
NIIN:00F030808
Kit Part:Y
MSDS Number: BSLXB
=== Responsible Party ===
Company Name:CHEMETRICS INC
Address:RT 28
City:CALVERTON
State:VA
ZIP:22016
Country:US
Info Phone Num:800-356-3072/703-788-9026
Emergency Phone Num:800-356-3072/703-788-9026
CAGE:7K791
=== Contractor Identification ===
Company Name:CHEMETRICS INC
Address:ROUTE 28
Box:City:CALVERTON
State:VA
ZIP:22016
Country:US
Phone:800-356-3072; 540-788-9026
CAGE:7K791

========== Composition/Information on Ingredients ==========

Ingred Name:SODIUM HYDROXIDE, CAUSTIC SODA, LYE
CAS:1310-73-2
RTECS #:WB4900000
Other REC Limits:2MG/M3 CEILING NIOSH
OSHA PEL:2 MG/CUM
ACGIH TLV:2 MG/CUM CEILING
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

========== Hazards Identification ==========

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:MUCOUS MEMBRANE IRRITANT. SKIN: SEVERE
IRRITATION, SENSITIZATION, DERMATITIS & BURNS. EYES: IRRITATION,
CONJUNCTIVITIS & BURNS. INGESTION: DAMAGE TO MUCOUS MEMBRANES OR
TISSUES.
Explanation of Carcinogenicity:NONE

========== First Aid Measures ==========

First Aid:SKIN: WASH W/SOAP OR MILD DETERGENT & PLENTY OF WATER. EYES:
FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MINS. INGESTION: IF
CONSCIOUS & NOT CONVULSING, IMMEDIATELY GIVE PLENTY OF WATER. DON'T
INDUCE VOMI TING. OBTAIN MEDICAL ATTENTION IN ALL CASES.

========== Fire Fighting Measures ==========

Flash Point:NON-FLAMMABLE
Extinguishing Media:DRY CHEMICAL, CO2, WATER SPRAY OR FOAM
Unusual Fire/Explosion Hazard:MAY RELEASE TOXIC FUMES OF SODIUM OXIDE, WHICH CAN REACT W/WATER OR STEAM TO PRODUCE HEAT & FLAMMABLE HYDROGEN VAPORS.

========== Accidental Release Measures ==========

Spill Release Procedures:DON'T TOUCH MATERIAL. TAKE UP W/SAND OR OTHER ABSORBENT MATERIAL & PLACE INTO SMALL CONTAINERS FOR DISPOSAL.

========== Exposure Controls/Personal Protection ==========

Ventilation:ADEQUATE
Protective Gloves:REQUIRED
Eye Protection:SAFETY GLASSES
Supplemental Safety and Health
MOLECULAR WEIGHT: 40. PRODUCT IS HYGROSCOPIC.

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:2534F/1390C
Melt/Freeze Pt:M.P/F.P Text:605F/318C
Vapor Pres:42
Spec Gravity:2.1
Solubility in Water:APPRECIABLE
Appearance and Odor:HYGROSCOPIC SOLID, WHITE

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
WATER, STREAM
Hazardous Decomposition Products:SODIUM OXIDE, FLAMMABLE HYDROGEN VAPORS

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSE OF IN ACCORDANCE W/LOCAL, STATE, & FEDERAL REGULATIONS.

MATHESON GAS PRODUCTS -- VINYL CHLORIDE -- 6810-00N034925

========== Product Identification ==========

Product ID:VINYL CHLORIDE
MSDS Date:10/01/1985
FSC:6810
NIIN:00N034925
MSDS Number: BQCBT
=== Responsible Party ===
Company Name:MATHESON GAS PRODUCTS
Address:932 PATTERSON PLANK RD
City:EAST RUTHERFORD
State:NJ
ZIP:07073
Country:US
Info Phone Num:201-933-2400
Emergency Phone Num:201-933-2400
CAGE:0FB11
=== Contractor Identification ===
Company Name:MATHESON GAS PRODUCTS
Address:30 SEAFIEW DRIVE
Box:City:SEACAUCUS
State:NJ
ZIP:07096
Country:US
Phone:201-867-4100, CHEMTREC 800-424-9300
CAGE:0FB11

========== Composition/Information on Ingredients ==========

Ingred Name:ETHYLENEM, CHLORO-; (VINYL CHLORIDE) (SARA III)
CAS:75-01-4
RTECS #:KU9625000
OSHA PEL:SEE 1910.1017
ACGIH TLV:5 PPM, A1; 9293
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

========== Hazards Identification ==========

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.
Routes of Entry: Inhalation:YES Skin:NO Ingestion:YES
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:YES
Health Hazards Acute and Chronic:ACUTE:INHAL MAY CAUSE DROWS, BLURRED
VISION, STAG GAIT, & TINGLING & NUMBNESS IN THE FEET & HANDS. IN
HIGH CONC VINYL CHLORIDE ACTS AS AN ANESTHETIC. CONTACT WITH LIQ
VINYL CHLORIDE MAY CAUSE SEVERE I RRITATION & BURNS. CHRONIC: VINYL
CHLORIDE IS A RECOGNIZED CARCINOGEN & HAS CAUSED CANCER IN
MAN.(EFTS OF OVEREXP)
Explanation of Carcinogenicity:VINYL CHLORIDE: KNOWN CARCINOGEN (NTP),
GROUP 1 (IARC); OSHA REGULATED
Effects of Overexposure:SEE HEALTH HAZARDS.
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:INHAL: MOVE VICTIM TO FRESH AIR. IF NOT BRTHG, GIVE ARTF
RESP. IF BRTHG IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

EYE/SKIN: IMMED FLUSH EYE/SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MIN. REMOVE CON TAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN. INGEST: GET MD IMMEDIATELY . NOTE: SKIN BURNS CAN BE TREATED BY THE APPLICATION OF MAGNESIUM PASTE (MAGNESIUM OXIDE AND GLYCERINE).

========== Fire Fighting Measures ==========

Lower Limits:4%
Upper Limits:22%
Extinguishing Media:TO EXTING A VINYL CHLORIDE FIRE STOP THE FLOW OF GAS. IF THE FLOW CANNOT BE STOPPED, LET THE FIRE BURN ITSELF(SUPP DATA)
Fire Fighting Procedures:FIRE FIGHTERS MUST WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT . FIREIGHTERS TURNOUT GEAR IS INADEQUATE.
Unusual Fire/Explosion Hazard:CYLINDERS THAT ARE EXPOSED TO FIRE MAY RUPTURE WITH VIOLENT FORCE. EXTING SURROUNDING FIRE & KEEP CYLINDERS COOL USING A WATER SPRAY APPLIED FROM THE(SUPP DATA)

========== Accidental Release Measures ==========

Spill Release Procedures:EVACUATE AREA. PERSONNEL EQUIPPED W/SPECIAL PERSONAL PROTECTIVE SUITS FOR FIRE/CHEMICALS AND POSITIVE PRESSURE NIOSH/MSHA APPROVED SCBA CAN RE-ENTER THE AREA AND ATTEMPT TO STOP LEAK.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:CYLINDERS SHOULD BE STORED AND USED IN DRY, WELL VENT AREAS AWAY FROM SOURCES OF HEAT OR IGNITION. DO NOT STORE WITH OXIDIZERS.
Other Precautions:BEFORE USING: 1)SECURE CYLINDER TO PVNT IT FROM FALLING OR BEING KNOCKED OVER. 2) INSTALL CHECK VALVES/TRAPS TO PVNT SUCKBACK TO CYLNDER. 3)LEAK CHECK LINES & EQUIP. 4) HAVE APPRVD RESP PROT & OTHER P ROT EQUIP. 5) HAVE AN EMER (SUPP DAT

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:NIOSH/MSHA APPROVED POSITIVE PRESSURE SCBA SHOULD BE WORN IF IT IS SUSPECTED THAT VINYL CHLORIDE IS IN THE AIR.
Ventilation:NONE SPECIFIED BY MANUFACTURER.
Protective Gloves:IMPERVIOUS GLOVES.
Eye Protection:CHEM WORK GOGG/FULL LENGTH FSHLD .
Other Protective Equipment:EYE WASH STATIONS & SAFETY SHOWERS READILY AVAILABE.
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
EXTING MEDIA:OUT WHILE COOLING CYLINDER & SURROUNDINGS USING A H*2O SPRAY. EXPLO HAZ:MAX POSS DISTANCE. FLAMM & TOX GASES MAY SPREAD FROM A SPILL AFTER FIRE IS EXTING & BE SUBJECT TO REIGNIT. THERMAL DECOMP PRODS MAY INCL HCL & PHOSGENE . OTHER PREC: PLAN COVERING STEPS TO BE TAKEN IN CASE OF ACCIDENTAL RELEASE.

========== Physical/Chemical Properties ==========

HCC:G2
Boiling Pt:B.P. Text:7.2F,-13.8C
Melt/Freeze Pt:M.P/F.P Text:-245F,-154C

Vapor Pres:234KPA@21C
Spec Gravity:2.21
Solubility in Water:1.07 CM3/1 ML H*2O
Appearance and Odor:COLORLESS, HIGHLY FLAMM GAS WITH A PLEASANT, SWEET ODOR AT HIGH CONC.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
OXIDIZING MATLS, ACTIVE METALS, ALUMINUM ALLOYS AND ORGANOMETALLICS.
Stability Condition to Avoid:AVOID EXPOSURE TO SUNLIGHT, HEAT, AIR, OXYGEN PEROXIDES AND OTHER STRONG OXIDIZING AGENTS.
Hazardous Decomposition Products:HYDROGEN CHLORIDE, PHOSGENE, CARBON MONOXIDE.
Conditions to Avoid Polymerization:OXYGEN (AIR), HEAT, SUNLIGHT, MOISTURE AND FREE RADICAL INITIATORS OR OTHER CATALYTIC MATERIALS.

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS .

APPENDIX D

SITE SPECIFIC MONITORING RESULTS

SITE SPECIFIC MONITORING RESULTS

Former Advance Plating 1005 E. Sumner Avenue Indianapolis, Marion County, Indiana			
Instruments	**Date/Time**	**Reading**	**Location**
Not required for proposed work Activities			

APPENDIX E

SAFETY PLAN AMENDMENTS

SAFETY PLAN AMENDMENTS

Site Name:	Former Advance Plating	**Date of Plan Amendment:**	
Scope of Work Change/Amendment/Update/Modification Made to the Plan:			
Reason For Change:			
Hazard Evaluation:			
Level of Protection:			
Air Monitoring:			
Person Requesting Change:			
Person Approving Change:			
Title:			
Printed Name:			
Signature & Date:			
Date Approved:			

SAFETY PLAN AMENDMENTS

Site Name:	Former Advance Plating	**Date of Plan Amendment:**	
Scope of Work Change/Amendment/Update/Modification Made to the Plan:			
Reason For Change:			
Hazard Evaluation:			
Level of Protection:			
Air Monitoring:			
Person Requesting Change:			
Person Approving Change:			
Title:			
Printed Name:			
Signature & Date:			
Date Approved:			

SAFETY PLAN AMENDMENTS

Site Name:	Former Advance Plating	**Date of Plan Amendment:**	
Scope of Work Change/Amendment/Update/Modification Made to the Plan:			
Reason For Change:			
Hazard Evaluation:			
Level of Protection:			
Air Monitoring:			
Person Requesting Change:			
Person Approving Change:			
Title:			
Printed Name:			
Signature & Date:			
Date Approved:			

APPENDIX F

HEALTH AND SAFETY PLAN SIGN-OFF LOG

HEALTH AND SAFETY PLAN SIGN-OFF LOG

I have read this Site Health and Safety Plan and understand it. I agree, to the best of my ability, to conduct activities as specified, giving health and safety concerns the highest priority.

PRINTED NAME	SIGNATURE	COMPANY NAME	DATE

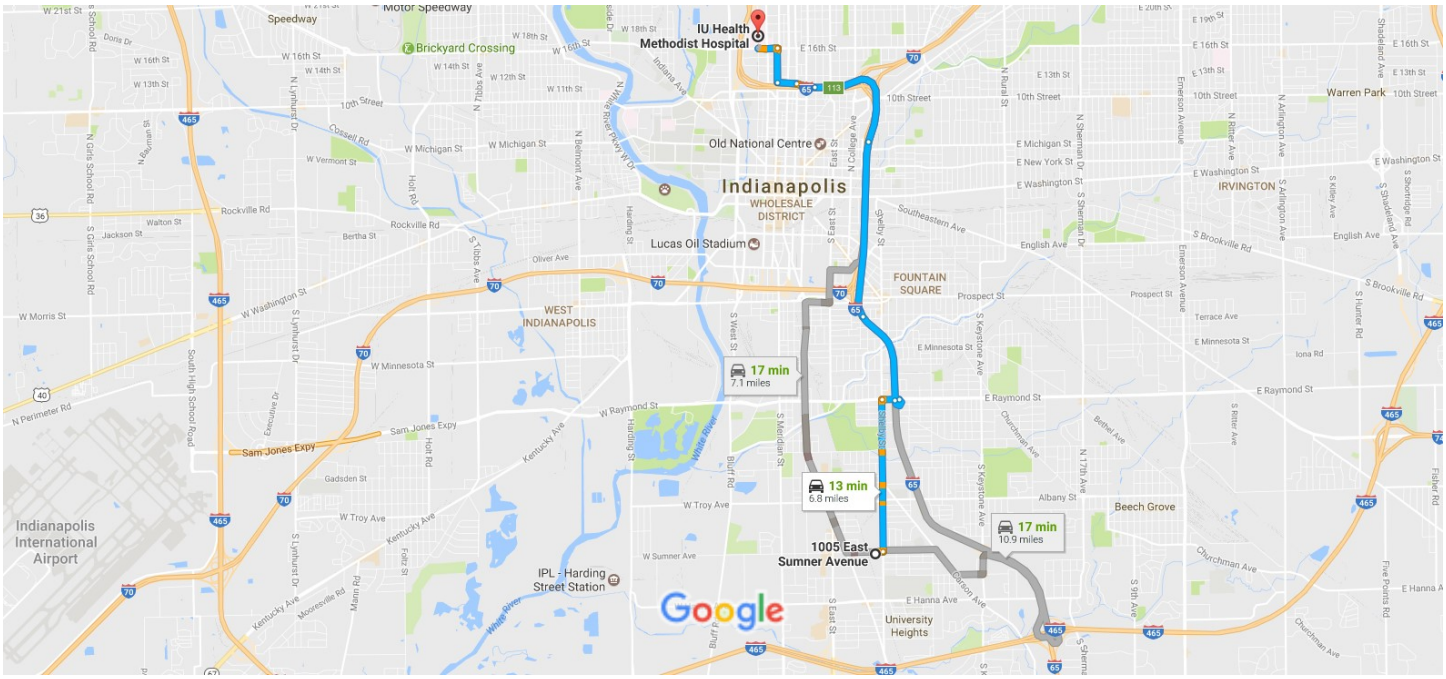
APPENDIX G

HOSPITAL AND/OR LOCAL MEDICAL PROVIDER MAPS

Google Maps

1005 E Sumner Ave, Indianapolis, IN to IU Health Methodist Hospital

Drive 6.8 miles, 13 min



Map data ©2016 Google 1 mi

1005 East Sumner Avenue

Indianapolis, IN 46227

Get on I-65 N in Center Township from Shelby St

6 min (1.9 mi)

1. Head east on E Sumner Ave toward Shelby St

427 ft

2. Turn left onto Shelby St

1.5 mi

3. Turn right onto E Raymond St

0.2 mi

4. Turn right onto the Interstate 65 N ramp

0.2 mi

Follow I-65 N to E 12th St. Take exit 113 from I-65 N

5 min (4.1 mi)

5. Merge onto I-65 N

1.0 mi

6. Keep right to stay on I-65 N

1.8 mi

7. Keep left at the fork to stay on I-65 N, follow signs for Interstate 65 N/Chicago

1.2 mi

8. Take exit 113 toward Meridian St/Pennsylvania Street

0.2 mi

Take N Illinois St to W 16th St

3 min (0.7 mi)

9. Continue onto E 12th St

0.2 mi

10. Turn right onto N Illinois St

0.3 mi

11. Turn left onto W 16th St

0.2 mi

IU Health Methodist Hospital

1701 Senate Boulevard, Indianapolis, IN 46202

APPENDIX B

SUBCONTRACTOR INJECTION PROPOSAL

REGENESIS

Technology-Based Solutions for the Environment

PROJECT NAME

Advance Plating

1005 E Sumner Ave, Indianapolis, IN 46227

PREPARED FOR

IWM Consulting Group

Brad Gentry
bgentry@iwmconsult.com

PREPARED BY

REGENESIS

Brett Hicks
bhicks@regenesis.com

Keith Gaskill
kgaskill@regenesis.com

April 23, 2024

Project Summary

REGENESIS appreciates the opportunity to provide IWM Consulting Group our remedial design and cost estimate for the Advance Plating project. This proposal includes an overview of our proposed solution, the project goals, technologies proposed, application design summary table and a treatment area map.

Proposed Solution

We propose a two-phase solution for this site. The first is the mass treatment of the plume in two areas. Area A and Area B will be treated with 3DME/S-MZVI/BDI+. Area A will be 17,200 square-feet and was designed as an extended grid (multiple barriers) with 8-foot spacing of points within the rows and 20-foot spacing between the rows (795 barrier feet). Area B will be 34,100 square-feet and was design as an extended grid (multiple barriers) with 8-foot spacing of points within rows and 20 foot spacing between rows (1,730 barrier feet). The second phase is to install two PlumeStop/S-MZVI barriers. Barrier A is on the upgradient property boundary to control the influx of plume mass from upgradient sources. Barrier A is 300 feet long treating 12-19 feet below grade. Barrier C is on the downgradient property boundary to control the migration of any contaminant mass offsite to the downgradient properties.

Project Goals

- Eliminate migration of upgradient plume onsite
- Reduce source area mass
- Eliminate downgradient migration of plume

Technologies Proposed

- 3-D Microemulsion
- Bio-Dechlor INOCULUM® Plus (BDI Plus)
- S-MicroZVI®
- PlumeStop®

Click above to access product specification sheets

Design Summary

Design Parameters	Unit	Value
Treatment Type		Barrier
Distance Perpendicular to Flow (ft)		795
Top Application Depth (ft bgs)		10
Vertical Treatment Interval	ft	10
Porosity	cm3/cm3	0.40
Application Summary		
Spacing Within Rows (ft)		8
Number of Rows		10
DPT Injection Points		99
RRS Application Days onsite		**5**
Product Dosage		
3DME to be Applied	lbs	6,000
S-MZVI to be Applied	lbs	4,500
BDI Plus to be Applied	L	37
CRS to be Applied	lbs	
Water Required	gallons	9,011
Total Volume Applied	gallons	9,587

Design Parameters	Unit	Value
Treatment Type		Barrier
Distance Perpendicular to Flow (ft)		1,730
Top Application Depth (ft bgs)		10
Vertical Treatment Interval	ft	10
Porosity	cm3/cm3	0.40
Application Summary		
Rows (ft)		8
s		10
oints		216
RRS Application Days onsite		**12**
oduct Dosage		
3DME to be Applied	lbs	12,000
S-MZVI to be Applied	lbs	9,000
BDI Plus to be Applied	L	79
CRS to be Applied	lbs	
Water Required	gallons	18,023
Total Volume Applied	gallons	19,173

Project Info		
Advanced Plating		
Indianapolis, IN		
PlumeStop Barrier A		
Prepared For:		
Bill Ackland (IWM)		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Barrier Length	ft	300
Top Treat Depth	ft	12.0
Bot Treat Depth	ft	19.0
Vertical Treatment Interval	ft	7.0
Treatment Zone Volume	ft^3	16,800
Treatment Zone Volume	cy	622
Soil Type	---	sand
Porosity	cm^3/cm^3	0.33
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	41,472
Treatment Zone Effective Pore Volume	gals	25,135
Treatment Zone Pore Volume	liters	156,988
Treatment Zone Effective Pore Volume	liters	95,144
Fraction Organic Carbon (foc)	g/g	0.002
Soil Density	g/cm^3	1.7
Soil Density	lb/ft^3	103
Soil Weight	lbs	1.7E+06
Hydraulic Conductivity	ft/day	23.0
Hydraulic Conductivity	cm/sec	8.11E-03
Hydraulic Gradient	ft/ft	0.003
GW Velocity	ft/day	0.35
GW Velocity	ft/yr	126

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**6,400**
S-MZVI to be Applied	**lbs**	**2,000**

PlumeStop® Application Design Summary

PlumeStop Barrier A

PlumeStop + S-MZVI	
Treatment Type	**Barrier**
Distance Perpendicular to Flow (ft)	300
Spacing Within Rows (ft)	5
Number of Rows	1
DPT Injection Points	**60**
Top Application Depth (ft bgs)	12
Bottom Application Depth (ft bgs)	19
PlumeStop to be Applied (lbs)	**6,400**
PlumeStop to be Applied (gals)	710
In Situ Chemical Reduction - S-MZVI	
S-MZVI to be added to PlumeStop (lbs)	**2,000**
S-MZVI to be added to PlumeStop (gals)	132
PlumeStop + S-MZVI Volume Totals	
Mixing Water (gal)	14,628
Total Application Volume (gals)	**15,488**
Injection Volume per Point (gals)	258

Technical Notes

Estimated Application Days
7.0

Special Instructions:

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s). The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the Government.

Prepared by: Keith M Gaskill, LPG, Sr Design Specialist
Date: 4/23/2024

Project Info		
Advanced Plating		
Indianapolis, IN		
PlumeStop Barrier C		
Prepared For:		
Bill Ackland (IWM)		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Barrier Length	ft	210
Top Treat Depth	ft	12.0
Bot Treat Depth	ft	19.0
Vertical Treatment Interval	ft	7.0
Treatment Zone Volume	ft^3	11,760
Treatment Zone Volume	cy	436
Soil Type	---	sand
Porosity	cm^3/cm^3	0.33
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	29,030
Treatment Zone Effective Pore Volume	gals	17,594
Treatment Zone Pore Volume	liters	109,892
Treatment Zone Effective Pore Volume	liters	66,601
Fraction Organic Carbon (foc)	g/g	0.002
Soil Density	g/cm^3	1.7
Soil Density	lb/ft^3	103
Soil Weight	lbs	1.2E+06
Hydraulic Conductivity	ft/day	23.0
Hydraulic Conductivity	cm/sec	8.11E-03
Hydraulic Gradient	ft/ft	0.003
GW Velocity	ft/day	0.35
GW Velocity	ft/yr	126

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**4,400**
S-MZVI to be Applied	**lbs**	**2,000**

PlumeStop® Application Design Summary

PlumeStop Barrier C

PlumeStop + S-MZVI	
Treatment Type	**Barrier**
Distance Perpendicular to Flow (ft)	210
Spacing Within Rows (ft)	5
Number of Rows	1
DPT Injection Points	**42**
Top Application Depth (ft bgs)	12
Bottom Application Depth (ft bgs)	19
PlumeStop to be Applied (lbs)	**4,400**
PlumeStop to be Applied (gals)	488
In Situ Chemical Reduction - S-MZVI	
S-MZVI to be added to PlumeStop (lbs)	**2,000**
S-MZVI to be added to PlumeStop (gals)	132
PlumeStop + S-MZVI Volume Totals	
Mixing Water (gal)	10,057
Total Application Volume (gals)	**10,695**
Injection Volume per Point (gals)	255

Technical Notes

Estimated Application Days
5.0

Special Instructions:

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

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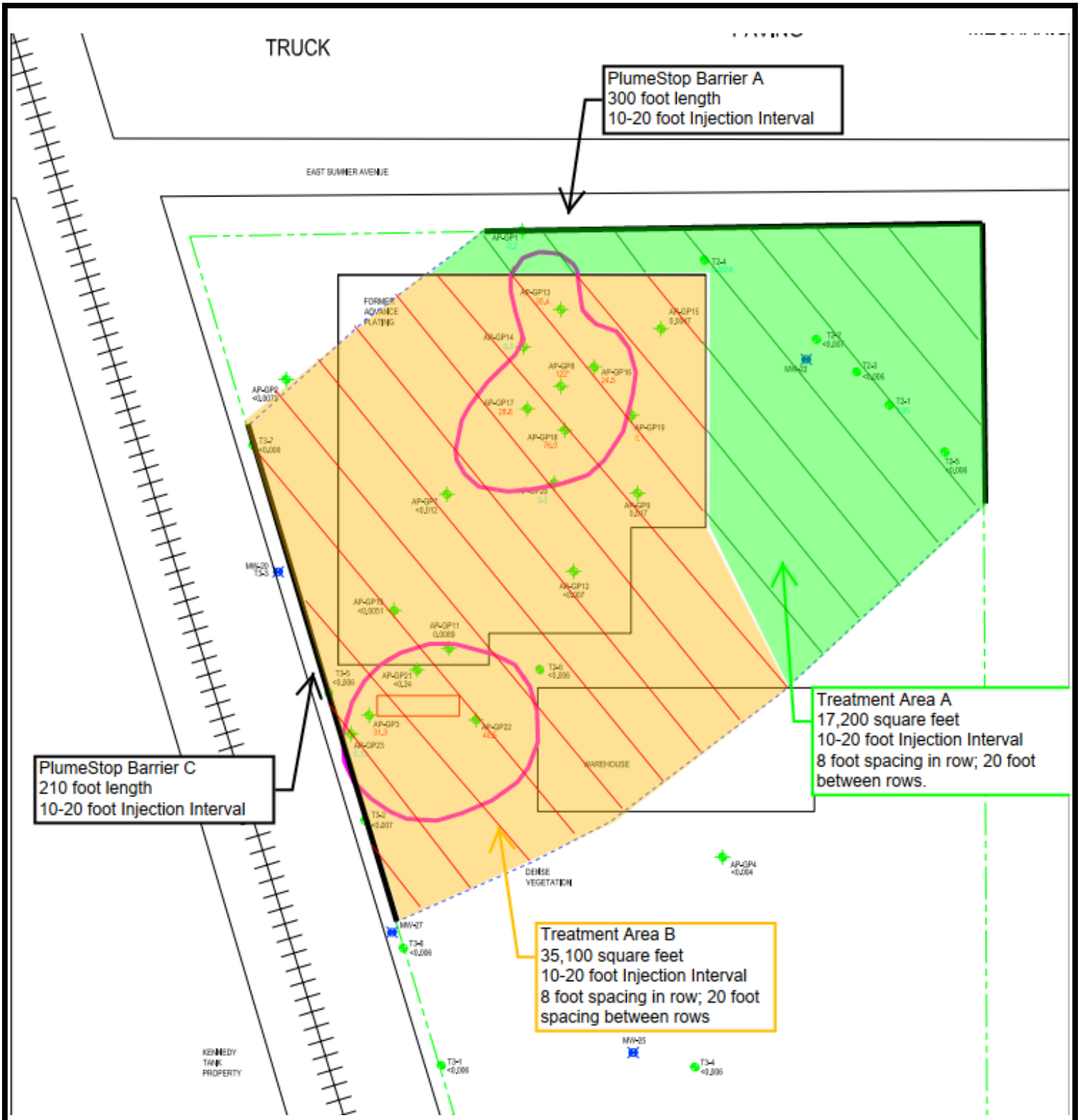
Prepared by: Keith M Gaskill, LPG, Sr Design Specialist
Date: 4/23/2024



Advance Plating

IWM Consulting Group

April 23, 2024

Figure 1-Treatment Area Map

REGENESIS

Technology-Based Solutions for the Environment

Technical Approach

Area A and Area B: This approach combines both biological enhanced reductive dechlorination (ERD) and abiotic in-situ chemical reduction (ISCR) degradation pathways for rapid reduction of chlorinated solvents. The self-distributing features of 3-D Microemulsion® (3DME) combined with its longevity (several years) allow for sufficient coverage with minimal pore volume displacement thereby minimizing application costs. Our colloidal zero-valent iron (ZVI) product, Sulfidated-MicroZVI (S-MicroZVI®), will provide a source of iron, creating conditions for abiotic reduction via the formation of iron sulfides, oxides, and hydroxides, while also maintaining strongly reducing conditions in the treatment area for an extended timeframe. This will foster rapid abiotic reduction of chlorinated solvents while reducing the potential for daughter product formation compared to a standard in-situ bioremediation approach. Bio-Dechlor INOCULUM® Plus (BDI Plus) is added to provide a live microbial culture that is known to fully degrade these compounds.

Barrier A and Barrier C: We are proposing the application of PlumeStop® Liquid Activated Carbon™ (PlumeStop) and Sulfidated-Micro Zero Valent Iron (S-MicroZVI®) to treat residual chlorinated solvents. Together, these technologies will foster rapid concentration reductions and provide long-term treatment of the target compounds through sorption plus abiotic destructive pathways, while minimizing the potential for daughter product formation. PlumeStop is a colloidal form of activated carbon with a surface treatment which reduces its interactions with the soil matrix. This allows it to move through soil pores leaving a coating on the soil matrix as it distributes from the injection point. This provides a very large sorption surface which will result in immediate reduction of these contaminants while concentrating contaminants to allow for more efficient and controlled remediation through destructive technologies. S-MicroZVI is a concentrated suspension of sulfidated, colloidal zero-valent iron, designed for enhanced, long-lasting reactivity and ease of application relative to other forms of ZVI. When applied to the subsurface it imparts an in-situ chemical reduction (ISCR) mechanism that allows for the direct destruction of chlorinated ethenes (i.e. TCE) via abiotic degradation pathways, which minimizes the formation of daughter products such as vinyl chloride. Sulfidation of the ZVI surface significantly decreases the reaction that occurs between water and the ZVI particles, allowing the reagent to be more effective for the chemical reduction of chlorinated ethenes.

TECHNICAL BULLETINS

- PlumeStop® Technical Bulletin 2.1: Sorption of Contaminants from Solution
- PlumeStop® Technical Bulletin 2.2: Sorption of Contaminants from Solution-Column Study
- PlumeStop® Technical Bulletin 3.1 Post-Sorption Contaminant Biodegradation
- PlumeStop® Technical Bulletin 4.1: Regeneration of Sorptive Capacity
- PlumeStop® Technical Bulletin 6.1: Treatment Solution of Back Diffusion-Tank Study
- 3-D Microemulsion® Technical Bulletin: Micelluar Distribution
- 3-D Microemulsion® Technical Bulletin: Subsurface Transport
- S-MicroZVI® Technical Bulletin: Benefits of Sulfidation
- S-MicroZVI® SDS

CASE STUDIES

- PlumeStop Case Study-Michigan Plating Facility
- PlumeStop® Case Study: Site Goals Achieved Within 2 Months at Manufacturing Facility
- 3-D Microemulsion® Case Study: Combined Remedy Protects Michigan Neighborhood
- 3-D Microemulsion® Case Study: EISB Approach at Aerospace Site
- 3-D Microemulsion® Case Study: Successful treatment at Dry Cleaners Site
- S-MicroZVI® Case Study: Tinker AFB

Performance Monitoring

To measure performance at your site, we recommend the following analytical parameters be collected at key wells within the zone of influence of treatment.

In-Situ Anaerobic Bioremediation Performance Monitoring Parameters	
Analytical Parameter	**Method**
Contaminants of Concern (COC's)	Varies
pH	Meter reading taken in flow-through cell (DO can also be measured with a Hach kit)
Dissolved Oxygen (DO)	
Oxidation Reduction Potential (ORP)	
Total Fe	Colorimetric Hach Method or EPA 6000 series with filtered and unfiltered samples
Total Mn	
Dissolved Fe	
Dissolved Mn	
Sulfate	EPA 375.3 or EPA 9056
Sulfide	EPA 376.1
Nitrate	EPA 353.1 or EPA 9056
Total Organic Carbon (TOC)	EPA 415.1 or EPA 9060
Alkalinity	EPA 310.2
Chloride	EPA 300
Methane, Ethane, Ethene, CO2	ASTM D1945

Placement Validation

Placement Validation (PV) seeks to evaluate that the designed injection point spacing and volumes are adequate to achieve proper distribution within the target treatment zone. Evaluation will be based on the reagent fluid monitoring at nearby monitoring locations during the injection process and modifications may be made to the design if initial field tests are not satisfactory. PV is also used to document visual PlumeStop sorption onto aquifer materials after its initial colloidal fluid state.

As such, RRS will conduct various field tests to evaluate the distribution and influence of the remedial reagents (particularly PlumeStop) in the subsurface throughout the injection application. These site--specific PV field tests will typically be conducted in strategically-located quality control segments within the injection area footprint. These segments are commonly referred to as as "clusters". The field tests may include pre-injection soil cores to view the lithology and confirm vertical treatment as designed; installation of temporary piezometers to monitor water level, groundwater parameters, and groundwater color; and lastly, collection of post-injection soil cores to observe PlumeStop adhered to the aquifer matrix. In general, RRS may utilize several field test procedures in combination or individually to evaluate the distribution and influence of the remedial reagents being applied. Materials for PV will need to be coordinated with the subcontracted drilling firm.

Performance Objectives

Purpose/Goals

The project goals are as follows:

- Eliminate migration of known contaminants from upgradient sources onto the property
- Control and reduce onsite source and plume mass
- Eliminate migration of contaminants from onsite to downgradient offsite sources

Monitoring

To evaluate and measure performance at this site, monitoring wells within and downgradient of the treatment will be utilized. Within this proposal it is suggested that groundwater monitoring parameters will be collected monthly for the 1st 3 months, and quarterly thereafter. To help support performance evaluations, REGENESIS requests the data collected be provided to us in a timely manner.

Qualifiers (Design Considerations)

- Seepage velocity/mass flux is a primary driver of dose for PlumeStop projects. This is the basis for our recommendation of Passive Flux Meters at your site. Any natural or anthropogenic changes to flux could affect performance.
- As indicated above key wells should be used to evaluate performance of the combined treatment. Wells located within or very near the PlumeStop barrier are direct performance monitoring points. Wells that are downgradient of the barriers will behave differently than the in-barrier wells due to residual mass that will slow the full adsorptive effects of the barriers.
- Wells located within the extended grid treatment should see rapid and sustained reduction.
- Side gradient and upgradient wells of the treatment area should not be expected to see remedial effects.

RRS Statement of Qualifications

RRS provides turn-key remediation planning, design, and application services. RRS field scientists are college degreed professionals who understand the details of each remediation design, the conceptual site model, the remediation chemistry being applied, the significance of the designed amendment dosing and achieving subsurface distribution, and how a breakdown of any one of these and other factors can result in poor remediation performance. They have the unique background and experience to understand the significance of modifications made in the field.

RRS' direct management of the injection program optimizes the design and ultimately, the overall remedy performance. No one has more professional experience handling and applying *in situ* remediation products than RRS personnel.

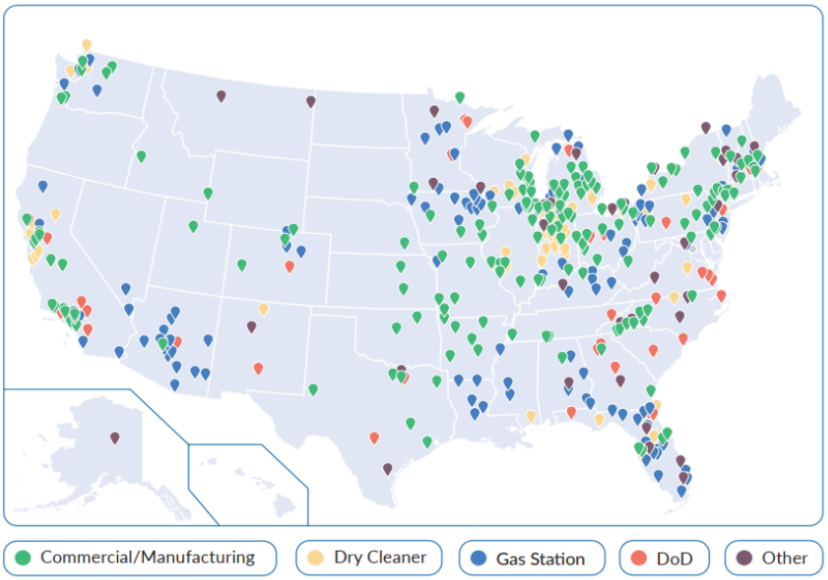
RRS has been offering industry-leading application services combined with excellence in field activity management for over a decade. We succeed by meeting the cleanup objectives established by the environmental engineering firms who contract our services. To produce this outcome, we employ field-experienced, disciplined, and dedicated project teams who work with our clients to address the unique requirements of each project site. Astute technical insight and timely, direct, and honest communication are hallmarks of RRS. Our reputation for meeting or exceeding clients' objectives has been proven in project successes throughout North America.

Further information on what sets RRS apart is provided in the following technical resources:

- RRS: Performance Driven, Results Based
- The RRS Difference
- RRS Project Experience

With decades of application experience, RRS is strategically located across the country to mobilize and assist on a wide range of sites throughout the US.

RRS consistently completes over 100 Projects annually across the US. For a current map of projects completed please click this link.



RRS Scope of Services

RRS, as part of its role, will operate under the guidance of IWM Consulting Group to execute the remedial actions in the field, employing the chosen remediation methodologies. The collaboration between RRS and IWM Consulting Group will entail joint responsibilities in carrying out this scope of work.

Additionally, prior to and during the injection, **Placement Validation (PV) testing** will be conducted. PV serves as a standard in-field methodology involving the extraction of soil cores and the observation of water samples to assess the dispersion of amendments during the remedial application. RRS will execute PV at the outset of the application and periodically thereafter. In-field adaptations may be implemented during the application if PV testing suggests adjustments are required to ensure the distribution of remedial amendments aligns with the design.

The distribution of responsibilities is elaborated upon in this section as well as under the Assumptions/Qualification segment. At the outset of each day, RRS will convene a safety tailgate meeting to discuss the day's objectives, procedures, assigned roles, and review health and safety concerns.

RRS will be outfitted with various injection tool alternatives compatible with the selected diameter Direct Push Technology (DPT) rods. The injection tool configuration will be advanced either to the upper or lower extent of the target treatment zone, and injections will be conducted utilizing either a bottom-up or top-down technique based on the subsurface lithology.

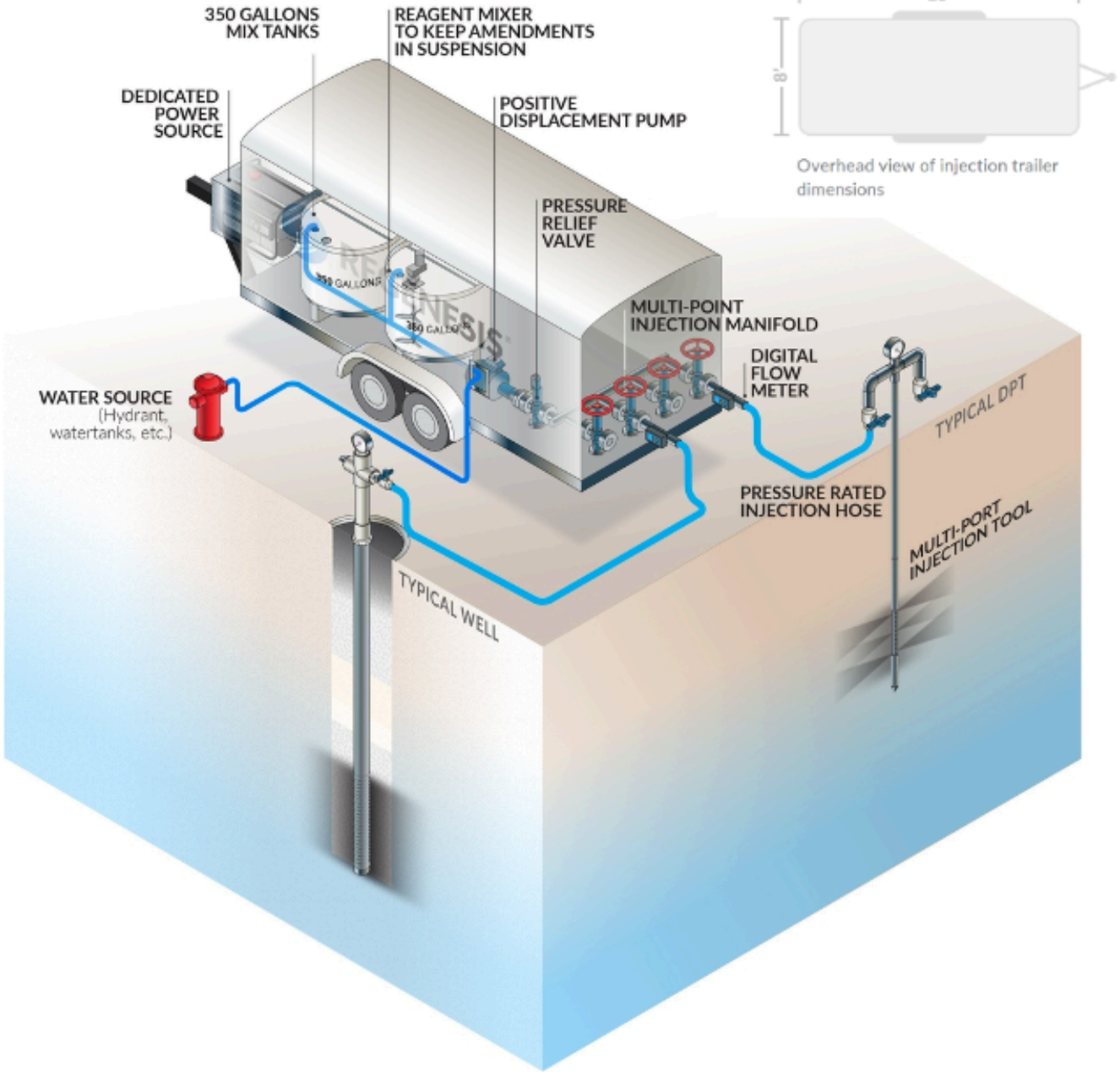
Remediation technologies will be mixed with water, utilizing a custom-built injection system (see below), adhering to the specified solution concentration. This mixture will be consistently agitated during the injection process. Parameters such as pressures, flow rates, and overall volume will be closely monitored and digitally recorded for each injection interval. To enhance efficiency on-site, simultaneous injections at multiple locations may be performed. RRS will vigilantly monitor the injection points and their surroundings for any indications of surfacing, and a spill response kit will remain on standby.

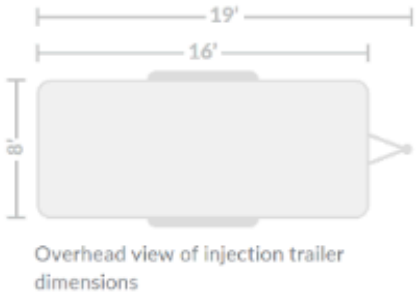
Throughout the application, real-time data will be collected and analyzed to corroborate design assumptions and the dispersion of reagents in the subsurface. Depending on the remedial agent applied, the gathered and analyzed data may encompass groundwater quality parameters (e.g., pH, conductivity, Dissolved Oxygen (DO), Oxidation-Reduction Potential (ORP), etc.), measurements of water table depth, visual indicators observed via groundwater or soil samples, and in-field concentration tests of injected substances. This data collection is typically conducted during the application process when operating within 10 feet of appropriately screened monitoring wells.

Guided by the collected information, the project team may introduce adjustments to the remediation design to enhance the injection application's efficacy. These adjustments might involve alterations in injection concentrations and volume per location.

Upon the conclusion of the injection operation, RRS will demobilize all equipment and personnel from the site. A comprehensive injection summary report, encompassing details of injection points (interval depths, injection pressure/flow rates, reagent volume, time elapsed, and surfacing occurrences), on-site observations, and any notable information, will be prepared and submitted to IWM Consulting Group.

RRS Application Trailer





Overhead view of injection trailer dimensions

Project Responsibilities

RRS will work with IWM Consulting Group to implement the scope of work associated with the application of the selected remediation technologies. Responsibilities for the implementation of this project will be shared between RRS and IWM Consulting Group. Responsibilities for each are listed below and further under the Assumptions/ Qualifications section.

RRS will:

- RRS will provide and ship the specified quantities of the remediation technologies to the site address provided by IWM Consulting Group. RRS will coordinate with IWM Consulting Group prior to any shipment of product.
- RRS will provide qualified and experienced 40-hour HAZWOPER-certified personnel to implement and manage the remediation application scope of work.
- RRS will provide the means to maneuver the product around the site (forklift or equivalent) as needed during the application activities.
- RRS will provide a custom-built injection system and other miscellaneous support equipment to handle, prepare, and apply the remediation technologies during the application process.
- RRS will subcontract a Direct Push Technology contractor with a qualified operator and crew of sufficient size to advance the appropriate tooling to the targeted treatment depth. The Direct Push Technology contractor will be equipped with enough downhole tooling for multiple simultaneous injections, hole abandonment supplies to close boring locations to the ground surface, and other required items to complete the scope of work.
- RRS will coordinate with the Direct Push Technology contractor and request a public utility locate through the nationwide "811 call before you dig" resource to approximate the location of buried public utilities at the site.
- RRS will perform site reconnaissance and pre-application activities that include H&S orientation, sensitive receptor identification and protection, treatment area identification, and equipment staging.
- RRS will prepare a site-specific health and safety plan.
- RRS will provide site safety equipment, including cones and caution tape, to delineate the immediate work area while making efforts to limit the impact on business operations at the site.
- RRS will perform real-time reagent distribution diagnostics during injection activities to allow for field modifications, as needed, to ensure optimal results.
- RRS will monitor the injection flow rates and pressures and observe signs of reagent surfacing around active injection areas. If surfacing is detected, RRS will stop or slow down injection activities at that location to stop additional surfacing and remove/vacuum up recoverable surfaced fluid.
- RRS will work directly with our design team to fill any data gaps identified during the injection application, thereby more effectively maintaining the project objectives and goals.
- RRS will collect project-related refuse and empty treatment chemistry containers daily to keep the site clean.
- RRS will generate a detailed injection summary report upon completion of the injection event. Items to be incorporated will include injection depths, material quantities, injection flow rates and pressures, an injection location map, implementation pictures, and other noteworthy field observations.
- RRS will provide a water source.
- RRS will provide mobile storage unit for secure product storage.

IWM Consulting Group will:

- IWM Consulting Group will coordinate project schedule and remediation technology order with REGENESIS to ensure adequate shipping and mobilization time.
- IWM Consulting Group will coordinate site access with property owner to coincide with project schedule and identify a secure product staging area.
- IWM Consulting Group will take delivery of the remediation technology prior to RRS mobilization and stage inside a secure location where the material will not be affected by inclement weather and is accessible by forklift or other equivalent means.
- Should private underground utilities be within or near the treatment area, IWM Consulting Group will contract with a private utility locating service provider to identify and mark the approximate location prior to RRS mobilization.

- IWM Consulting Group will procure any necessary permits needed to complete the project including right of way, UIC and municipal.
- IWM Consulting Group is responsible for all soil, air and groundwater sampling and analysis.
- IWM Consulting Group is responsible for transportation and disposal of any contaminated waste generated onsite during injection activities, though we do not anticipate generating any such waste during injection activities.
- IWM Consulting Group will provide a depth to water meter and field water quality meter similar to a YSI 556 with a down-hole sensor capable of reaching the water table and well screen interval while on-site for injection activities.
- IWM Consulting Group will provide access to a restroom during on-site hours.
- All empty product containers will be the responsibility of IWM Consulting Group for proper disposal/recycling. General refuse will be collected and disposed of in a IWM Consulting Group provided refuse container on-site.
- Any traffic control requirement beyond providing cones and caution tape is the responsibility of IWM Consulting Group

RRS Assumptions and Qualifications

In generating this proposal, RRS relied upon professional judgment and site-specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to estimate product quantities and subsurface placement required to achieve the remedial goals. The attached design summary tables specify the assumptions used to complete the remedial design. We request that these modeling input assumptions be verified by your firm before injection. Other assumptions and qualifications related to this proposal are as follows:

- The product and services cost outlined will be valid for 60 days from the proposal date. If beyond 60 days, RRS reserves the right to update the cost.
- The freight charges included for product delivery above are estimated at the time of proposal generation. Actual freight charges are neither set nor guaranteed by RRS and are calculated when the product order is placed. This price may vary from what is estimated above. Actual freight charges for product delivery will be invoiced.
- Freight delivery time frames cannot be guaranteed and RRS will not be responsible for any delays or increased costs associated with those delays.
- If applicable, sales tax charges for product, freight, and services are considered estimated at the time of proposal submittal. The appropriate sales tax category (i.e., product, freight, and services) and actual sales tax rate are finalized at the time of invoice and may change from date of proposal submittal.
- RRS will have access to the site for equipment operation and secure storage of materials and equipment throughout the project duration. Access to each work area location will be clear and free of obstructions. RRS also assumes the injection trailer can be staged within 80 feet of the furthest injection point location.
- For safety reasons, access to the treatment area will be limited to RRS and IWM Consulting Group personnel.
- RRS is not responsible for treatment chemistry infiltration into undesired locations beyond our visible control. The remediation design and injection procedures contain the necessary precautions to minimize the likelihood of surfacing of the treatment chemistry.
- RRS personnel will have access to the site for work up to 12 hours per day, Monday through Friday (daylight hours). However, the standard workday does not exceed 10 hours, with travel time Monday through Friday. A 10-hour workday does not mean 10 hours on-site and/or injection pumping. Additional charges may apply for work completed on Saturday and Sunday.
- RRS is not responsible for damage to unmarked utilities and subsurface structures. IWM Consulting Group will review as-built drawings with RRS and confirm clearance prior to injection activities and the remedial fluids being distributed throughout the subsurface.
- This proposal assumes probing and drilling will begin at the ground surface. If hand auger, concrete/asphalt coring, or air knife services are required, additional charges, including surface restoration will apply.
- RRS assumes that a direct-push style drill rig (7800 series or smaller) can access all injection point locations and drive a minimum of 1.5" diameter injection tooling to the required depth. If site conditions limit the use of the provided direct-push rig or tooling for any injection point and other drilling methods are required to complete the task, additional charges will apply.
- Ground surface restoration costs have not been included. Additional charges will apply if surface restoration is needed.
- Site conditions can change over time and should be monitored post-injection. RRS is not responsible for changing site conditions after completing the scope of work and demobilizing. Such changes include but are not limited to changes related to applicable borehole abandonment (i.e., swelling of backfill material), surface restoration, well conditions, and on-site utilities.

Health and Safety Plan

RRS is committed to providing a safe and healthy working environment for all on-site employees, including IWM Consulting Groups and contractors on-site. Before mobilization, RRS will develop a site-specific Health and Safety Plan (HASP) and designate an on-site safety officer. All personnel on-site are required to participate in daily safety tailgate meetings to proactively identify potential hazards and mitigate risks to the full extent possible.

In addition to the hours of rigorous safety training courses all personnel are required to complete, RRS also incorporates a behavior-based safety program by utilizing our DoneSafe mobile application (app) interface on every site. This app encourages our personnel to actively search for potential on-site risks and document mitigation actions. The effectiveness of our safety program can be seen in our industry-leading Experience Modification Rating (EMR) listed in table below.

Year	Total Hours	EMR
2023	193,433	0.67
2022	189,458	0.73
2021	125,592	0.71
2020	162,037	0.64

RRS safety tailgate meetings and HASP will include the following:

- Site map .
- List of personnel and contact information for employees on-site and supporting the project.
- Route to the nearest occupational treatment facility and hospital along with contact information.
- Job Hazard Analysis (JHA) detailing each job task on-site with its potential hazards and best practices to avoid those hazards.
- Description and hazards of the contaminants of concern (COC) with appropriate Personal Protection Equipment (PPE) requirements.
- List and description of REGENESIS chemicals on-site including a Safety Data Sheet (SDS) for each chemical.
- Checklist of site safety equipment including fire extinguishers, eyewash station, first aid kit, spill prevention kit and any site-specific equipment needed.
- Daily tailgate safety meeting sheet with identified hazards and risks associated with the site and job tasks for that day, along with shared learning observations from the previous day.

Acknowledgement

Signature below confirms signee has reviewed the proposal and agrees with all outlined responsibilities and assumptions/qualifications. Please also review our terms and conditions.

Here is a list of next steps toward implementation of this project. Please note these steps may take 4-6 weeks to complete depending upon the complexity of the project and previous experience with your company. RRS will contact you soon to begin the implementation process.

Steps to Project Implementation

1. Sign acceptance of proposal
2. Finalize contract documents incorporating this proposal or formal REGENESIS Subcontract Agreement
3. Confirm account credit status
4. Complete remediation services logistics evaluation
5. Confirm delivery address and date
6. Schedule application

Please sign below to acknowledge acceptance of proposal RRS Proposal_ Advance Plating for the Advance Plating Site and authorize REGENESIS to proceed with a final contract and work authorization:

SIGNATURE
Brad Gentry

Not yet accepted

Detailed Design Table

Project Information		
Advanced Plating		
Indianapolis, IN		
Area A		
Prepared For:		
Brad Gentry (IWM)		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Barrier Length	ft	795
Top Treat Depth	ft	10.0
Bot Treat Depth	ft	20.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	63,600
Treatment Zone Volume	cy	2,356
Soil Type	---	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	190,304
Treatment Zone Effective Pore Volume	gals	95,152
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	6.4E+06
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91
Application Dosing		
3-D Microemulsion to be Applied	lbs	6,000
S-MZVI to be Applied	lbs	4,500
BDI Plus to be Applied	liters	37

3-D Microemulsion®, S-MZVI®, BDI® Plus Application Design Summary		
Area A		
Treatment Type	Barrier	
Distance Perpendicular to Flow (ft)	795	Input special application instructions here as needed.
Spacing Within Rows (ft)	8	
Number of Rows	10	
DPT Injection Points	99	
Top Application Depth (ft bgs)	10	**Field Mixing Ratios**
Bottom Application Depth (ft bgs)	20	3DME Concentrate per Pt (gals)
3DME to be Applied (lbs)	6,000	6
3DME to be Applied (gals)	575	Mix Water per Pt (gals)
3DME Mix %	6%	91
Volume Water (gals)	9,011	3DME Mix Volume per Pt (gals)
3DME Mix Volume (gals)	9,587	97
S-MZVI to be Applied (lbs)	4,500	S-MZVI Volume per Pt (gals)
S-MZVI Volume (gals)	298	3
BDI Plus to be Applied (L)	37	BDI Volume per Pt (L)
BDI Plus Mix Water Volume (gals)	370	0.4
	0	
	0	
Total Application Volume (gals)	10,264	Volume per pt (gals)
Estimated Radius of Injection (ft)	3.2	104
Prepared by: Keith M Gaskill, LPG, Sr Design Specialist		Volume per vertical ft (gals)
Date: 7/22/2022		10
Technical Notes/Discussion		

Project Information

Advanced Plating
Indianapolis, IN
Area B
Prepared For:
Brad Gentry (IWM)

Target Treatment Zone (TTZ) Info	Unit	Value
Barrier Length	ft	1,730
Top Treat Depth	ft	10.0
Bot Treat Depth	ft	20.0
Vertical Treatment Interval	ft	10.0
Treatment Zone Volume	ft^3	138,400
Treatment Zone Volume	cy	5,126
Soil Type	---	silty sand
Porosity	cm^3/cm^3	0.40
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	414,122
Treatment Zone Effective Pore Volume	gals	207,061
Fraction Organic Carbon (foc)	g/g	0.003
Soil Density	g/cm^3	1.6
Soil Density	lb/ft^3	100
Soil Weight	lbs	1.4E+07
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.25
GW Velocity	ft/yr	91

Application Dosing

3-D Microemulsion to be Applied	**lbs**	**12,000**
S-MZVI to be Applied	**lbs**	**9,000**
BDI Plus to be Applied	**liters**	**79**

3-D Microemulsion®, S-MZVI®, BDI® Plus Application Design Summary

Area B		
Treatment Type	**Barrier**	
Distance Perpendicular to Flow (ft)	1,730	**Input special application instructions here as needed.**
Spacing Within Rows (ft)	8	
Number of Rows	10	
DPT Injection Points	216	
Top Application Depth (ft bgs)	10	**Field Mixing Ratios**
Bottom Application Depth (ft bgs)	20	3DME Concentrate per Pt (gals)
3DME to be Applied (lbs)	**12,000**	5
3DME to be Applied (gals)	1,150	Mix Water per Pt (gals)
3DME Mix %	6%	83
Volume Water (gals)	**18,023**	3DME Mix Volume per Pt (gals)
3DME Mix Volume (gals)	19,173	89
S-MZVI to be Applied (lbs)	**9,000**	S-MZVI Volume per Pt (gals)
S-MZVI Volume (gals)	596	3
BDI Plus to be Applied (L)	**79**	BDI Volume per Pt (L)
BDI Plus Mix Water Volume (gals)	790	0.4
	0	
	0	
Total Application Volume (gals)	**20,580**	Volume per pt (gals)
Estimated Radius of Injection (ft)	3.1	95
Prepared by: Keith M Gaskill, LPG, Sr Design Specialist		Volume per vertical ft (gals)
Date: 4/23/2024		10

Technical Notes/Discussion

Project Info

Advanced Plating
Indianapolis, IN
PlumeStop Barrier A
Prepared For:
Bill Ackland (IWM)

Target Treatment Zone (TTZ) Info	Unit	Value
Barrier Length	ft	300
Top Treat Depth	ft	12.0
Bot Treat Depth	ft	19.0
Vertical Treatment Interval	ft	7.0
Treatment Zone Volume	ft^3	16,800
Treatment Zone Volume	cy	622
Soil Type	---	sand
Porosity	cm^3/cm^3	0.33
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	41,472
Treatment Zone Effective Pore Volume	gals	25,135
Treatment Zone Pore Volume	liters	156,988
Treatment Zone Effective Pore Volume	liters	95,144
Fraction Organic Carbon (foc)	g/g	0.002
Soil Density	g/cm^3	1.7
Soil Density	lb/ft^3	103
Soil Weight	lbs	1.7E+06
Hydraulic Conductivity	ft/day	23.0
Hydraulic Conductivity	cm/sec	8.11E-03
Hydraulic Gradient	ft/ft	0.003
GW Velocity	ft/day	0.35
GW Velocity	ft/yr	126

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**6,400**
S-MZVI to be Applied	**lbs**	**2,000**

PlumeStop® Application Design Summary

PlumeStop Barrier A

PlumeStop + S-MZVI	
Treatment Type	**Barrier**
Distance Perpendicular to Flow (ft)	300
Spacing Within Rows (ft)	5
Number of Rows	1
DPT Injection Points	**60**
Top Application Depth (ft bgs)	12
Bottom Application Depth (ft bgs)	19
PlumeStop to be Applied (lbs)	**6,400**
PlumeStop to be Applied (gals)	710
In Situ Chemical Reduction - S-MZVI	
S-MZVI to be added to PlumeStop (lbs)	**2,000**
S-MZVI to be added to PlumeStop (gals)	132
PlumeStop + S-MZVI Volume Totals	
Mixing Water (gal)	14,628
Total Application Volume (gals)	**15,488**
Injection Volume per Point (gals)	258

Technical Notes

Estimated Application Days
7.0

Special Instructions:

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS developed this Scope of Work in reliance upon the data and professional judgments provided by those whom completed the earlier environmental site assessment(s). The fees and charges associated with the Scope of Work were generated through REGENESIS' proprietary formulas and thus may not conform to billing guidelines, constraints or other limits on fees. REGENESIS does not seek reimbursement directly from any government agency or any governmental reimbursement fund (the "Government"). In any circumstance where REGENESIS may serve as a supplier or subcontractor to an entity which seeks reimbursement from the Government for all or part of the services performed or products provided by REGENESIS, it is the sole responsibility of the entity seeking reimbursement to ensure the Scope of Work and associated charges are in compliance with and acceptable to the Government prior to submission. When serving as a supplier or subcontractor to an entity which seeks reimbursement from the Government, REGENESIS does not knowingly present or cause to be presented any claim for payment to the Government.

Prepared by: Keith M Gaskill, LPG, Sr Design Specialist
Date: 4/23/2024

Project Info

Advanced Plating
Indianapolis, IN
PlumeStop Barrier C
Prepared For:
Bill Ackland (IWM)

Target Treatment Zone (TTZ) Info	Unit	Value
Barrier Length	ft	210
Top Treat Depth	ft	12.0
Bot Treat Depth	ft	19.0
Vertical Treatment Interval	ft	7.0
Treatment Zone Volume	ft^3	11,760
Treatment Zone Volume	cy	436
Soil Type	---	sand
Porosity	cm^3/cm^3	0.33
Effective Porosity	cm^3/cm^3	0.20
Treatment Zone Pore Volume	gals	29,030
Treatment Zone Effective Pore Volume	gals	17,594
Treatment Zone Pore Volume	liters	109,892
Treatment Zone Effective Pore Volume	liters	66,601
Fraction Organic Carbon (foc)	g/g	0.002
Soil Density	g/cm^3	1.7
Soil Density	lb/ft^3	103
Soil Weight	lbs	1.2E+06
Hydraulic Conductivity	ft/day	23.0
Hydraulic Conductivity	cm/sec	8.11E-03
Hydraulic Gradient	ft/ft	0.003
GW Velocity	ft/day	0.35
GW Velocity	ft/yr	126

PlumeStop® Application Design Summary

PlumeStop Barrier C

PlumeStop + S-MZVI	
Treatment Type	**Barrier**
Distance Perpendicular to Flow (ft)	210
Spacing Within Rows (ft)	5
Number of Rows	1
DPT Injection Points	**42**
Top Application Depth (ft bgs)	12
Bottom Application Depth (ft bgs)	19
PlumeStop to be Applied (lbs)	**4,400**
PlumeStop to be Applied (gals)	488
In Situ Chemical Reduction - S-MZVI	
S-MZVI to be added to PlumeStop (lbs)	**2,000**
S-MZVI to be added to PlumeStop (gals)	132
PlumeStop + S-MZVI Volume Totals	
Mixing Water (gal)	10,057
Total Application Volume (gals)	**10,695**
Injection Volume per Point (gals)	255

Technical Notes

Estimated Application Days
5.0

Special Instructions:

Application Dosing	Unit	Value
PlumeStop to be Applied	**lbs**	**4,400**
S-MZVI to be Applied	**lbs**	**2,000**

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

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Prepared by: Keith M Gaskill, LPG, Sr Design Specialist
Date: 4/23/2024