SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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April 9, 2020

San Mateo County Planning Commission
planning-commission@smcgov.org
mschaller@smcgov.org

**Subject: Comments on the MidPen Cypress Point Project, PLN2018-00264**

Dear Commissioners Hansson, Gupta, Santacruz, Ramirez and Ketcham,

We write regarding the proposed MidPen Cypress Point Project ("Project") located in Moss Beach, California. MidPen proposes to develop 71 housing units, a community building, and outdoor recreation areas on the 11-acre Project site. I am a California-licensed hydrogeologist and the former Senior Science Policy Advisor with the U.S. EPA. My CV is attached for reference as Exhibit A.

To prepare the comments below, we have reviewed the Project's Preliminary Environmental Evaluation Report (PEIR) dated April 2019, the Phase I Report dated November 10, 2015, the Additional Subsurface Investigation and Water Well Evaluation dated February 20, 2018, the Groundwater Sampling and Well Destruction Report dated April 9, 2018.

Our review of the above documents leads us to conclude that the PEIR fails to adequately evaluate the Project's impacts in the subject areas of Hazards and Hazardous Materials and Hydrology and Water Quality. Impacts associated with construction and operation of the proposed Project are undisclosed and inadequately mitigated. An Environmental Impact Report (EIR) should be prepared to assess and mitigate the potential impacts that the Project may have.

## Hazards and Hazardous Materials

The PEIR fails to disclose residual soil contamination at the Project site. The Project site is a former World War II-era facility used for gunnery training. A November 10, 2015 Phase I Environmental Site Assessment (ESA), prepared for the Project, describes the Project site to have been used for barracks, offices, a mess hall, a library, a garage, a boiler room, and an incinerator.

On the basis of a Phase I recommendation, a Phase II ESA sampling investigation was completed. The Phase II ESA found two locations (Borings B-7 and B-21) where lead concentrations in soil exceeded the San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL).

The concentrations of lead in those two samples, taken at the ground surface, was 230 mg/kg and 88 mg/kg, respectively. In contrast, the RWQCB ESL for lead in residential shallow soil is 32 mg/kg[1] based on terrestrial habitat exposure.

The lead contamination was attributed in the Phase I ESA to the use of lead paint. The Phase II ESA was followed by an additional investigation (the February 20, 2018 "Additional Subsurface Investigation & Water Well Evaluation") that conducted further sampling for lead in soil. The additional investigation found lead at one location at concentrations above the ESL. The concentration of lead in soil at boring CS-3 was found to be 290 mg/kg – nine times the ESL. Figure 2 from the additional investigation is attached and shows that the horizontal extent of the lead contamination has not been determined.

The additional investigation, without any regulatory input, prescribed mixing of Project site soils upon excavation as a solution to the lead contamination. None of these lead contamination results, nor the suggested soil mixing plan, were disclosed in the PEIR. The mixing plan also does not address the fact that the horizontal extent of the lead contamination is unknown and that additional elevated lead soil concentrations ("hot spots") may be found if further testing as conducted.

No documentation was provided in the PEIR, in the Phase I, the Phase II or the additional investigation to show that the results were shared with any regulatory agency. The Project site does not appear on the RWQCB Geotracker or the Department of Toxic Substances (DTSC) Control Envirostor websites and therefore the lead contamination that was found apparently has not been brought to the attention of the RWQCB or the DTSC.

The Phase I, the Phase II and the additional investigation basically self-certify that the sampling that was conducted and the analysis of the results do not pose a threat to human health with the soil mixing plan that is planned. The additional investigation concluded (p. 5):

> On the basis of the information, presented herein, no further investigation or remedial action is warranted at this time.

Without regulatory review, this conclusion of no further action or remediation and the basis for this conclusion (all which was not disclosed in the PEIR), should not be relied upon for decision making about the potential risk to human health and the adequacy of the Mitigation Measure HAZ-1, the sole mitigation measure proposed to address Hazards and Hazardous Waste impacts. Mitigation Measure HAZ-1 only commits to a management plan and is quoted in its entirely below:

> MidPen will prepare a Site Management Plan for the project site prior to submitting an application for a Coastal Development Permit for the proposed project, and will comply with all requirements and implement all BMPs contained in the plan during construction of the project.

Because of the lead contamination, the Phase I, the Phase II and the additional investigation should be submitted for regulatory review, to the San Mateo County Environmental Health Services, to the San

[1] https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/esl.html (Table "Tier 1 ESLs")

Francisco Bay RWQCB, and to DTSC. A formal voluntary oversight agreement is recommended with the RWQCB to certify the reliability of the data for decision making and to ensure the protection of public health. Any determination by the regulatory agencies about the need for further action, to include sampling or soil excavation and off-site disposal, should be included in an EIR.

## Hydrology and Water Quality

The Project site is located approximately 750 feet from the coastline. A perennial stream (Montara Creek), located approximately 50 to 250 feet to the northeast of the project site, runs in parallel to the northern border of the site (prior to emptying into the Pacific Ocean).

The PEIR states (p. 18):

> Potential impacts to groundwater and surface water quality could occur both during construction and operation of the proposed project. Temporary increases in the erosion of exposed soils during construction of the project could result in minor on-or-off-site water quality impacts, particularly if rainfall events occur during an active construction phase.

The PEIR further states (p. 18):

> On-site soils are subject to severe water erosion hazards (NRCS 2018).

What the PEIR fails to disclose is that onsite soils are contaminated with lead at concentrations greater than the RWQCB ESL 32 mg/kg for the protection of terrestrial habitat.[2] The PEIR makes no specific provisions in Mitigation Measure GEO-2 for the protection of terrestrial habitat in the adjacent Montara Creek from the erosion of lead-contaminated soils upon soil disturbance during the Project's construction period or from any residual soil contamination that would be left in place after the mixing of site soils, as planned.

Note that the statistical analysis that was performed in the Additional Subsurface Investigation & Water Well Evaluation found the upper 95$^{th}$ percentile confidence limit for lead in soil to be 42 mg/kg. This value exceeds the ESL of 32 mg/kg for the protection of terrestrial habitat.

Best management practices (BMPs) that are specific to known lead contamination at concentrations above the terrestrial habitat protection ESL need to be implemented during the project construction period. The reference in the PEIR to compliance with the State Water Resources Control Board Construction General permit is insufficient mitigation without consideration of the lead contamination and specific BMPs that would be taken to control lead in stormwater runoff An EIR should be prepared to disclose lead contamination in the context of Hydrology and Water Quality impacts, along with effective mitigation measures and BMPs to control lead-contaminated soils from erosion and transportation to the adjacent Montara Creek.

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[2] https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/esl.html (Table "Summary of Soil ESLs")

Sincerely,

Matt Hagemann, P.G., C.Hg.

Attachment A: CV, Matt Hagemann

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## Matthew F. Hagemann, P.G., C.Hg., QSD, QSP

**Geologic and Hydrogeologic Characterization**
**Investigation and Remediation Strategies**
**Litigation Support and Testifying Expert**
**Industrial Stormwater Compliance**
**CEQA Review**

**Education:**

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

**Professional Certifications:**

California Professional Geologist
California Certified Hydrogeologist
Qualified SWPPP Developer and Practitioner

**Professional Experience:**

Matt has 30 years of experience in environmental policy, contaminant assessment and remediation, stormwater compliance, and CEQA review. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) and directed efforts to improve hydrogeologic characterization and water quality monitoring. For the past 15 years, as a founding partner with SWAPE, Matt has developed extensive client relationships and has managed complex projects that include consultation as an expert witness and a regulatory specialist, and a manager of projects ranging from industrial stormwater compliance to CEQA review of impacts from hazardous waste, air quality and greenhouse gas emissions.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – 2104, 2017;
- Senior Environmental Analyst, Komex H2O Science, Inc. (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

**Senior Regulatory and Litigation Support Analyst:**

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of over 300 environmental impact reports and negative declarations since 2003 under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, greenhouse gas emissions, and geologic hazards. Make recommendations for additional mitigation measures to lead agencies at the local and county level to include additional characterization of health risks and implementation of protective measures to reduce worker exposure to hazards from toxins and Valley Fever.
- Stormwater analysis, sampling and best management practice evaluation at more than 150 industrial facilities.
- Expert witness on numerous cases including, for example, perfluorooctanoic acid (PFOA) contamination of groundwater, MTBE litigation, air toxins at hazards at a school, CERCLA compliance in assessment and remediation, and industrial stormwater contamination.
- Technical assistance and litigation support for vapor intrusion concerns.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.

- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.
- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

**Executive Director:**

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the discharge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

**Hydrogeology:**

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted

public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

**Policy:**

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9.

Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific

principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

**Geology:**

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

**Teaching:**

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt is currently a part time geology instructor at Golden West College in Huntington Beach, California where he taught from 2010 to 2014 and in 2017.

**Invited Testimony, Reports, Papers and Presentations:**

**Hagemann, M.F**., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

**Hagemann, M.F**., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

**Hagemann, M.F.,** 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

**Hagemann, M.F.,** 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

**Hagemann, M.F.**, 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

**Hagemann, M.F.,** 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

**Hagemann, M.F.,** 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

**Hagemann, M.F**., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

**Hagemann, M.F**., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

**Hagemann, M.F**., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

**Hagemann, M.F**., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

**Hagemann, M.F**., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

**Hagemann, M.F**., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

**Hagemann, M.F**., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

**Hagemann, M.F**., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

**Hagemann, M.F**., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

**Hagemann, M.F**., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

**Hagemann, M.F**., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

**Hagemann, M.F**., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

**Hagemann, M.F**., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

**Hagemann, M.F**., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

**Hagemann, M.F**., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

**Hagemann, M.F**., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

**Hagemann, M.F**., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

**Hagemann, M.F**., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

**Hagemann, M. F**., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

**Hagemann, M.F**., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

**Hagemann, M.**F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

**Hagemann, M.F**., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

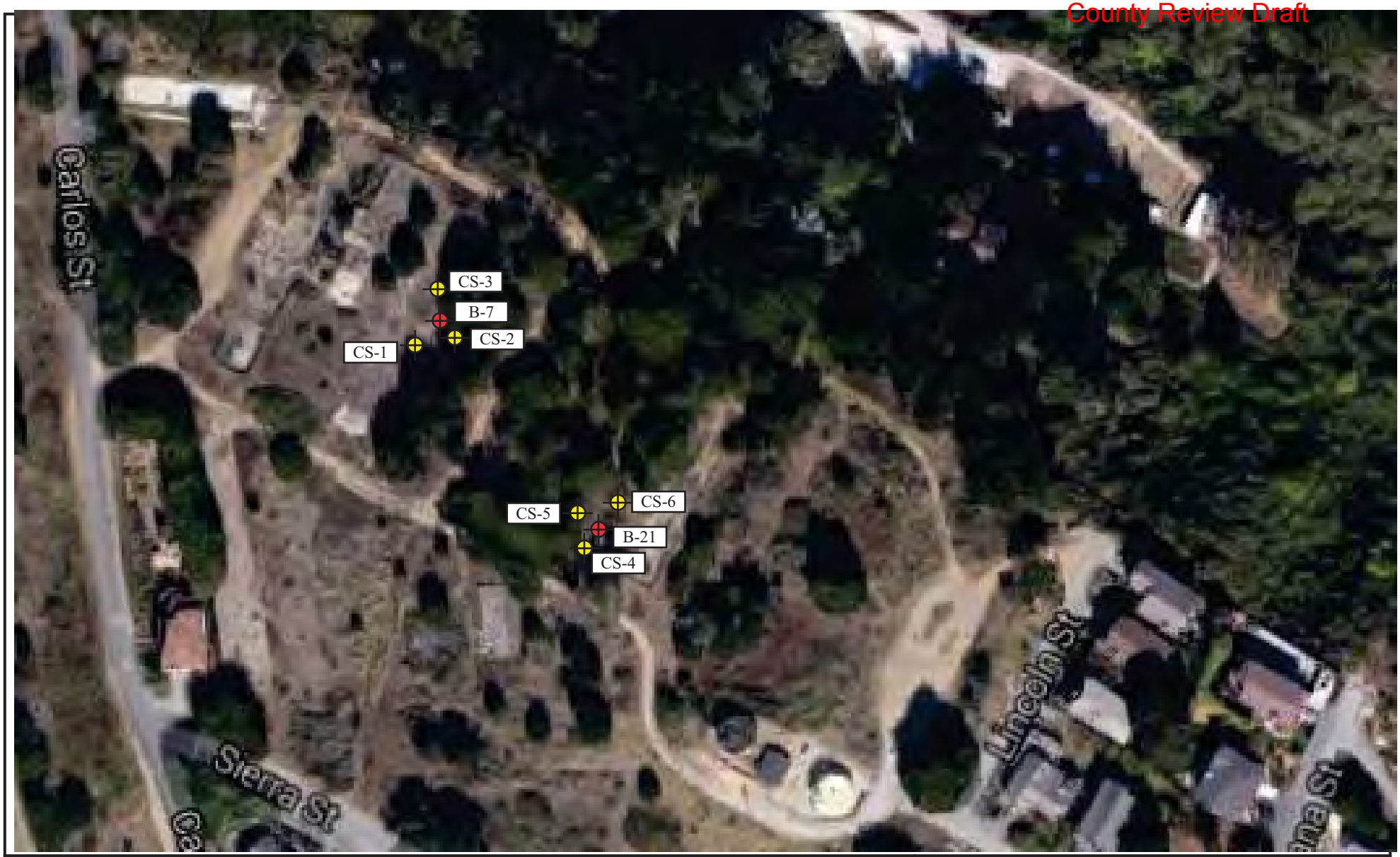
**Hagemann, M.F**., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

**Other Experience:**

Selected as subject matter expert for the California Professional Geologist licensing examinations, 2009-2011.

Attachment B: Additional Subsurface Investigation & Water Well Evaluation – Figure 2

County Review Draft




## LEGEND

- Soil Boring (AEI, 2017)
- Exploratory Boring (AEI, 2015)

0 50 100
APPROXIMATE SCALE (Feet)

N

# AEI CONSULTANTS

3880 S. BASCOM AVENUE, SAN JOSE, CALIFONIA

## CONFIRMATION BORING LOCATIONS

Carlos Street at Sierra Street
Moss Beach, California

**FIGURE 2**
Project No. 350248

Attachment C: Environmental Screening Level Tables

## Tier 1 ESLs [1]

**2019 (Rev. 2)**

**Based on a generic conceptual site model designed for use at most sites[2]**

| Chemicals | CAS No. | Groundwater (µg/L) | Soil (mg/kg) | Subslab / Soil Gas (µg/m$^3$) | Indoor Air (µg/m$^3$) |
|---|---|---|---|---|---|
| 1,2-Dichloropropane | 78-87-5 | 2.3E+00 | 6.5E-02 | 9.4E+00 | 2.8E-01 |
| 1,3-Dichloropropene | 542-75-6 | 5.0E-01 | 1.7E-02 | 5.8E+00 | 1.8E-01 |
| Dieldrin | 60-57-1 | 1.4E-04 | 4.6E-04 | 2.0E-02 | 6.1E-04 |
| Diethyl phthalate | 84-66-2 | 1.5E+00 | 2.5E-02 | -- | -- |
| Dimethyl phthalate | 131-11-3 | 1.5E+00 | 3.5E-02 | -- | -- |
| 2,4-Dimethylphenol | 105-67-9 | 1.0E+02 | 8.1E+00 | 3.3E+01 | 1.0E+00 |
| 2,4-Dinitrophenol | 51-28-5 | 3.9E+01 | 3.0E+00 | -- | -- |
| 2,4-Dinitrotoluene | 121-14-2 | 2.4E-01 | 2.3E-02 | -- | -- |
| 1,4-Dioxane | 123-91-1 | 3.8E-01 | 1.7E-04 | 1.2E+01 | 3.6E-01 |
| Dioxin (2,3,7,8-TCDD) | 1746-01-6 | 1.4E-08 | 4.8E-06 | 2.5E-06 | 7.4E-08 |
| Endosulfan | 115-29-7 | 8.7E-03 | 9.8E-03 | -- | -- |
| Endrin | 72-20-8 | 2.3E-03 | 1.1E-03 | -- | -- |
| Ethylbenzene | 100-41-4 | 3.5E+00 | 4.3E-01 | 3.7E+01 | 1.1E+00 |
| Fluoranthene [PAH] | 206-44-0 | 8.0E+00 | 6.9E-01 | -- | -- |
| Fluorene [PAH] | 86-73-7 | 3.9E+00 | 6.0E+00 | -- | -- |
| Heptachlor | 76-44-8 | 2.1E-04 | 1.2E-01 | 7.2E-02 | 2.2E-03 |
| Heptachlor epoxide | 1024-57-3 | 1.1E-04 | 1.8E-04 | 3.6E-02 | 1.1E-03 |
| Hexachlorobenzene | 118-74-1 | 7.7E-04 | 8.0E-04 | 1.8E-01 | 5.5E-03 |
| Hexachlorobutadiene | 87-68-3 | 1.4E-01 | 2.8E-02 | 4.3E+00 | 1.3E-01 |
| g-Hexachlorocyclohexane (Lindane) | 58-89-9 | 1.6E-02 | 7.4E-03 | -- | -- |
| Hexachloroethane | 67-72-1 | 3.3E-01 | 1.9E-02 | 8.5E+00 | 2.6E-01 |
| Indeno[1,2,3-c,d]pyrene [PAH] | 193-39-5 | 4.9E-02 | 4.8E-01 | -- | -- |
| Lead | 7439-92-1 | 2.5E+00 | 3.2E+01 | -- | -- |
| Mercury (elemental) | 7439-97-6 | 2.5E-02 | 1.3E+01 | 1.0E+00 | 3.1E-02 |
| Methoxychlor | 72-43-5 | 3.0E-03 | 1.3E-02 | -- | -- |
| Methylene chloride | 75-09-2 | 5.0E+00 | 1.2E-01 | 3.4E+01 | 1.0E+00 |
| Methyl ethyl ketone | 78-93-3 | 5.6E+03 | 6.1E+00 | 1.7E+05 | 5.2E+03 |
| Methyl isobutyl ketone | 108-10-1 | 1.2E+02 | 3.6E-01 | 1.4E+04 | 4.2E+02 |
| Methyl mercury | 22967-92-6 | 3.0E-03 | 3.4E-02 | -- | -- |
| 2-Methylnaphthalene | 91-57-6 | 2.1E+00 | 8.8E-01 | 2.3E+03 | 6.8E+01 |
| Methyl tertiary butyl ether (MTBE) | 1634-04-4 | 5.0E+00 | 2.8E-02 | 3.6E+02 | 1.1E+01 |
| Molybdenum | 7439-98-7 | 1.0E+02 | 6.9E+00 | -- | -- |
| Naphthalene [PAH] | 91-20-3 | 1.7E-01 | 4.2E-02 | 2.8E+00 | 8.3E-02 |
| Nickel | 7440-02-0 | 8.2E+00 | 8.6E+01 | -- | -- |
| Pentachlorophenol | 87-86-5 | 1.0E+00 | 1.3E-02 | -- | -- |
| Perchlorate | 7790-98-9 | 6.0E+00 | 5.5E+01 | -- | -- |
| Petroleum - Gasoline | -- | 1.0E+02 | 1.0E+02 | 3.3E+03 | 1.0E+02 |
| Petroleum - Stoddard Solvent | -- | 1.0E+02 | 1.0E+02 | 1.1E+04 | 3.3E+02 |
| Petroleum - Jet Fuel | -- | 1.0E+02 | 1.0E+02 | 1.1E+04 | 3.3E+02 |
| Petroleum - Diesel | -- | 1.0E+02 | 2.6E+02 | 8.9E+03 | 2.7E+02 |
| Petroleum - HOPs | -- | 1.0E+02 | -- | -- | -- |
| Petroleum - Motor Oil | -- | -- | 1.6E+03 | -- | -- |
| Phenanthrene [PAH] | 85-01-8 | 4.6E+00 | 7.8E+00 | 1.8E+03 | 5.5E+01 |
| Phenol | 108-95-2 | 5.0E+00 | 1.6E-01 | 5.2E+03 | 1.6E+02 |
| Polychlorinated biphenyls (PCBs) | 1336-36-3 | 1.7E-04 | 2.3E-01 | 1.6E-01 | 4.9E-03 |
| Pyrene [PAH] | 129-00-0 | 2.0E+00 | 4.5E+01 | -- | -- |
| Selenium | 7782-49-2 | 5.0E-01 | 2.4E+00 | -- | -- |
| Silver | 7440-22-4 | 1.9E-01 | 2.5E+01 | -- | -- |
| Styrene | 100-42-5 | 1.0E+01 | 9.2E-01 | 3.1E+04 | 9.4E+02 |
| tert-Butyl alcohol | 75-65-0 | 1.2E+01 | 7.5E-02 | -- | -- |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5.7E-01 | 1.7E-02 | 1.3E+01 | 3.8E-01 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 1.0E+00 | 1.8E-02 | 1.6E+00 | 4.8E-02 |
| Tetrachloroethene | 127-18-4 | 6.4E-01 | 8.0E-02 | 1.5E+01 | 4.6E-01 |
| Thallium | 7440-28-0 | 2.0E+00 | 7.8E-01 | -- | -- |
| Toluene | 108-88-3 | 4.0E+01 | 3.2E+00 | 1.0E+04 | 3.1E+02 |
| Toxaphene | 8001-35-2 | 2.0E-04 | 5.1E-01 | -- | -- |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5.0E+00 | 1.2E+00 | 7.0E+01 | 2.1E+00 |

# Tier 1 ESLs [1]

**2019 (Rev. 2)**

**Based on a generic conceptual site model designed for use at most sites[2]**

| Chemicals | CAS No. | Groundwater (µg/L) | Soil (mg/kg) | Subslab / Soil Gas (µg/m$^3$) | Indoor Air (µg/m$^3$) |
|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 71-55-6 | 6.2E+01 | 7.0E+00 | 3.5E+04 | 1.0E+03 |
| 1,1,2-Trichloroethane | 79-00-5 | 5.0E+00 | 7.6E-02 | 5.8E+00 | 1.8E-01 |
| Trichloroethene | 79-01-6 | 1.2E+00 | 8.5E-02 | 1.6E+01 | 4.8E-01 |
| 2,4,5-Trichlorophenol | 95-95-4 | 1.1E+01 | 2.9E+00 | -- | -- |
| 2,4,6-Trichlorophenol | 88-06-2 | 6.3E-01 | 4.0E-02 | 1.0E+01 | 3.0E-01 |
| 1,2,3-Trichloropropane | 96-18-4 | 5.0E-03 | 1.1E-04 | 1.0E+01 | 3.1E-01 |
| Vanadium | 7440-62-2 | 1.9E+01 | 1.8E+01 | -- | -- |
| Vinyl chloride | 75-01-4 | 8.6E-03 | 1.5E-03 | 3.2E-01 | 9.5E-03 |
| Xylenes | 1330-20-7 | 2.0E+01 | 2.1E+00 | 3.5E+03 | 1.0E+02 |
| Zinc | 7440-66-6 | 8.1E+01 | 3.4E+02 | -- | -- |

**Notes:**

1 - ESLs are developed based on methodologies discussed in the User's Guide. Evaluation of laboratory detection limits and naturally occurring background or ambient concentrations should be independently conducted. See User's Guide Chapter 12 (Additional Considerations) for further information.

2 - Generic Conceptual Site Model - See User's Guide Chapter 2. Input settings are:
Land Use = Residential
Groundwater Use = Drinking Water Resource
MCL Priority over Risk-Based Levels = Yes
Discharge to Surface Water = Saltwater & Freshwater
Vegetation Level = Substantial
Soil Exposure Depth = Shallow

**Abbreviations:**

DDD - Dichlorodiphenyldichloroethane
DDE - Dichlorodiphenyldichloroethene
DDT - Dichlorodiphenyltrichloroethane
HOPs - Hydrocarbon Oxidation Products (biodegradation metabolites and photo-oxidation products of petroleum hydrocarbons). See User's Guide Chapter 4 for further information.
PAH - Polycyclic aromatic hydrocarbon
TCDD - Tetrachlorodibenzodioxin

| 2019 (Rev. 2) | | Summary of Groundwater ESLs (µg/L) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemicals | CAS No. | Direct Exposure Human Health Risk Levels (Table GW-1) | | | Aquatic Habitat Goal Levels (Table GW-2) | | | Groundwater Vapor Intrusion Human Health Risk Levels (Table GW-3) | | | | Gross Contam-ination Levels (GW-4) | Odor Nuisance Levels (Table GW-5) | | GW Tier 1 ESL | Basis |
| | | | | | | | | Residential | | Commercial/Industrial | | | | | | |
| | | MCL Priority[1] | Tapwater Cancer Risk | Tapwater Non-cancer Hazard | Fresh Water Ecotox | Saltwater Ecotox | Seafood Ingestion Human Health | Cancer Risk | Non-cancer Hazard | Cancer Risk | Non-cancer Hazard | | Drinking Water | Non-Drinking Water | | |
| Heptachlor | 76-44-8 | 1.0E-02 | 1.4E-03 | 1.3E+00 | 3.8E-03 | 3.6E-03 | 2.1E-04 | 1.8E-01 | -- | 7.9E-01 | -- | 9.0E+01 | 2.0E+01 | 2.0E+02 | 2.1E-04 | Aquatic Habitat |
| Heptachlor epoxide | 1024-57-3 | 1.0E-02 | 1.4E-03 | 1.2E-01 | 3.8E-03 | 3.6E-03 | 1.1E-04 | 1.3E+00 | -- | 5.5E+00 | -- | 1.0E+02 | -- | -- | 1.1E-04 | Aquatic Habitat |
| Hexachlorobenzene | 118-74-1 | 1.0E+00 | 8.8E-03 | 1.6E+01 | 3.7E+00 | 6.5E+01 | 7.7E-04 | 7.9E-02 | -- | 3.4E-01 | -- | 3.1E+00 | 3.0E+03 | 3.0E+04 | 7.7E-04 | Aquatic Habitat |
| Hexachlorobutadiene | 87-68-3 | 1.4E-01 | 1.4E-01 | 6.5E+00 | 4.7E+00 | 3.2E+00 | 5.0E+01 | 3.0E-01 | -- | 1.3E+00 | -- | 1.6E+03 | 6.0E+00 | 6.0E+01 | 1.4E-01 | Tap Canc-Risk |
| g-Hexachlorocyclohexane (Lindane) | 58-89-9 | 2.0E-01 | 3.2E-02 | 3.6E+00 | 8.0E-02 | 1.6E-02 | 6.3E-02 | -- | -- | -- | -- | 3.7E+03 | 1.2E+04 | 1.2E+05 | 1.6E-02 | Aquatic Habitat |
| Hexachloroethane | 67-72-1 | 3.3E-01 | 3.3E-01 | 6.2E+00 | 1.2E+01 | 9.4E+01 | 8.9E+00 | 1.6E+00 | 2.0E+02 | 7.0E+00 | 8.2E+02 | 2.5E+04 | 1.0E+01 | 1.0E+02 | 3.3E-01 | Tap Canc-Risk |
| Indeno[1,2,3-c,d]pyrene [PAH] | 193-39-5 | 2.5E-01 | 2.5E-01 | -- | -- | 1.5E+01 | 4.9E-02 | -- | -- | -- | -- | 9.5E-02 | -- | -- | 4.9E-02 | Aquatic Habitat |
| Lead | 7439-92-1 | 1.5E+01 | 9.2E+00 | 2.0E-01 | 2.5E+00 | 8.1E+00 | -- | -- | -- | -- | -- | 5.0E+04 | -- | -- | 2.5E+00 | Aquatic Habitat |
| Mercury (elemental) | 7439-97-6 | 2.0E+00 | -- | 6.1E-02 | 2.5E-02 | 2.5E-02 | 5.1E-02 | -- | 8.9E-02 | -- | 3.8E-01 | 3.0E+01 | -- | -- | 2.5E-02 | Aquatic Habitat |
| Methoxychlor | 72-43-5 | 3.0E+01 | -- | 9.0E-02 | 1.9E-02 | 3.0E-03 | -- | -- | -- | -- | -- | 5.0E+01 | 4.7E+03 | 4.7E+04 | 3.0E-03 | Aquatic Habitat |
| Methylene chloride | 75-09-2 | 5.0E+00 | 9.3E-01 | 1.0E+02 | 2.2E+03 | 3.2E+03 | 1.6E+03 | 7.8E+00 | 3.2E+03 | 9.4E+01 | 1.3E+04 | 5.0E+04 | 9.1E+03 | 9.1E+04 | 5.0E+00 | MCL |
| Methyl ethyl ketone | 78-93-3 | 5.6E+03 | -- | 5.6E+03 | 1.4E+04 | -- | -- | -- | 2.3E+06 | -- | 9.5E+06 | 5.0E+04 | 8.4E+03 | 8.4E+04 | 5.6E+03 | Tap NC-Hazard |
| Methyl isobutyl ketone | 108-10-1 | 1.2E+02 | -- | 1.2E+02 | 1.7E+02 | -- | -- | -- | 5.6E+05 | -- | 2.3E+06 | 5.0E+04 | 1.3E+03 | 1.3E+04 | 1.2E+02 | Tap NC-Hazard |
| Methyl mercury | 22967-92-6 | 2.0E+00 | -- | 2.0E+00 | 3.0E-03 | -- | -- | -- | -- | -- | -- | 5.0E+04 | -- | -- | 3.0E-03 | Aquatic Habitat |
| 2-Methylnaphthalene | 91-57-6 | 3.6E+01 | -- | 3.6E+01 | 2.1E+00 | 3.0E+01 | -- | -- | -- | -- | -- | 1.3E+04 | 1.0E+01 | 1.0E+02 | 2.1E+00 | Aquatic Habitat |
| Methyl tertiary butyl ether (MTBE) | 1634-04-4 | 5.0E+00 | 1.3E+01 | 6.3E+03 | 6.6E+04 | 8.0E+03 | -- | 4.5E+02 | 1.3E+05 | 2.0E+03 | 5.5E+05 | 5.0E+04 | 5.0E+00 | 1.8E+03 | 5.0E+00 | Odor/Nuis |
| Molybdenum | 7439-98-7 | 1.0E+02 | -- | 1.0E+02 | 2.4E+02 | -- | -- | -- | -- | -- | -- | 5.0E+04 | -- | -- | 1.0E+02 | Tap NC-Hazard |
| Naphthalene [PAH] | 91-20-3 | 1.7E-01 | 1.7E-01 | 6.1E+00 | 2.4E+01 | 1.5E+01 | -- | 4.6E+00 | 1.7E+02 | 2.0E+01 | 7.3E+02 | 1.6E+04 | 2.1E+01 | 2.1E+02 | 1.7E-01 | Tap Canc-Risk |
| Nickel | 7440-02-0 | 1.0E+02 | 1.2E+01 | 2.2E+02 | 5.2E+01 | 8.2E+00 | 4.6E+03 | -- | -- | -- | -- | 5.0E+04 | -- | -- | 8.2E+00 | Aquatic Habitat |
| Pentachlorophenol | 87-86-5 | 1.0E+00 | 4.0E-02 | 2.3E+01 | 1.5E+01 | 7.9E+00 | 8.2E+00 | -- | -- | -- | -- | 7.0E+03 | 3.0E+01 | 5.9E+03 | 1.0E+00 | MCL |
| Perchlorate | 7790-98-9 | 6.0E+00 | -- | 1.0E+00 | 6.0E+02 | -- | -- | -- | -- | -- | -- | 5.0E+04 | -- | -- | 6.0E+00 | MCL |
| Petroleum - Gasoline | -- | 7.6E+02 | -- | 7.6E+02 | 4.4E+02 | 3.7E+03 | -- | -- | -- | -- | -- | 5.0E+04 | 1.0E+02 | 5.0E+03 | 1.0E+02 | Odor/Nuis |
| Petroleum - Stoddard Solvent | -- | 2.1E+02 | -- | 2.1E+02 | 6.4E+02 | 6.4E+02 | -- | -- | -- | -- | -- | 2.5E+03 | 1.0E+02 | 5.0E+03 | 1.0E+02 | Odor/Nuis |
| Petroleum - Jet Fuel | -- | 2.1E+02 | -- | 2.1E+02 | 6.4E+02 | 6.4E+02 | -- | -- | -- | -- | -- | 2.5E+03 | 1.0E+02 | 5.0E+03 | 1.0E+02 | Odor/Nuis |
| Petroleum - Diesel | -- | 2.0E+02 | -- | 2.0E+02 | 6.4E+02 | 6.4E+02 | -- | -- | -- | -- | -- | 2.5E+03 | 1.0E+02 | 5.0E+03 | 1.0E+02 | Odor/Nuis |
| Petroleum - HOPs | -- | 4.1E+02 | -- | 4.1E+02 | 5.1E+02 | 5.1E+02 | -- | -- | -- | -- | -- | 5.0E+04 | 1.0E+02 | 5.0E+03 | 1.0E+02 | Odor/Nuis |
| Petroleum - Motor Oil | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene [PAH] | 85-01-8 | -- | -- | -- | 6.3E+00 | 4.6E+00 | -- | -- | -- | -- | -- | 4.1E+02 | 1.0E+03 | 1.0E+04 | 4.6E+00 | Aquatic Habitat |
| Phenol | 108-95-2 | 4.2E+03 | -- | 4.2E+03 | 1.3E+03 | 5.8E+02 | 4.6E+06 | -- | -- | -- | -- | 5.0E+04 | 5.0E+00 | 7.9E+04 | 5.0E+00 | Odor/Nuis |
| Polychlorinated biphenyls (PCBs) | 1336-36-3 | 5.0E-01 | 1.9E-03 | -- | 1.4E-02 | 3.0E-02 | 1.7E-04 | 2.9E-01 | -- | 1.3E+00 | -- | 3.5E+02 | -- | -- | 1.7E-04 | Aquatic Habitat |
| Pyrene [PAH] | 129-00-0 | 1.2E+02 | -- | 1.2E+02 | 2.0E+00 | 1.5E+01 | 1.1E+04 | -- | -- | -- | -- | 7.0E+01 | -- | -- | 2.0E+00 | Aquatic Habitat |
| Selenium | 7782-49-2 | 5.0E+01 | -- | 3.0E+01 | 5.0E+00 | 5.0E-01 | -- | -- | -- | -- | -- | 5.0E+04 | -- | -- | 5.0E-01 | Aquatic Habitat |
| Silver | 7440-22-4 | 1.0E+02 | -- | 9.4E+01 | 3.4E+00 | 1.9E-01 | -- | -- | -- | -- | -- | 5.0E+04 | 1.0E+02 | -- | 1.9E-01 | Aquatic Habitat |
| Styrene | 100-42-5 | 1.0E+01 | 5.0E-01 | 1.1E+03 | -- | -- | -- | -- | 8.5E+03 | -- | 3.6E+04 | 5.0E+04 | 1.0E+01 | 1.1E+02 | 1.0E+01 | Odor/Nuis |
| tert-Butyl alcohol | 75-65-0 | 1.2E+01 | 1.2E+01 | -- | 1.8E+04 | -- | -- | -- | -- | -- | -- | 5.0E+04 | -- | -- | 1.2E+01 | Tap Canc-Risk |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5.7E-01 | 5.7E-01 | 4.8E+02 | 9.3E+02 | -- | -- | 3.8E+00 | -- | 1.7E+01 | -- | 5.0E+04 | -- | -- | 5.7E-01 | Tap Canc-Risk |

| 2019 (Rev. 2) | | Summary of Soil ESLs (mg/kg) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemicals | CAS No. | Direct Exposure Human Health Risk Levels (Table S-1) | | | | | | Terrestrial Habitat Levels (Table S-2) | | Leaching to Groundwater Levels (Table S-3) | | Gross Contamination Levels (Table S-4) | Odor Nuisance Levels (Table S-5) | | | Soil Tier 1 ESL | Basis |
| | | Residential: Shallow Soil Exposure | | Commerical/ Industrial: Shallow Soil Exposure | | Construction Worker: Any Land Use/ Any Depth Soil Exposure | | Significantly Vegetated Area | Minimally Vegetated Area | Drinking Water | Non-drinking Water | | Res: Shallow Soil Exposure | Com/Ind: Shallow Soil Exposure | Any Land Use: Any Soil Exposure (CW) | | |
| | | Cancer Risk | Non-cancer Hazard | Cancer Risk | Non-cancer Hazard | Cancer Risk | Non-cancer Hazard | Examples: Parkland or single family homes with yards | Examples: High density residential or commercial/ industrial areas | | | | | | | | |
| 1,2-Dichlorobenzene | 95-50-1 | -- | 1.8E+03 | -- | 9.4E+03 | -- | 7.8E+03 | 4.3E+00 | 8.5E+00 | 1.0E+00 | 1.0E+00 | 3.8E+02 | 1.0E+03 | 2.5E+03 | 2.5E+03 | 1.0E+00 | Leaching |
| 1,3-Dichlorobenzene | 541-73-1 | -- | -- | -- | -- | -- | -- | 6.0E+00 | 1.2E+01 | 7.4E+00 | 7.4E+00 | 6.1E+02 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 6.0E+00 | Terr Habitat |
| 1,4-Dichlorobenzene | 106-46-7 | 2.6E+00 | 3.4E+03 | 1.2E+01 | 2.6E+04 | 2.8E+02 | 1.5E+04 | 4.5E+00 | 9.0E+00 | 2.0E-01 | 2.0E-01 | 1.9E+02 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.0E-01 | Leaching |
| 3,3-Dichlorobenzidine | 91-94-1 | 5.8E-01 | -- | 2.7E+00 | -- | 2.0E+01 | -- | -- | -- | 2.5E-02 | 1.3E+02 | 6.0E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.5E-02 | Leaching |
| DDD | 72-54-8 | 2.7E+00 | -- | 1.2E+01 | -- | 8.1E+01 | -- | 8.5E+00 | 1.7E+01 | 6.5E+01 | 6.5E+01 | 6.5E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.7E+00 | Canc-Risk |
| DDE | 72-55-9 | 1.8E+00 | -- | 8.3E+00 | -- | 5.7E+01 | -- | 3.3E-01 | 6.5E-01 | 2.9E+01 | 2.9E+01 | 2.9E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 3.3E-01 | Terr Habitat |
| DDT | 50-29-3 | 1.9E+00 | 3.7E+01 | 8.5E+00 | 5.2E+02 | 5.7E+01 | 1.4E+02 | 1.1E-03 | 7.8E+00 | 5.6E+00 | 5.6E+00 | 5.6E+00 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.1E-03 | Terr Habitat |
| 1,1-Dichloroethane | 75-34-3 | 3.6E+00 | 1.6E+04 | 1.6E+01 | 2.3E+05 | 3.7E+02 | 7.1E+04 | 1.1E+01 | 2.1E+01 | 2.0E-01 | 3.1E-01 | 1.7E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.0E-01 | Leaching |
| 1,2-Dichloroethane | 107-06-2 | 4.7E-01 | 3.2E+01 | 2.1E+00 | 1.4E+02 | 4.5E+01 | 1.3E+02 | 2.9E+01 | 2.9E+01 | 7.0E-03 | 3.1E-02 | 3.0E+03 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 7.0E-03 | Leaching |
| 1,1-Dichloroethene | 75-35-4 | -- | 8.3E+01 | -- | 3.5E+02 | -- | 3.5E+02 | 4.3E+01 | 1.3E+02 | 5.4E-01 | 4.2E+00 | 1.2E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 5.4E-01 | Leaching |
| cis-1,2-Dichloroethene | 156-59-2 | -- | 1.9E+01 | -- | 8.5E+01 | -- | 7.8E+01 | 8.4E+01 | 9.4E+02 | 1.9E-01 | 1.6E+00 | 2.4E+03 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 1.9E-01 | Leaching |
| trans-1,2-Dichloroethene | 156-60-5 | -- | 1.3E+02 | -- | 6.0E+02 | -- | 5.7E+02 | 8.4E+01 | 9.4E+02 | 6.5E-01 | 1.4E+01 | 1.9E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 6.5E-01 | Leaching |
| 2,4-Dichlorophenol | 120-83-2 | -- | 2.3E+02 | -- | 3.5E+03 | -- | 1.1E+03 | 2.1E+00 | -- | 7.5E-03 | 7.5E-02 | 5.6E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 7.5E-03 | Leaching |
| 1,2-Dichloropropane | 78-87-5 | 1.0E+00 | 1.6E+01 | 4.4E+00 | 6.6E+01 | 9.9E+01 | 6.6E+01 | 3.1E+01 | 6.3E+01 | 6.5E-02 | 6.5E-02 | 1.4E+03 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 6.5E-02 | Leaching |
| 1,3-Dichloropropene | 542-75-6 | 5.7E-01 | 7.2E+01 | 2.5E+00 | 3.1E+02 | 5.3E+01 | 3.0E+02 | 3.1E+01 | 6.3E+01 | 1.7E-02 | 4.0E-02 | 1.6E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.7E-02 | Leaching |
| Dieldrin | 60-57-1 | 3.7E-02 | 3.5E+00 | 1.6E-01 | 4.8E+01 | 1.1E+00 | 1.2E+01 | 9.6E-04 | 1.1E-01 | 4.6E-04 | 6.3E-03 | 2.4E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 4.6E-04 | Leaching |
| Diethyl phthalate | 84-66-2 | -- | 5.1E+04 | -- | 6.6E+05 | -- | 1.5E+05 | 1.3E+01 | 2.7E+01 | 2.5E-02 | 2.5E-02 | 7.7E+02 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.5E-02 | Leaching |
| Dimethyl phthalate | 131-11-3 | -- | -- | -- | -- | -- | -- | 2.1E+01 | 4.2E+01 | 3.5E-02 | 3.5E-02 | 4.7E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 3.5E-02 | Leaching |
| 2,4-Dimethylphenol | 105-67-9 | -- | 1.6E+03 | -- | 2.3E+04 | -- | 7.1E+03 | -- | -- | 8.1E+00 | 8.9E+00 | 2.4E+04 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 8.1E+00 | Leaching |
| 2,4-Dinitrophenol | 51-28-5 | -- | 1.6E+02 | -- | 2.3E+03 | -- | 7.1E+02 | -- | -- | 3.0E+00 | 5.7E+00 | 8.0E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 3.0E+00 | Leaching |
| 2,4-Dinitrotoluene | 121-14-2 | 2.2E+00 | 1.6E+02 | 1.1E+01 | 2.3E+03 | 7.9E+01 | 7.1E+02 | -- | -- | 2.3E-02 | 1.1E+01 | 7.2E+02 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.3E-02 | Leaching |
| 1,4-Dioxane | 123-91-1 | 4.7E+00 | 8.1E+02 | 2.2E+01 | 4.5E+03 | 2.1E+02 | 3.4E+03 | 1.8E+00 | 1.8E+00 | 1.7E-04 | 8.4E-01 | 1.2E+05 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.7E-04 | Leaching |
| Dioxin (2,3,7,8-TCDD) | 1746-01-6 | 4.8E-06 | 5.1E-05 | 2.2E-05 | 7.2E-04 | 1.5E-04 | 2.0E-04 | 1.3E-05 | 9.9E-05 | 3.0E-01 | 3.0E-01 | 3.0E-01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 4.8E-06 | Canc-Risk |
| Endosulfan | 115-29-7 | -- | 4.2E+02 | -- | 5.8E+03 | -- | 1.5E+03 | 2.3E-02 | 3.8E-01 | 9.8E-03 | 9.8E-03 | 1.3E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 9.8E-03 | Leaching |
| Endrin | 72-20-8 | -- | 2.1E+01 | -- | 2.9E+02 | -- | 7.4E+01 | 1.1E-03 | 1.1E-03 | 7.6E-03 | 7.6E-03 | 3.0E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.1E-03 | Terr Habitat |
| Ethylbenzene | 100-41-4 | 5.9E+00 | 3.4E+03 | 2.6E+01 | 2.1E+04 | 5.4E+02 | 1.5E+04 | 9.0E+01 | 4.3E+02 | 4.3E-01 | 4.3E-01 | 4.9E+02 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 4.3E-01 | Leaching |
| Fluoranthene [PAH] | 206-44-0 | -- | 2.4E+03 | -- | 3.0E+04 | -- | 6.7E+03 | 6.9E-01 | 1.2E+05 | 8.6E+01 | 8.6E+01 | 8.6E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 6.9E-01 | Terr Habitat |
| Fluorene [PAH] | 86-73-7 | -- | 2.4E+03 | -- | 3.0E+04 | -- | 6.7E+03 | -- | -- | 6.0E+00 | 6.0E+00 | 9.4E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 6.0E+00 | Leaching |
| Heptachlor | 76-44-8 | 1.2E-01 | 3.5E+01 | 5.3E-01 | 4.8E+02 | 3.7E+00 | 1.2E+02 | 2.5E-01 | 5.0E-01 | 4.4E+01 | 4.4E+01 | 4.4E+01 | 1.0E+03 | 2.5E+03 | 2.5E+03 | 1.2E-01 | Canc-Risk |
| Heptachlor epoxide | 1024-57-3 | 6.2E-02 | 9.1E-01 | 2.8E-01 | 1.3E+01 | 1.9E+00 | 3.2E+00 | -- | -- | 1.8E-04 | 6.0E-03 | 1.2E+01 | 1.0E+03 | 2.5E+03 | 2.5E+03 | 1.8E-04 | Leaching |
| Hexachlorobenzene | 118-74-1 | 1.8E-01 | 5.6E+01 | 7.8E-01 | 7.7E+02 | 7.7E+00 | 2.0E+02 | 1.3E+02 | 2.5E+02 | 8.0E-04 | 8.2E-02 | 2.3E-01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 8.0E-04 | Leaching |
| Hexachlorobutadiene | 87-68-3 | 1.2E+00 | 7.8E+01 | 5.3E+00 | 1.2E+03 | 1.0E+02 | 3.5E+02 | -- | -- | 2.8E-02 | 6.2E-02 | 1.7E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 2.8E-02 | Leaching |
| g-Hexachlorocyclohexane (Lindane) | 58-89-9 | 5.5E-01 | 2.1E+01 | 2.5E+00 | 2.9E+02 | 1.6E+01 | 7.4E+01 | 7.4E+00 | 1.5E+01 | 7.4E-03 | 7.4E-03 | 1.2E+02 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 7.4E-03 | Leaching |
| Hexachloroethane | 67-72-1 | 1.8E+00 | 3.8E+01 | 7.8E+00 | 3.7E+02 | 1.3E+02 | 1.2E+02 | -- | -- | 1.9E-02 | 9.2E-02 | 6.7E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.9E-02 | Leaching |
| Indeno[1,2,3-c,d]pyrene [PAH] | 193-39-5 | 1.1E+00 | -- | 2.1E+01 | -- | 1.1E+02 | -- | 4.8E-01 | 9.5E-01 | 1.6E+01 | 3.2E+01 | 2.3E+00 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 4.8E-01 | Terr Habitat |
| Lead | 7439-92-1 | 8.2E+01 | 8.0E+01 | 3.8E+02 | 3.2E+02 | 2.7E+03 | 1.6E+02 | 3.2E+01 | 3.2E+01 | -- | -- | -- | -- | -- | -- | 3.2E+01 | Terr Habitat |
| Mercury (elemental) | 7439-97-6 | -- | 1.3E+01 | -- | 1.9E+02 | -- | 4.4E+01 | 1.5E+01 | 2.0E+01 | -- | -- | -- | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.3E+01 | NC-Hazard |
| Methoxychlor | 72-43-5 | -- | 3.5E+02 | -- | 4.8E+03 | -- | 1.2E+03 | 1.3E-01 | 4.1E+03 | 1.3E-02 | 1.3E-02 | 1.6E+01 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.3E-02 | Leaching |
| Methylene chloride | 75-09-2 | 1.9E+00 | 3.1E+02 | 2.5E+01 | 2.5E+03 | 4.9E+02 | 1.4E+03 | 9.8E-01 | 2.0E+00 | 1.2E-01 | 1.9E-01 | 3.3E+03 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 1.2E-01 | Leaching |
| Methyl ethyl ketone | 78-93-3 | -- | 2.7E+04 | -- | 2.0E+05 | -- | 1.2E+05 | 4.4E+01 | 8.8E+01 | 6.1E+00 | 1.5E+01 | 2.8E+04 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 6.1E+00 | Leaching |
| Methyl isobutyl ketone | 108-10-1 | -- | 3.4E+04 | -- | 1.4E+05 | -- | 1.4E+05 | -- | -- | 3.6E-01 | 5.1E-01 | 3.4E+03 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 3.6E-01 | Leaching |
| Methyl mercury | 22967-92-6 | -- | 6.3E+00 | -- | 8.2E+01 | -- | 1.9E+01 | 3.4E-02 | 3.4E-02 | -- | -- | -- | 1.0E+02 | 5.0E+02 | 5.0E+02 | 3.4E-02 | Terr Habitat |
| 2-Methylnaphthalene | 91-57-6 | -- | 2.4E+02 | -- | 3.0E+03 | -- | 6.7E+02 | -- | -- | 8.8E-01 | 8.8E-01 | 3.8E+02 | 5.0E+02 | 1.0E+03 | 1.0E+03 | 8.8E-01 | Leaching |
| Methyl tertiary butyl ether (MTBE) | 1634-04-4 | 4.7E+01 | 1.6E+04 | 2.1E+02 | 6.6E+04 | 4.1E+03 | 6.5E+04 | 3.1E+01 | 6.3E+01 | 2.8E-02 | 2.5E+00 | 9.0E+03 | 1.0E+02 | 5.0E+02 | 5.0E+02 | 2.8E-02 | Leaching |

| 2019 (Rev. 2) | | Summary of Vapor ESLs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Subslab/ Soil Gas (µg/m$^3$) | | | | | | | Indoor Air (µg/m$^3$) | | | | | | |
| Chemicals | CAS No. | Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels (Table SG-1) | | | | Subslab/ Soil Gas Vapor Intrusion: Odor Nuisance Levels (Table SG-2) | Tier 1 ESL | Basis | Direct Exposure Human Health Risk Levels (Table IA-1) | | | | Odor Nuisance Levels (Table IA-2) | Tier 1 ESL | Basis |
| | | Residential | | Commercial/ Industrial | | | | | Residential | | Commercial/ Industrial | | | | |
| | | Cancer Risk | Non-cancer Hazard | Cancer Risk | Non-cancer Hazard | | | | Cancer Risk | Non-cancer Hazard | Cancer Risk | Non-cancer Hazard | | | |
| Dioxin (2,3,7,8-TCDD) | 1746-01-6 | 2.5E-06 | 1.4E-03 | 1.1E-05 | 5.8E-03 | -- | 2.5E-06 | Canc-Risk | 7.4E-08 | 4.2E-05 | 3.2E-07 | 1.8E-04 | -- | 7.4E-08 | Canc-Risk |
| Endosulfan | 115-29-7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endrin | 72-20-8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | 100-41-4 | 3.7E+01 | 3.5E+04 | 1.6E+02 | 1.5E+05 | 6.7E+04 | 3.7E+01 | Canc-Risk | 1.1E+00 | 1.0E+03 | 4.9E+00 | 4.4E+03 | 2.0E+03 | 1.1E+00 | Canc-Risk |
| Fluoranthene [PAH] | 206-44-0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene [PAH] | 86-73-7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor | 76-44-8 | 7.2E-02 | -- | 3.1E-01 | -- | 1.0E+04 | 7.2E-02 | Canc-Risk | 2.2E-03 | -- | 9.4E-03 | -- | 3.0E+02 | 2.2E-03 | Canc-Risk |
| Heptachlor epoxide | 1024-57-3 | 3.6E-02 | -- | 1.6E-01 | -- | 1.0E+04 | 3.6E-02 | Canc-Risk | 1.1E-03 | -- | 4.7E-03 | -- | 3.0E+02 | 1.1E-03 | Canc-Risk |
| Hexachlorobenzene | 118-74-1 | 1.8E-01 | -- | 8.0E-01 | -- | -- | 1.8E-01 | Canc-Risk | 5.5E-03 | -- | 2.4E-02 | -- | -- | 5.5E-03 | Canc-Risk |
| Hexachlorobutadiene | 87-68-3 | 4.3E+00 | -- | 1.9E+01 | -- | 4.0E+05 | 4.3E+00 | Canc-Risk | 1.3E-01 | -- | 5.6E-01 | -- | 1.2E+04 | 1.3E-01 | Canc-Risk |
| g-Hexachlorocyclohexane (Lindane) | 58-89-9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Hexachloroethane | 67-72-1 | 8.5E+00 | 1.0E+03 | 3.7E+01 | 4.4E+03 | -- | 8.5E+00 | Canc-Risk | 2.6E-01 | 3.1E+01 | 1.1E+00 | 1.3E+02 | -- | 2.6E-01 | Canc-Risk |
| Indeno[1,2,3-c,d]pyrene [PAH] | 193-39-5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | 7439-92-1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury (elemental) | 7439-97-6 | -- | 1.0E+00 | -- | 4.4E+00 | -- | 1.0E+00 | NC-Hazard | -- | 3.1E-02 | -- | 1.3E-01 | -- | 3.1E-02 | NC-Hazard |
| Methoxychlor | 72-43-5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Methylene chloride | 75-09-2 | 3.4E+01 | 1.4E+04 | 4.1E+02 | 5.8E+04 | 1.9E+07 | 3.4E+01 | Canc-Risk | 1.0E+00 | 4.2E+02 | 1.2E+01 | 1.8E+03 | 5.6E+05 | 1.0E+00 | Canc-Risk |
| Methyl ethyl ketone | 78-93-3 | -- | 1.7E+05 | -- | 7.3E+05 | 1.1E+06 | 1.7E+05 | NC-Hazard | -- | 5.2E+03 | -- | 2.2E+04 | 3.2E+04 | 5.2E+03 | NC-Hazard |
| Methyl isobutyl ketone | 108-10-1 | -- | 1.0E+05 | -- | 4.4E+05 | 1.4E+04 | 1.4E+04 | Odor/Nuis | -- | 3.1E+03 | -- | 1.3E+04 | 4.2E+02 | 4.2E+02 | Nuis/Odor |
| Methyl mercury | 22967-92-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | 91-57-6 | -- | -- | -- | -- | 2.3E+03 | 2.3E+03 | Odor/Nuis | -- | -- | -- | -- | 6.8E+01 | 6.8E+01 | Nuis/Odor |
| Methyl tertiary butyl ether (MTBE) | 1634-04-4 | 3.6E+02 | 1.0E+05 | 1.6E+03 | 4.4E+05 | 1.8E+04 | 3.6E+02 | Canc-Risk | 1.1E+01 | 3.1E+03 | 4.7E+01 | 1.3E+04 | 5.3E+02 | 1.1E+01 | Canc-Risk |
| Molybdenum | 7439-98-7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene [PAH] | 91-20-3 | 2.8E+00 | 1.0E+02 | 1.2E+01 | 4.4E+02 | 1.5E+04 | 2.8E+00 | Canc-Risk | 8.3E-02 | 3.1E+00 | 3.6E-01 | 1.3E+01 | 4.4E+02 | 8.3E-02 | Canc-Risk |
| Nickel | 7440-02-0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pentachlorophenol | 87-86-5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Perchlorate | 7790-98-9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Petroleum - Gasoline | -- | -- | 2.0E+04 | -- | 8.3E+04 | 3.3E+03 | 3.3E+03 | Odor/Nuis | -- | 6.0E+02 | -- | 2.5E+03 | 1.0E+02 | 1.0E+02 | Nuis/Odor |
| Petroleum - Stoddard Solvent | -- | -- | 1.1E+04 | -- | 4.6E+04 | 3.3E+04 | 1.1E+04 | NC-Hazard | -- | 3.3E+02 | -- | 1.4E+03 | 1.0E+03 | 3.3E+02 | NC-Hazard |
| Petroleum - Jet Fuel | -- | -- | 1.1E+04 | -- | 4.6E+04 | 3.3E+04 | 1.1E+04 | NC-Hazard | -- | 3.3E+02 | -- | 1.4E+03 | 1.0E+03 | 3.3E+02 | NC-Hazard |
| Petroleum - Diesel | -- | -- | 8.9E+03 | -- | 3.7E+04 | 3.3E+04 | 8.9E+03 | NC-Hazard | -- | 2.7E+02 | -- | 1.1E+03 | 1.0E+03 | 2.7E+02 | NC-Hazard |
| Petroleum - HOPs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Petroleum - Motor Oil | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |