SUBPART II

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

RISK EVALUATION PROCEDURES FOR

VOLUNTARY CLEANUP AND REDEVELOPMENT OF

BROWNFIELD SITES

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SUBPART II. RISK EVALUATION PROCEDURES

Chapter 1. GENERAL

Section 101. Introduction

(a) The Mississippi Brownfields Voluntary Cleanup and Redevelopment Program (Brownfields Program) utilizes risk-based criteria for Site evaluation and remediation. The risk-based procedures and rationale for evaluating environmental contamination on or under a Site are presented in this Subpart II. This evaluation is necessary to develop remediation requirements that are protective of human health and the environment. All remediation and/or corrective actions must be approved by MDEQ.

(b) In considering the risk-based evaluation of conditions on or under a Site, the following must be addressed:

(1) complete the Site Conceptual Exposure Model (SCEM) to evaluate site-specific risk and exposure conditions before and after remediation;

(2) conduct a Site Characterization to delineate the nature and extent (vertically and horizontally) of contamination found on or under the Site;

(3) complete the Site Ecological Checklist to determine whether an ecological risk assessment is necessary; and

(4) conduct a Risk-Based Evaluation of the Site utilizing the Brownfields Program three-tiered approach.

(c) The cornerstone of the Brownfields Program is a three-tiered risk-based process for evaluating human health and environmental risks. These tiers are referred to as Tier 1, Tier 2, and Tier 3. These tiers are designed to allow the Applicant to evaluate and determine appropriate remedial options for site specific conditions. A description of each tier is discussed below.

(1) A Tier 1 Evaluation is the comparison of site-specific data to a "look-up" table of chemical-specific target remediation goals (TRGs). Specific TRG concentrations have been determined to be protective of human health and the environment for restricted use and unrestricted use of a Site. The Tier 1 TRG Table is presented in Appendix A.

(2) A Tier 2 Evaluation provides the Applicant the option of performing a more in-depth evaluation of site-specific conditions to develop site-specific Remediation Goals (RG) and/or to better define site-specific data to be used for a Tier 1 Evaluation.

(3) A Tier 3 Evaluation is a site-specific risk assessment to evaluate the potential human health and ecological risks at the Site that will result in the development of site-specific Remediation Goals (RGs).

(d) Land use plays an integral role in the three-tiered approach and in the development of the SCEM. Land-use restrictions may reduce or eliminate the potential for exposure to contaminants and risk.

(e) Specific criteria for evaluating Sites impacted with petroleum hydrocarbons is contained in Chapter 7 of this Subpart II.

Chapter 2. BROWNFIELD SITE EVALUATION

Section 201. Site Conceptual Exposure Model (SCEM)

(a) The SCEM is a graphical representation of actual and potential Site conditions based on available data and an understanding of those Site conditions. A BASELINE and a REMEDIAL SCEM must be completed and are provided in forms prescribed by MDEQ. The BASELINE SCEM represents the risk and exposure conditions that exist prior to the implementation of remediation. The REMEDIAL SCEM represents the risk and exposure conditions that exist or are expected to exist after the implementation of remediation. Items to be identified in the SCEM include the following:

(1) chemical of concern (CoC) sources;
(2) CoC movement (migration/transport);
(3) the actual or potential exposure pathways; and
(4) the actual or potential receptor populations.

(b) Based on the results of the completed BASELINE SCEM, exposure point concentrations (EPCs) must be identified for CoC(s) with completed and potentially completed exposure pathways. EPCs are the concentrations of site-related compounds in a specific media that a human or environmental receptor will contact (Complete) or may potentially contact (Potentially Complete) through ingestion or inhalation at the point of exposure.

(c) All four elements identified in the SCEM must be complete for exposure to occur. It is important to note that the BASELINE SCEM should be developed early in the process (i.e., Brownfield Application and/or work plan stage) and identified as "draft" if additional information is pending. The BASELINE SCEM can be updated and modified as the site investigation progresses and more site-specific information becomes available. BASELINE SCEM should be identified as "final" once the Site Characterization is complete.

(d) If additional issues of concern pertaining to exposure at the site (additional pathways, media, sources, transport mechanisms, receptors, etc.) are not

specifically addressed in the SCEMs, the Applicant should provide an attachment(s) to the appropriate SCEM discussing the additional issues.

(e) The BASELINE and REMEDIAL SCEM worksheets must be included as part of the Site Characterization Report and the Corrective Action Report.

(f) The procedures for completing the SCEMs follow:

(1) Identify the Primary Sources (on-site and off-site) of contamination that exist or are believed to have existed.
(2) Identify the Secondary Sources. Mark the media (soils, groundwater, sediments, or surface water) that have been impacted (Complete) or could potentially be impacted (Potentially Complete) by a release from a primary source.
(3) Identify the Transport Mechanisms by which the contaminants may move through the environment.
(4) Identify the Exposure Pathway that is the medium (soil, groundwater, air, sediments, or surface water) that a receptor will contact (Complete) or may contact (Potentially Complete).
(5) Identify the Actual (Complete) and the Future (Potentially Complete) Receptors for restricted and unrestricted land-use.

Section 202. Criteria For Completing The SCEMs

(a) **BASELINE SCEM** - The following sections describe the criteria for evaluating the completeness and potential completeness of contaminant exposure for the Site. All potential exposure pathways should be evaluated for completeness, as identified in the SCEM worksheets. The Applicant should provide as much detail as possible. Indicate all sources, transport mechanisms, pathways and receptors that are complete or potentially complete. If information is not available to support a pathway as incomplete then that pathway should be considered to be potentially complete and should be identified for evaluation until such information becomes available. A description of each of the BASELINE SCEM criteria is provided in the following sections.

(1) **Sources** can be defined as either Primary Sources or Secondary Sources. Primary Sources are those present or past storage units (i.e., tanks, impoundments, piles), distribution systems (i.e., piping, manifolds, lines, pumps), operations (i.e., wash areas, repair bays, water treatment, blending tanks, formulation areas), waste management units (i.e., burn pits, disposal units, dumps) and other on-site and off-site sources of actual or potential contamination that have or may have leaked, leached, spilled, or otherwise been released and may have impacted the Site. Several categories of potential primary sources are included on the SCEM worksheet and can be identified by filling in the appropriate boxes on the worksheet. If the sources

listed do not pertain to the Site, then use "Other". The Applicant should be as specific as possible about the source of contamination. Supporting documentation (i.e., analytical results, product storage/transmission information, tank information, etc.) of the primary source of contamination should be provided in the appropriate section(s) of the Work Plan and/or Site Characterization Report.

Secondary Sources are defined as transport media (i.e., surficial soils, subsurface soils, groundwater, sediments, or surface water) that have been impacted or potentially impacted by the primary (release) source. Identify all media that may serve as secondary sources of contamination. For the purposes of this Subpart II, surficial soil is defined as extending to 6 ft. below ground surface (bgs). The presence of CoCs that cannot be attributed to background should be identified as "complete," and any secondary source that is potentially affected by an on-site or off-site primary source should be identified as "potentially complete." The Applicant must provide adequate documentation to demonstrate that a secondary source has not been affected in order to remove that medium from further consideration. If such documentation has not yet been gathered to support the exclusion of a secondary source, then that medium must be identified as "potentially complete" until such time as such information becomes available. The BASELINE SCEM can be updated as additional site-specific data are gathered.

(2) **Transport Mechanisms** are means by which the CoC release can migrate from the identified secondary sources and result in actual or potential human exposure. A variety of potential transport mechanisms are generally applicable to a site. Indicate on the BASELINE SCEM Worksheet those transport mechanisms that are applicable or potentially applicable to the site. Those transport mechanisms identified as applicable or potentially applicable should be marked "complete" or "potentially complete," respectively.

i. **Surficial Soils** - If surficial soil has been identified as a secondary source, then the following transport mechanisms must be identified as "complete" or "potentially complete":
   (A) Wind Erosion and Atmospheric Dispersion (For Non-Volatile Compounds Only)
   (B) Volatilization and Atmospheric Dispersion (For Volatile Compounds Only)
   (C) Volatilization and Enclosed-Space Accumulation (For Volatile Compounds Only)
   (D) Leaching and Groundwater Transport

Note: The Soil Exposure Pathway must also be identified as "complete" or "potentially complete" if surficial soil has been identified as a secondary source.

ii. **Subsurface Soils** - If subsurface soil has been identified as a secondary source, then the following transport mechanisms must be identified as "complete" or "potentially complete":
(A) Volatilization and Enclosed-Space Accumulation (For Volatile Compounds Only)
(B) Leaching and Groundwater Transport

iii. **Groundwater** - If groundwater has been identified as a secondary source, then the following transport mechanisms must be identified as "complete" or "potentially complete":
(A) Volatilization and Enclosed-Space Accumulation (For Volatile Compounds Only)
(B) Leaching and Groundwater Transport

iv. **Sediments or Surface Water** - If sediment or surface water has been identified as a secondary source, then Surface Water Runoff or Surface Water Transport must be identified as "complete" or "potentially complete."

(3) **Exposure Pathways** are the processes by which human uptake or exposure to site-related compounds may occur. Identify all "complete" or "potentially complete" exposure pathways at the Site that may provide a means for human exposure. All exposure pathways should be identified as potentially complete if supporting information for the exclusion of the pathway is not currently available.

i. **Soil** - If surficial soils are affected, then direct exposure through incidental ingestion must be indicated as complete or potentially complete. Contamination in surface and subsurface soils may be available for exposure through direct contact during intrusive activities, such as construction. The future use of the site and any plans for construction should be considered when evaluating the completeness of direct contact to subsurface soils.

ii. **Air** - Contamination of surface soil provides the potential for human uptake or exposure through inhalation of vapor from volatile compounds and through inhalation of non-volatile compounds that have adsorbed to surface soil particulates. Contamination of subsurface soil provides the potential for human uptake or exposure through inhalation of vapor from volatile compounds (i.e., migration into basements or during intrusive activities such as construction) and through inhalation of non-volatile compounds that have adsorbed to subsurface soil particulates during

intrusive activities, such as construction. In addition, the presence of volatile compounds in groundwater at the site produces the potential for volatilization into air (i.e., migration into basements, depth to groundwater is less than six (6) feet or intrusive activities).

iii. **Groundwater** - Contamination of groundwater requires that the Groundwater Exposure Pathway be marked as "complete" in the BASELINE SCEM. Surface and subsurface soils capable of leaching into groundwater at levels above the Groundwater TRG require that the Groundwater Exposure Pathway be marked as "complete" in the BASELINE SCEM. The presence of CoCs in surface and subsurface soils requires that the Groundwater Exposure Pathway be marked as "potentially complete" in the BASELINE SCEM. The Applicant must provide adequate documentation to demonstrate that CoCs in surface and subsurface soils will not leach into groundwater in order to remove that medium from further consideration. If documentation has not been gathered to support the exclusion of exposure pathway, that pathway must be identified as "potentially complete." The BASELINE SCEM can be updated as additional site-specific data are gathered.

iv. **Surface Water** - The exposure pathways applicable to surface water are included in the SCEM Worksheet in order to protect surface water bodies that may be used for domestic or recreational purposes. The presence of site-related compounds in soils, sediments, surface water, or groundwater provides the potential for migration or discharge to either on-site or off-site surface water bodies that may be used for recreational purposes, for a potable water supply, or for livestock watering. If contaminants are present in onsite media and such a surface water body is present within 500 ft. of the Site boundary, the pathway should indicate "potentially complete." Provide documentation in the Work Plan and/or the Site Characterization Report that a water body is not associated with or affected by the Site.

(4) The identification of **Potential Receptor** populations at the site is an important part of the completion of the BASELINE SCEM. It is important to know as much about the current and potential future use of the site and receptor populations, as possible. The receptor populations and the planned future use of the site are integral in supporting the remedial options at the site. Any and all potential receptor populations that could be exposed to site-related compounds should be identified on the BASELINE SCEM.

(b) **REMEDIAL SCEM** - Once the BASELINE SCEM has been completed, remedial options (i.e., institutional controls, engineering controls, or active cleanup) for the Site that can "shut off" or eliminate exposure to contamination should be evaluated. Those complete and potentially complete exposure routes linking sources to receptor populations must be remediated using one or a combination of options.

Free product must be remediated in a manner consistent with Section 601(d)(4) of this Subpart II. The REMEDIAL SCEM includes shut-off valves to graphically depict "open" or "closed" pathways between contaminated media and the receptor population. Shut-off valves are marked (shut) to indicate the remedial action that has been taken or proposed for the Site. A description of the types of remedial actions follow:

(1) **Institutional Controls** - The use of institutional controls (land use restrictions and agreed order with MDEQ) can serve as barriers in preventing future contact with subsurface soils and groundwater. Site land-use may be "unrestricted" or "restricted" that relates generally to residential and industrial/commercial, respectively. The potential to restrict the future use of the site (example: use of the site to a defined industrial use only, or the limitations of future construction activities, prohibiting groundwater use) can be considered in the remediation of the Site. If no restrictions for future use will be placed on the property by the Applicant, the identified remediation goals will be based on the future unrestricted (residential) use of the Site. Documentation of the institutional controls must be provided to support the proposed site remediation. A land use restriction and agreed order with MDEQ shall be used for "restricting" the Site. Institutional controls are to be used to "shut off" exposure to contamination. The Site Characterization Report and/or Corrective Action Plan must document the appropriate restrictions to be implemented. The Institutional Control Shut-off Valve on the REMEDIAL SCEM should be marked to reflect this option. An institutional control by itself cannot be used if there is further migration and/or expansion of the contamination.

(2) **Engineering Controls** - The use of engineering controls can reduce or eliminate the potential for exposure to contaminants through containment. Engineering Controls may include, but are not limited to, physical or hydraulic control measures (such as groundwater recovery trenches and leachate collection systems), groundwater treatment systems, engineered caps, liner systems, slurry walls or permanent structures, but shall not include the exclusive use of security fencing. Ingestion and dermal contact of soil contamination that exists under a building may be considered "shut off" provided the institutional control restricts the removal of the slab, thus eliminating the future potentially complete exposure route to soil contamination via ingestion or dermal contact. If an engineering control is used to "shut-off" exposure to contamination, the Site Characterization Report and/or Corrective Action Plan must document the appropriate engineering control and/or institutional control to be implemented. The Engineering Control Shut-off Valve on the REMEDIAL SCEM should be marked to reflect this option. An institutional control must be coupled with the engineering control to ensure the engineering control is maintained until the site is remediated to an unrestricted level.

(3) **Active Cleanup** - The active cleanup (i.e., removal, treatment) of contamination to levels that are protective of human health and the environment can reduce or eliminate the potential for exposure to contaminants. If active cleanup is used to "shut off" exposure to contamination, the Site Characterization Report and/or Corrective Action Plan must document the active cleanup activities and/or institutional control to be implemented. The Active Cleanup Shut-off Valve on the REMEDIAL SCEM should be marked to reflect this option. An institutional control may be necessary, depending upon the projected length of the cleanup, particularly if groundwater has been impacted (e.g., pump and treat system has been installed and projected to continue for 30 years).

Section 203. Site Characterization

(a) A Site Characterization must be conducted to delineate the nature and extent (vertically and horizontally) of contamination on and under the Site. Site characterization data should be collected and presented in accordance with the Quality Assurance Project Plan (QAPP) and Site Characterization Report formats. In general, the Applicant must demonstrate that the data are representative of the actual and/or potential contamination conditions at the Site. Collected data must include information describing and delineating the contaminant source area. Information pertaining to the characteristics of the CoCs, including the chemical and physical properties as well as the potential of the CoCs to migrate and transport to receptor locations through or in the affected media, must also be provided.

(b) The degree of contamination in surface and subsurface soil should be determined by performing soil boring(s) down to the depth of groundwater in the saturated zone. Surface soil is defined as the soil located at the surface and extending to a depth of six (6) feet below the ground surface. The subsurface soil depth is any depth beyond six feet. The Applicant must address ingestion, potential dermal contact, and inhalation (through volatilization and particulates) of hazardous chemicals present in the surface soil. In addition, CoCs in the surface soil may be transported off-site through precipitation runoff.

(c) The Applicant must demonstrate that groundwater is not impacted by the site-related contaminant; or that if groundwater is impacted, the impacted groundwater is confined and will remain confined within the Site. Groundwater contaminant concentrations should be determined by collecting groundwater samples.

(d) Measured data are those data collected from temporary or permanent (monitoring) wells. The Applicant should install wells, as necessary, to delineate the vertical and horizontal extent of groundwater impact and to determine flow direction and groundwater quality. Wells must be installed, developed, purged, and sampled in a manner consistent with EPA Region IV, Science and Ecological Support Division, Environmental Investigations Standard Operating Procedures and Quality

Assurance Manual, May 1996, as amended, or other procedures approved by MDEQ. Measured groundwater data must be based on unfiltered groundwater samples.

(e) The site characterization data should be collected in accordance with data quality objectives (DQOs) stipulated in the QAPP. The DQOs shall, at a minimum, identify the number of field and quality control samples, quantitation limits, analytical methods, and sample collection, preservation, and handling methods. Matrix interferences shall be minimized to the extent feasible by modified sample extraction and preparation methods in accordance with EPA or MDEQ approved analytical methodologies.

(f) The data collection strategy should be based on the Site Conceptual Exposure Model (SCEM) that hypothesizes or describes how the source chemicals or CoCs are released, transported, and exposed to the receptors.

(g) The Applicant must demonstrate that the analytical laboratory data have been reviewed for compliance with the DQOs. In the Site Characterization Report, the Applicant shall identify data that meet DQOs.

(h) To establish background chemical concentrations, the Applicant may collect samples from locations, as approved by MDEQ, outside of the influence of known contaminated areas and regionally prevalent chemicals and must analyze these samples using the same analytical methods as the CoC analyses.

(i) To establish regionally prevalent chemical concentrations, the Applicant may collect samples from locations, as approved by MDEQ, throughout a substantial geographic region and outside the influence of known contaminated areas and must analyze these samples using the same analytical methods as the CoC analyses.

(j) Historical data approved by MDEQ may be submitted in lieu of collecting new data provided that: (1) the Site characterization data requirements are summarized and presented in accordance with the Quality Assurance Project Plan and Site Characterization Report Formats; and (2) the data was collected in a manner consistent with appropriate sampling protocols, as approved by MDEQ. All detailed information must be referenced in the reports including sampling protocols. In any event, relevant previous site characterization reports should be submitted along with the application. Deviations from the required methodologies in the Quality Assurance Project Plan, Site Characterization Report, or Corrective Action Plan formats must be presented to and approved by MDEQ.

Section 204. Site Ecological Checklist

The Ecological Checklist is used to determined if ecological receptors of concern are present and potentially impacted (See Appendix D). If such receptors are present, MDEQ will make a determination as to whether a Tier 3 assessment of ecological risk should be performed to assess the potential ecological impact. Tier 1 and Tier 2 Evaluations are applicable for Sites with no known ecological receptors of concern.

Chapter 3. TIER 1 EVALUATION

Section 301. Tier 1 Evaluation Target Risk Level

The TRGs presented in the Tier 1 TRG table, Appendix A, are based on either (1) a $1x10^{-6}$ target risk level for each carcinogenic chemical, (2) a hazard index not to exceed 1 for each systemic toxicant, or (3) constituent TRG concentrations established through federal/state programs (i.e., Safe Drinking Water Act). The values presented in the Tier 1 TRG table will be modified periodically based on EPA updates of toxicity values obtained from the sources presented in Section 502(c)(2) of this Subpart II.

Section 302. Tier 1 Evaluation Procedures

(a) The basic methodology for a Tier 1 Evaluation shall be the comparison of the highest concentration of each contaminant in each media to the TRGs provided in the Tier 1 TRG table. Results of the comparison will be used to determine if the site specific data are:

(1) at or below the unrestricted risk value;
(2) above the unrestricted risk value, but at or below the restricted risk value; or
(3) above the restricted risk value.

(b) Sites that do not require an ecological evaluation beyond the Site Ecological Checklist and that exhibit chemical concentrations that are at or below the unrestricted TRGs do not require further evaluation or action. Such sites are not eligible for the Brownfields Program since remediation is not necessary as required in Section 49-5-5(b) of Mississippi Code Annotated, as amended.

(c) Sites with chemical concentrations in soils that are greater than the unrestricted TRGs but below the restricted TRGs may:

(1) clean-up and/or remove the affected media to a value at or below the unrestricted TRG values resulting in an unrestricted land-use site;
(2) implement appropriate institutional controls (i.e., land use restriction and agreed order with MDEQ) resulting in a restricted land use site; or
(3) perform a Tier 2 Evaluation.

(d) Sites with chemical concentrations in soils that exceed the restricted TRGs may:

(1) clean-up and/or remove the affected media to a value at or below the unrestricted TRG values resulting in an unrestricted land use site;
(2) clean-up and/or remove the affected media to a value at or below the restricted TRG values but above the unrestricted TRG values resulting in a restricted land use site and implement appropriate institutional controls (i.e., land use restriction and agreed order with MDEQ); or
(3) perform a Tier 2 Evaluation.

(e) Sites with chemical concentrations in groundwater that are greater than the unrestricted TRGs may:

(1) clean-up the affected media to a value at or below the unrestricted TRG values resulting in an unrestricted land-use site;
(2) implement appropriate institutional controls (i.e., land use restriction and agreed order with MDEQ) resulting in a restricted land use site; or
(3) perform a Tier 2 Evaluation.

(f) MDEQ may consider utilizing the Method Detection Limit (MDL) in place of the Target Remediation Goal (TRG) on a case by case basis.

(g) In areas of a site where chemical concentrations of petroleum hydrocarbon indicator compounds (e.g., BTEX, PAHs, MTBE) are not quantifiable to the Tier 1 TRGs (e.g., dilution and/or matrix interference) may:

(1) use the Tier 1 TRGs for TPH-GRO/DRO for performing a Tier 1 Evaluation; or
(2) perform a Tier 2 TPH Fractioning Evaluation.

Chapter 4. TIER 2 EVALUATION

Section 401. Tier 2 Evaluation Target Risk Level

For human health, the remediation goal (RG) for each individual contaminant which is (1) a carcinogen must be calculated to attain a Risk Level of 10^{-6} (i.e.,1 in a million) and (2) a systemic toxicant must be calculated to attain a total hazard quotient of not more than 1 except with regard to a background chemical concentration or a regionally prevalent chemical concentration. In cases where contaminants with corrective action concentrations established through federal and/or state programs (i.e., Safe Drinking Water Act maximum contaminant levels (MCLs)) are present, the MDEQ will determine the appropriate corrective action concentration on a contaminant by contaminant basis. In no event, except with regard to a background chemical concentration, may either (1) the cumulative (total) site carcinogenic risk exceed 1×10^{-4} for carcinogenic CoCs or (2) the site hazard index (summation of hazard quotients) exceed 3 for non-carcinogenic CoCs

affecting the same organ or organ system without the use of both an engineering control and an institutional control.

Section 402. Tier 2 Evaluation Options

(a) Tier 2 Evaluation is a more in-depth evaluation of site-specific conditions beyond the Tier 1 Evaluation methodology. The Tier 2 Evaluation may include, but is not limited to, an evaluation of site-specific conditions by (1) determining the Upper Confidence Limit (UCL) of the Mean for a CoC utilizing statistical methods and comparing the UCL to the Tier 1 TRGs, (2) comparing EPCs to calculated background chemical concentrations, (3) comparing EPCs to calculated regionally prevalent chemical concentrations, (4) utilizing site-specific variables (i.e., exposure frequency, exposure duration, etc.) to calculate site-specific RGs, (5) eliminating or minimizing exposure to contaminants, (6) conducting an analysis of Petroleum Hydrocarbons using TPH Fractioning, or (7) utilizing other methods approved by MDEQ.

(1) **Statistical Methods** - If the Applicant can demonstrate to the satisfaction of MDEQ that the UCL of the Mean for a CoC utilizing statistical methods is less than the Tier 1 TRG for that CoC, this calculated value may be used instead of the highest CoC concentration. The UCL of the Mean is then compared to the Tier 1 TRG to evaluate remedial options. The Applicant must demonstrate to the satisfaction of MDEQ that the data are statistically normal or can be statistically normalized.

i. The methodology used to determine the UCL of the Mean should be conducted in accordance with the EPA's Supplemental Guidance to RAGS: Calculating the Concentration Term (EPA, 1992a), or another method approved by MDEQ.

(2) **Site Background** - CoC concentrations may be compared to site background chemical concentrations to evaluate appropriate remedial actions at the Site.

i. To establish background chemical concentrations, the Brownfield Applicant may collect samples from locations outside of the influence of known contaminated areas and regionally prevalent chemicals (both vertically and horizontally), as approved by MDEQ and must analyze these samples using the same analytical methods as the CoC analyses.

ii. If the Applicant can establish that the background chemical concentration of a CoC is higher than the Tier 1 TRG concentration for that CoC listed in Appendix A, the Applicant shall have the option of using the background chemical concentration as the Remedial Goal (RG).

iii. Remediation of a CoC above its established background chemical concentration will not be necessary.

iv. The methodology used to determine background chemical concentrations in soil shall be conducted in accordance with EPA's Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites (EPA/540/S-96/500), December 1995, or another method approved by MDEQ.

v. The methodology used to determine background chemical concentrations in groundwater shall be conducted in accordance with EPA's Guidance Document on the Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities (EPA/530/SW-89/026), April 1989, or another method approved by MDEQ.

(3) **Regionally Prevalent Chemicals** - CoC concentrations may be compared to regionally prevalent chemical concentrations to evaluate appropriate remedial actions at the Site.

i. To establish regionally prevalent chemical concentrations, the Brownfield Applicant may collect samples from locations throughout a substantial geographic region and outside the influence of known contaminated areas, as approved by MDEQ, and must analyze these samples using the same analytical methods as the CoC analyses.

ii. If the Applicant can establish that the concentration of a CoC is higher than the concentration of a regionally prevalent chemical, the Applicant shall have the option of using the concentration of the regionally prevalent chemical as the Remedial Goal (RG) provided (1) the cumulative (total) site carcinogenic risk does not exceed 1×10^{-4} for all on-site carcinogenic CoCs and (2) the site hazard index (summation of hazard quotients) does not exceed 3 for all on-site non-carcinogenic CoCs that affect the same organ or organ system.

iii. The methodology used to determine regionally prevalent chemical concentrations in soil shall be conducted in accordance with EPA's Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites (EPA/540/S-96/500), December 1995, or another method approved by MDEQ.

iv. The methodology used to determine regionally prevalent chemical concentrations in groundwater shall be conducted in accordance with EPA's Guidance Document on the Statistical Analysis of Ground-Water

Monitoring Data at RCRA Facilities (EPA/530/SW-89/026), April 1989, or another method approved by MDEQ.

(4) **Site-Specific Variables** - If the Applicant can demonstrate to the satisfaction of MDEQ that site-specific variables (i.e., exposure duration, exposure frequency, moisture content, etc.) are more representative of site conditions than the default variables utilized in the development of the Tier 1 TRGs, the Applicant may modify site-specific variables in the risk calculation to develop RGs for the CoCs. Chemical-specific values (i.e., Henry's law constant, diffusivity in water, etc.) must be taken from EPA's Soil Screening Guidance: Technical Background Document (EPA/540/R-95/128), May 1996, unless otherwise approved by MDEQ. The Applicant shall not adjust the following variables in the development of site-specific RGs in Tier 2:

i. Oral cancer slope factor;
ii. Inhalation cancer slope factor;
iii. Oral chronic reference dose;
iv. Inhalation chronic reference dose;
v. Target excess individual lifetime cancer risk;
vi. Target hazard index;
vii. Body weight, adult; or
viii. Body weight, child.

(5) **Eliminate/Minimize Exposure Routes** - If the Applicant can demonstrate to the satisfaction of MDEQ that land-use restrictions and engineering controls at the site will eliminate all complete exposure pathways or will minimize contamination exposure to levels that will be protective of human health and the environment, MDEQ may determine that further remediation is not required. The Commission considers the presence of free product to be an unacceptable potential risk to public health and the environment because it is considered to be a continuing source of contamination that may increase the level of risk that is the basis for the remediation requirements, may reduce the margin of safety provided by the remediation design, or may jeopardize the permanence of the Brownfield Agreement. Therefore, free product must be removed unless it can be demonstrated to the satisfaction of MDEQ that removal of the free product is technically impracticable. The Applicant must also demonstrate to the satisfaction of MDEQ that the contamination is confined and will remain confined within the site boundaries. Any monitoring plan must be approved by MDEQ.

(6) **TPH Fractioning** - In areas where concentrations of Tier 1 petroleum hydrocarbon indicator compounds are not quantifiable to the Tier 1 TRGs and where the concentrations of TPH exceed the Tier 1 TRG for TPH-GRO/DRO, the Brownfield Applicant may either (1) conduct a more detailed evaluation of petroleum hydrocarbons using the methodology outlined in Chapter 7 of this

Subpart II or (2) conduct an evaluation of TPH utilizing another methodology approved by MDEQ.

(7) **Other Approved Methods** - MDEQ may approve other risk evaluation methodologies or combinations thereof under Tier 2.

(b) MDEQ may consider utilizing the Method Detection Limit (MDL) as the site-specific Remediation Goal (RG) on a case by case basis.

(c) References for any fate and transport models used for the exposure point calculations (EPA-approved model or models that have been peer reviewed by experts in the modeling field) and all input values and assumptions for the models must be provided to and approved by MDEQ.

Chapter 5. TIER 3 EVALUATION

Section 501. Tier 3 Evaluation Target Risk Level

(a) **Human Health**

(1) The remediation goal (RG) for each individual contaminant which is a carcinogen must be calculated to attain a Risk Level of 10^{-6} (i.e.,1 in a million) or which is a systemic toxicant must be calculated to attain a total hazard quotient of not more than 1, except with regard to a background chemical concentration or a regionally prevalent chemical concentration. In cases where contaminants with corrective action concentrations established through federal and/or state programs (i.e., Safe Drinking Water Act maximum contaminant levels (MCLs)) are present, the MDEQ will determine the appropriate corrective action concentration on a contaminant by contaminant basis. In no event, except with regard to a background chemical concentration, may either (1) the cumulative (total) site carcinogenic risk exceed 1×10^{-4} for carcinogenic CoCs or (2) the site hazard index (summation of hazard quotients) exceed 3 for non-carcinogenic CoCs affecting the same organ or organ system.

(2) The MDEQ may consider an alternative quantitative or qualitative remediation goal (RG) for each individual contaminant, provided the Applicant can demonstrate to the satisfaction of MDEQ that the attainment of (1) a Risk Level of 10^{-6} for each individual carcinogenic contaminant or (2) a total hazard quotient of not more than 1 for each individual systemic toxicant is technically impracticable, except with regard to a background chemical concentration or a regionally prevalent chemical concentration.

(3) The Site risk levels shall be based on high-end exposure (use of high-end values for the exposure point concentration and exposure duration parameters) in the intake calculation of a deterministic risk assessment or 90th percentile of the risk presented in the probabilistic risk assessment. The Site hazard indices

and/or quotients shall be based on high-end exposure in a deterministic risk assessment or 90th percentile of the exposure presented in the probabilistic risk assessment.

(b) **Ecological**

(1) For a Tier 3 Ecological Evaluation, one of the following must be satisfied:

i. High-end CoC concentrations in the impacted media must be below their respective threshold concentrations or regulatory values that are protective of the ecological receptors of concern or the valued resources to be protected;
ii. Findings from a field survey indicate that there is no readily apparent harm at the site or notable difference (at 95% confidence level) between the site and the potentially impacted ecological receptors;
iii. Individual hazard quotients estimated for the ecological receptors of concern, valued natural resources, or their surrogate species are below unity (1) for each CoC; or
iv. Additional ecological risk evaluations performed under the MDEQ approved work plan conclude that the potential ecological risk is insignificant or readily recoverable.

Section 502. Tier 3 Evaluation (Risk Assessment) Procedures

(a) The Applicant may choose to conduct a site-specific risk assessment (Tier 3), develop and meet site-specific RGs, and have the site-specific RGs approved by MDEQ. This Tier 3 option may entail additional costs to the applicant for MDEQ to subcontract the review of the toxicological and/or risk assessment evaluation. These additional costs shall be paid by the Applicant.

(b) For a human health evaluation of the site or areas within the site (if the site characterization data support such area delineations), the Applicant shall perform risk characterization and present information on risk assessment uncertainty in accordance with the following options:

(1) Deterministic risk assessment according to RAGS - Part A methodology (high-end risk and hazard).

(2) Deterministic risk assessment according to RAGS - Part A (high-end and average risk and hazard).

(3) Probabilistic risk assessment according to EPA's Guiding Principles for Monte Carlo Analysis (EPA/630/R-97/001) or RAGS - Part E methodology to provide probability density function [PDF] for identifying mean, median, and 90th percentile risk and hazard.

(4) Population cancer risk characterization based on the product of average site carcinogenic risk for an individual and the projected number of exposed individuals. Population non-cancer hazard characterization will be based on the projected number of individuals who are likely to be exposed resulting in the hazard index for each specified systemic effect exceeding one (1).

(c) The human health evaluation report shall include, at a minimum, four components: hazard identification, toxicity assessment, exposure assessment, and characterization of risk and uncertainty.

(1) **Hazard identification** - This component presents the site history, area(s) where releases have occurred, and the identified site-related chemicals (i.e., CoCs). Site data shall be compiled at the 95% UCL of the mean and compared with the 95% UCL of the mean background data to establish whether the concentration for a detected chemical is above or below background level.

(2) **Toxicity assessment** - This component requires the identification of CoCs as carcinogenic, non-carcinogenic (causing systemic effects), or both. Toxicity values used in the risk assessment are slope factors and reference doses and must be obtained from:

i. EPA's Integrated Risk Information System (IRIS),
ii. Health Effects and Assessment Summary Tables (HEAST),
iii. Toxicological Profiles prepared by the Agency for Toxic Substances and Disease Registry (ATSDR), and
iv. other peer-reviewed reference sources or literature approved by MDEQ.

(3) **Exposure Assessment** - This component estimates the type and magnitude of exposures to the CoCs that are present at or migrating from the Site. The results of the exposure assessment are combined with chemical-specific toxicity information to characterize potential risks. The general procedure for conducting an exposure assessment is outlined in Chapter 6 of RAGS.

(4) **Characterization of Risk and Uncertainty** - This section describes the final step of the health risk assessment process. In this step, the toxicity and exposure assessments are summarized and integrated into quantitative and qualitative expressions of risk. Major assumptions, scientific judgments, and, to the extent possible, estimates of the uncertainties embodied in the assessment are also presented.

(d) Non-carcinogens that act on the same organ systems can be identified in Table 2, EPA's Soil Screening Guidance: Technical Background Document (EPA/540/R-95/128) or Appendix A, Tables E, Title 35 Illinois Administrative Code Part 742, as amended. The Applicant must identify the uncertainty associated with each toxicity

value. Toxicity values with a high degree of uncertainty should not be used in the risk assessment.

(e) The Applicant shall provide information on the CoC exposure point concentrations (EPCs), activities, and exposure routes that lead to exposure. Site-specific information in combination with relevant information found in EPA's Exposure Factors Handbook (Volumes I, II, and III, EPA's National Center for Environmental Assessment, March 1998), AIHC's Exposure Factors Sourcebook, or other peer-reviewed literature approved by MDEQ may be used to assess exposure. At a minimum, the exposure assessment shall include:

(1) a SCEM to provide the basis for determining which exposure pathways are complete; and
(2) specific input values and their basis (references) for exposure parameters such as the exposure frequency (days per year), duration (number of years), and absorption factors.

(f) Carcinogenic risk and non-carcinogenic hazard posed by the CoCs shall be estimated for the Site or areas within the Site where past releases have occurred. Risks from all complete exposure pathways (i.e., incidental ingestion, dermal contact, inhalation of volatiles or particulates), and contaminated on-site food sources (indirect exposure) shall be characterized, as identified in the SCEM.

(1) Carcinogenic risks from individual CoCs for all complete exposure pathways shall be summed to provide the total site carcinogenic risk (cumulative excess lifetime cancer risk to an individual).

(2) Non-carcinogenic hazards (hazard quotients) from individual CoCs that act on the same organ or organ system for all complete exposure pathways shall be summed to provide the site hazard indices.

(g) The following risk assessment protocols shall be followed for assessing special chemicals or categories of chemicals, unless otherwise approved by MDEQ:

(1) Chlorinated dioxins and dibenzofurans - The evaluation of chlorinated dioxins and dibenzofurans must be consistent with EPA Region IV's Human Health Risk Assessment Bulletins: Supplement to RAGS (https://www.epa.gov/risk/regional-human-health-risk-assessment-supplemental-guidance).

(2) Lead and lead-based compounds - For the assessment of risk to children (if such receptors are reasonably anticipated to be present under the current and future use scenarios), the EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) (EPA/540/R-93/081) shall be used. If adults are the receptors, the Adult Lead Model published in the "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (December 1996) by

the EPA Technical Review Workgroup (TRW) shall be used to assess the hazard of lead exposure.

(3) Polycyclic aromatic hydrocarbons (PAHs) - The evaluation of PAHs must be consistent with EPA Region IV's Human Health Risk Assessment Bulletins: Supplement to RAGS (https://www.epa.gov/risk/regional-human-health-risk-assessment-supplemental-guidance).

(4) Polychlorinated biphenyls (PCBs) – A slope factor of 7.7 $(mg/kg/day)^{-1}$ shall be used for total PCBs. If congener-specific or group-specific (mono- through deca-chlorinated) biphenyls are analyzed and quantified using Modified EPA Method 1668, the slope factor to be used will be 2.0 $(mg/kg/day)^{-1}$ for tri-, tetra-, penta-, hexa-, and hepta-chlorinated PCBs. Slope factors lower than 2.0 $(mg/kg/day)^{-1}$may be used if there are low concentrations of 2,3,7,8-substituted PCBs). The lowest slope factor of 0.4 $(mg/kg/day)^{-1}$ can be used if 2,3,7,8-substituted PCBs are not present. The Applicant shall bear the burden of providing documentation to MDEQ to justify using slope factors lower than 7.7 $(mg/kg/day)^{-1}$ in the risk assessment report.

(5) Radioactive materials or radionuclides - The risk assessment of radioactive materials shall be in accordance with Chapter 10 of RAGS - Part A. Other methodologies (e.g., dose reconstruction for exposure assessment) shall be approved by MDEQ on a case-by-case basis.

Section 503. Tier 3 Ecological Risk Evaluation Procedures

(a) For the entire Site or areas within the Site (if the site physical characteristics support delineations of different ecosystems), the Applicant shall perform screening and/or more in-depth ecological risk evaluations and present uncertainty associated with the evaluations in accordance with the following options:

(1) Identify the ecological receptors of concern and compare CoC concentrations in the potentially impacted media with their respective benchmark or threshold values that are protective of the receptors of ecological concern. The initial screening levels and procedures are available in the EPA Region 4 Ecological Risk Assessment Bulletins-- Supplement to RAGS (https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance).

(2) Additional ecological benchmark values are available from EPA (e.g., Office of Technical Services Supplemental Guidance to RAGs: Region IV), U.S. Fish and Wildlife Service, the National Atmospheric and Oceanic Administration, or other values in peer-reviewed literature, as appropriate.

(3) Conduct biological field surveys for species diversity and abundance in the potentially impacted area and a reference (background) area and compare both survey results to determine whether there are significant differences at 95% level of confidence.

(4) Identify assessment and measurement endpoints and perform a deterministic risk evaluation on the receptors of ecological concern or their indicator species by the hazard quotient method.

(5) Perform additional ecological risk evaluations based on an MDEQ-approved work plan submitted by the Applicant that is consistent with the EPA's Framework for Ecological Risk Assessment guidance and its subsequent update.

(b) A deterministic risk evaluation shall include a minimum of four components: problem formulation, ecological effects assessment, exposure assessment, and characterization of risk and uncertainty.

(1) **Problem formulation** - This component presents the site history (including documented incidents of readily apparent harm), physical characteristics, area(s) where releases have occurred, and identified site-related chemicals (i.e., CoCs). This component also proposes and provides the rationale for identifying any ecological receptors of concern and valued resources present on site that may be impacted by the CoCs. The basis for assessment and measurement endpoint(s) selection should be provided to MDEQ.

(2) **Ecological effects assessment** - This component requires the identification of potential or known acute and chronic toxic effects of the CoCs on the ecological receptors of concern, valued resources, and any surrogate species proposed as the measurement endpoints. Dose-response data shall be obtained from EPA data bases or other federal/state databases approved by MDEQ.

(3) **Exposure assessment** - This component presents the SCEM and explains how the CoCs are released, transported, bioconcentrated or biomagnified in organisms, and exposed to the ecological receptors of concern or valued resources to be protected. Where appropriate, behavior patterns or reasonable assumptions should be used to estimate daily intake of the CoCs.

(4) **Characterization of risk and uncertainty** - This component shall present the risk assessment results and the underlying uncertainty associated with the assessment method employed. If a quotient method is used, the hazard quotients shall be estimated for the ecological receptors of concern or their surrogates. Risk may be characterized qualitatively by the weight-of-evidence approach based on professional judgment. This component should identify types and magnitude of potential effects anticipated, the spatial and temporal

extent of the effects, significance of the effects on the ecosystems, and recovery potential.

(c) A Tier 3 ecological risk evaluation shall be presented in the following report format: problem formulation, approach and rationale, and presentation of results, uncertainties, and recommendations. In interpreting these evaluation findings, the Applicant should consider the effects of natural succession, non-site related impacts (e.g., farm or urban runoff), and seasonal changes on the data or observations collected. The report format may vary based on MDEQ requirements of the ecological risk evaluation work plan.

Section 504. Tier 3 Risk Assessment Data Requirements

(a) The basic procedure for the assessment of human health and ecological receptors of concern for a Tier 3 risk assessment shall be to obtain representative site characterization data in order to perform a screening or more in-depth risk assessment. Specific requirements for performing a Tier 3 risk assessment include, but are not limited to, the following:

(1) Site characterization data shall be obtained in accordance with the MDEQ-approved Quality Assurance Project Plan (QAPP). The Applicant must demonstrate that the Site has been adequately characterized to delineate the nature and extent of contamination. The scope of the site investigation shall be based on the considerations set forth below.

i. Previous field investigations should be used to define the SCEM and identify data gaps or uncertainty for the nature and extent of the site characterization under this site investigation phase.

ii. Field analytical data may be used to identify areas of contamination and to supplement fixed-laboratory analyses if the Applicant can demonstrate that the field analytical data are comparable to fixed laboratory data by regression or co-relational analyses and meet DQO requirements for precision, accuracy, and reproducibility. A minimum of 10% of the collected samples shall be fixed-laboratory data to demonstrate correlation. Samples must be collected from the areas exhibiting the highest field concentrations and analyzed at a fixed laboratory.

iii. Areas with distinct high concentrations of site-related chemicals shall be segregated from other areas for data compilation purposes. Additional field characterization of high-concentration areas or areas with buried wastes is necessary to support remedial design.

iv. The RAGS procedure for the selection of CoCs shall be followed to properly characterize the Site. The Applicant should exclude background

chemicals, laboratory and field contaminants or artifacts, and chemicals that are essential nutrients present at or below the recommended daily allowance intake levels.

v. All reported data shall be in compliance with the DQOs established in the QAPP. In addition to data review, the data will be validated by a qualified technical individual, familiar with data validation, at the rate of at least 10% or as otherwise specified by MDEQ. The Applicant shall provide data review and validation summaries in the Site Characterization Report.

Chapter 6. RISK-BASED REMEDIATION

Section 601. Risk-Based Remediation Goals

(a) Risk-based remediation goals (RGs) may be quantitative for chemical-specific RGs or qualitative for remedial action-specific RGs. The methodology for quantifying the chemical-specific RGs involves solving for the concentration term given a defined risk level in a deterministic or probabilistic risk assessment and shall be proposed for the principal threat chemicals or all CoCs if the principal threat chemicals cannot be identified. The chemical-specific RG may be modified upward or downward based on risk management considerations by MDEQ. A qualitative RG is established by describing the objectives for engineering controls that reduce site risk to an acceptable level. Risk-based remediation goals shall accompany the proposed remedial action(s) in the Site Characterization Report and/or the Corrective Action Plan (CAP).

(b) **Quantitative RG** - Site-specific information that is relevant to the future use of the Site shall be used in the risk methodology.

(1) The derived value shall not be higher than the soil saturation limit (Csat) for the soil or sediment RG for a CoC with a melting point less than 30 degrees Celsius. The derived value shall not be higher than the solubility limit (Csol) for the groundwater RG for groundwater. At sites where a mixture of contaminants is present (e.g., gasoline), the effective solubility limit may be used if required by MDEQ. Values for Csat and Csol may be found or derived from equations in EPA's Soil Screening Guidance: Technical Background Document (EPA/540/R-95/128), May 1996 or other reference approved by MDEQ.

(2) The derived chemical-specific RG for a carcinogen for the protection of human health shall be (1) the MCL value, (2) a value derived using the acceptable carcinogenic risk level of 1×10^{-6}, or (3) a value defined in state/federal programs and approved by MDEQ.

(3) The derived chemical-specific RG for a non-carcinogen for the protection of human health shall be (1) the MCL value, (2) a value derived using the

acceptable hazard quotient level of unity (1), or a value defined in state/federal programs and approved by MDEQ.

(4) The MDEQ may consider an alternative quantitative or qualitative remediation goal (RG) for each individual contaminant, provided the Applicant can demonstrate to the satisfaction of MDEQ that the attainment of (1) a Risk Level of 10^{-6} for each individual carcinogenic contaminant or (2) a total hazard quotient of not more than 1 for each individual systemic toxicant is technically impracticable except with regard to a background chemical concentration or a regionally prevalent chemical. In no event, except with regard to a background chemical concentration, may either (1) the cumulative (total) site carcinogenic risk exceed 1×10^{-4} for carcinogenic CoCs or (2) the site hazard index (summation of hazard quotients) exceed 3 for non-carcinogenic CoCs affecting the same organ or organ system.

(5) Any of the following methods may be used to derive chemical-specific quantitative RGs in soil or sediment to protect human health:

i. algorithms or methodology employed by MDEQ in deriving the TRGs in Appendix A of this Subpart II;

ii. algorithms or methodology employed by EPA Region III (Technical and Program Support Branch, 3HW70) to derive the Risk-Based Concentrations (RBCs);

iii. algorithms or methodology employed by EPA (Office of Solid Waste and Emergency Response) to derive the SSLs using EPA's Soil Screening Guidance: Technical Background Document (EPA/540/R-95/128), May 1996;

iv. algorithms or methodology employed by the American Society of Testing and Materials (ASTM) to derive the Risk-Based Screening Levels (RBSLs) (Emergency Standard Guide ES 38-94); or

v. other EPA published or peer-reviewed methodologies that have been reviewed and approved by MDEQ.

Note: All input/default values must be approved by MDEQ prior to employing any of the above methodologies.

(6) Fate and transport modeling and/or the use of a dilution-attenuation factor (DAF) to determine migration-to-groundwater soil RGs approved by MDEQ may be used to demonstrate that the concentrations of CoCs at the source area provide adequate protection of human health and the environment at the Site boundary, except when it appears that free product is present.

(7) The acceptable level of a CoC in groundwater at the Site boundary is its groundwater RG or if the boundary is a surface water body, the water quality criteria published by MDEQ, whichever is lower.

(8) Any of the following methods may be used to derive chemical-specific quantitative RGs in groundwater:

i. algorithms or methodology employed by MDEQ in deriving the TRGs in Appendix A of this Subpart II;

ii. algorithms or methodology employed by EPA Region IX (Technical Support Team, DFD-8-B) to derive the Preliminary Remediation Goals (PRGs); or

iii. other EPA published or peer-reviewed methodologies that have been reviewed and approved by MDEQ.

(9) The quotient method may be used to derive quantitative RGs for the protection of an ecological receptor of concern.

(10) The following methods may be used to derive chemical-specific quantitative RGs in soil and sediment for protection of an ecological receptor of concern:

i. algorithms or methodology described in the Risk Assessment Handbook, Volume 2 - Environmental Evaluation (EM 200-1-4) developed by the U.S. Army Corps of Engineers; or

ii. other EPA published or peer-reviewed methodologies that have been reviewed and approved by MDEQ.

(c) **Qualitative RG** - A qualitative RG shall define objectives and describe how land-use restrictions and/or engineering controls are expected to reduce site risk to an acceptable level. The following information shall be presented:

(1) complete exposure pathway that contribute to human health or environmental risk;

(2) the CoC or principal threat chemical and its background concentrations;

(3) physical, chemical, and fate and transport properties of the CoC or principal threat chemical (including the potential for adsorption and monitored natural attenuation);

(4) presence of any man-made or natural conveyances, conduits, or transport routes from the source to the receptor location;

(5) Potential engineering controls that will exclude the exposure pathway based on treatability study data and/or practical experience may also be considered. Engineering controls may include physical or hydraulic control measures, but shall not include the exclusive use of security fencing. Typical engineering controls are presented below and the Applicant may propose alternative controls for MDEQ approval.

i. groundwater recovery trenches and leachate collection systems;
ii. groundwater extraction (pumpage) and treatment systems;
iii. engineered caps with or without liner systems;
iv. slurry walls, funnel-and-gate barrier walls, bio-polymer walls, or any modifications thereof; and
v. permanent structures such as building, driveways, and paved roads.

(d) No further action at the Site shall be based on obtaining either the quantitative or qualitative RGs, or both, and/or other terms and conditions stipulated by MDEQ (i.e., Brownfield Agreement, Corrective Action Plan). The Applicant has the option to propose either type of RGs or a combination of the two for delineated areas of the Site, depending on the site-specific factors, chemical data, and risk management considerations approved by the MDEQ. The following criteria shall be met for this determination:

(1) The remedial action has achieved the chemical-specific RGs based on verification sampling and analyses at the point of exposure or at the contaminated source area. The 95% UCL of the normalized verification sample data must be less that the chemical-specific RG.

(2) The engineered control measures proposed by the Applicant and approved by MDEQ are completed.

(3) The groundwater quality at the Site boundary shall not exceed MCLs or risk-based TRGs for groundwater identified in Appendix A. The Point of Compliance is the Site Boundary.

(4) Free product must be removed from the Site, unless it can be demonstrated to the satisfaction of MDEQ that removal of the free product is technically impracticable and that the contamination is confined and will remain confined within the Site boundaries. Free product is considered to exist if:

i. concentrations in soil exceed Csat for CoCs with a melting point of less than 30 degrees Celsius;
ii. concentrations in groundwater exceed Csol for any CoC or the effective Csol or
iii. measurable using best available technologies.

Chapter 7. PETROLEUM HYDROCARBONS

Section 701. Introduction

(a) Specific procedures and evaluation criteria have been developed for sites with petroleum hydrocarbon contamination. This criteria has been developed to simplify the contaminant analyses required to characterize the site and to establish site-specific remediation goals (RGs). Petroleum hydrocarbon indicator compounds (i.e., Benzene, Toluene, PAHs, etc.) may not be quantifiable at the Tier 1 TRG Table concentrations because high petroleum hydrocarbon concentrations in the sample may cause analytical interferences resulting in either of the following:

(1) Dilution of the extract, which would cause elevated detection limits and useless surrogate recovery data; and/or

(2) Inaccurate compound identification and quantification, due to a poor peak separation or an elevated baseline during chromatography.

(b) In addition, of the 250 individual compounds identified in petroleum, only 95 have toxicity data. Of these 95 compounds with toxicity data, only 25 have sufficient data to develop toxicity criteria. The interactive effects of all compounds present in TPH cannot be determined by data on 25 individual compounds. Therefore, to account for these unknowns, as well as to account for instances as described in Section 701(a), these procedures have been developed.

(c) To evaluate human health and environmental risks specific to a Site under the circumstances in Section 701(a)(1) and (2), MDEQ has developed procedures for petroleum hydrocarbon contaminated Sites.

Section 702. Petroleum Hydrocarbon Evaluation Procedures

(a) The Applicant shall utilize the procedures presented herein for the evaluation of potential human health and environmental risks from petroleum hydrocarbons in soil and groundwater.

(b) A Tier 1 Evaluation of indicator compounds of petroleum hydrocarbons **and** TPH is required to establish the vertical and horizontal extent of indicator compound concentrations **and** TPH below the unrestricted values of the Tier 1 TRG Table.

(c) A Site Ecological Checklist must be completed.

(d) Petroleum-impacted soil and groundwater shall be assessed using the petroleum hydrocarbon indicator compounds, TPH-GRO, and TPH-DRO as presented in Appendix B, Table 1. Petroleum hydrocarbon categories presented in Appendix B, Table 1 represent typical hydrocarbon products. The Applicant shall correlate the

site-specific hydrocarbon release and/or knowledge of the released hydrocarbon product to the appropriate category listed in Appendix B, Table 1. If the specific product that has been released is unknown, then a complete analytical evaluation must be conducted.

(e) The Applicant shall perform soil and groundwater laboratory testing for the following indicator compounds:

(1) Volatile Organic Compounds, **including MTBE** by SW-846 Method 8260B, or other Method approved by MDEQ.[1]

(2) Polycyclic Aromatic Hydrocarbons (PAHs) by Method 8310, with appropriate sample extraction, clean-up and instrumental finish. Analysis to be conducted for the PAHs listed in Appendix B, Table 1, or other Method approved by MDEQ.

(3) Metals[2] by SW-846 Method 6010, 6020, or the appropriate 7000 series, or other Method approved by MDEQ.

(4) Methyl ethyl ketone[2] by SW-846 Method 8260B, or other Method approved by MDEQ.

(5) Methyl isobutyl ketone[2] by SW-846 Method 8260B, or other Method approved by MDEQ.

Note: [1]All soil samples collected for VOC analysis must be collected in a manner consistent with MDEQ's Guidance for Collecting Volatile Organic Compounds in Soil, unless otherwise approved by MDEQ.
[2] When suspected to be present

(f) Although lead (organic and inorganic) has not been used as a gasoline additive for some time (since the late 1970's to early 1980's), there may be sites where lead (organic and inorganic) may be present due to historical activities on the Site. At sites where lead is suspected to be present as a potential site-related compound, inorganic lead and organic lead (specifically tetraethyl lead) must be identified as target analytes by appropriate analytical methods approved by MDEQ.

Section 703. Tier 1 Petroleum Hydrocarbon Evaluation

(a) A Tier 1 Evaluation of indicator compounds of petroleum hydrocarbons, TPH-GRO, and TPH-DRO is required to establish the extent of indicator compound concentrations and TPH-GRO/DRO below the Tier 1 TRG Table.

(b) Results of the indicator compound analysis, TPH-GRO, and TPH-DRO shall be compared with the TRGs presented in the Tier 1 TRG Table in Appendix A utilizing the Tier 1 Evaluation Procedures outlined in Section 302 of this Subpart II.

(c) The Applicant shall address a hydrocarbon release using TPH analyses using SW-846 Method 8015B or other Method approved by MDEQ and by analyzing the indicator compounds as described in Section 701.

(d) In areas of the site where the indicator compounds cannot be quantified to the Tier 1 Target Remedial Goal concentrations, the Applicant has the option of either:

(1) conducting a Tier 1 Evaluation utilizing the Tier 1 Evaluation Procedures outlined in Section 302 of this Subpart II for TPH-GRO and TPH-DRO;
(2) conducting a Tier 2 Evaluation using TPH Fractioning; or
(3) conducting a Tier 3 Evaluation using methods approved by MDEQ.

Section 704. Tier 2 Petroleum Hydrocarbon Evaluation - TPH Fractioning

(a) A Tier 2 Petroleum Hydrocarbon Evaluation is primarily utilized in cases as described in Section 701 of this Subpart II where indicator compound concentrations cannot be determined due to dilution and interference and where the concentrations of TPH-GRO/DRO exceed the restricted Tier 1 TRG levels for TPH-GRO/DRO. Along with the required comparison of indicator compounds as described in Section 703(b) of this Subpart II, the Applicant shall have the option of utilizing the TPH Carbon Fraction TRGs in Table 2 of Appendix B.

(b) **Massachusetts Method**

(1) The Massachusetts Department of Environmental Protection (MADEP) VPH/EPH Approach may be utilized to evaluate petroleum hydrocarbons under Tier 2. This method quantifies the total petroleum hydrocarbon fractions into collective aliphatic and aromatic ranges. To account for the hydrocarbon ranges present in contaminated media, MADEP's Volatile Petroleum Hydrocarbon (VPH) method and Extractible Petroleum Hydrocarbon (EPH) method have been developed. A detailed description of the MADEP VPH/EPH Approach may be found on the MADEP Web Site at (https://www.mass.gov/doc/wsc-02-411-characterizing-risks-posed-by-petroleum-contaminated-sites-implementation-of-the/download).

(2) The following principles form the basis for this approach:

i. Petroleum products are comprised mainly of aliphatic/alicyclic and aromatic hydrocarbon compounds.

ii. Aromatic hydrocarbons appear to be more toxic than aliphatic compounds.

iii. The toxicity of aliphatic compounds appear to be related to their carbon number/molecular weight.

(3) Under this approach, the non-cancer toxicity of petroleum contaminated soil or water has been established by (1) determining the collective concentrations of specified ranges of aliphatic and aromatic hydrocarbons, and (2) assigning a toxicity value to each range. Well-characterized compounds within specified ranges have been selected as "surrogate" indicators to define the toxicity of the entire range.

Toxicological Approach for Non-Carcinogens				
Hydrocarbon Fraction	**Analytical Fraction**	**Analytical Method**	**Surrogate Compound**	**Reference Dose (mg/kg/d)**
C_5-C_8 Aliphatics	C_5-C_8	VPH	n-Hexane	0.04
C_9-C_{18} Aliphatics	C_9-C_{12}	VPH	n-Nonane	0.1
	C_9-C_{18}	EPH	n-Nonane	0.1
C_{19}-C_{36} Aliphatics	C_{19}-C_{36}	EPH	Eicosane	2.0
C_9-C_{22} Aromatics	C_9-C_{10}	VPH	Pyrene	0.03
	C_{11}-C_{22}	EPH	Pyrene	0.03

(4) Carcinogenic and additional non-carcinogenic effects must be evaluated for the indicator constituents listed in Table 1 of Appendix B.

(5) The EPH method separates the TPH Carbon Ranges (Fractions) into 3 sub-fractions and indicator PAH compounds. The VPH method separates the GRO Carbon Ranges (Fractions) into 3 sub-fractions and indicator compounds (i.e., BTEX, MTBE and naphthalene).

(6) The VPH Method is a Purge and Trap, GC/PID/FID procedure and the EPH Method is a solvent extraction/fractionation GC/FID procedure.

(7) The unrestricted TRGs listed in Table 2 of Appendix B have been adopted by MDEQ and correlate with the GW-1 groundwater zone the S-1 soil zone as defined by MADEP.

(8) The restricted TRGs listed in Table 2 of Appendix B have been adopted by MDEQ and correlate to the GW-1 groundwater zone and the S-3 soil zone as defined by MADEP.

(9) The Applicant must ensure and provide documentation to MDEQ that the Laboratory conducting the MADEP VPH/EPH Methodology is equipped to so

do and will utilize appropriate Standard Operating Procedures (SOPs) as required by this methodology.

(c) MDEQ may approve other TPH risk evaluation methodologies (e.g., TPHWG Methodology) or combinations thereof under Tier 2.

Section 705. Tier 3 Petroleum Hydrocarbon Evaluation

(a) Alternative petroleum hydrocarbon Remedial Goals (RGs) may be established using a Tier 3 Risk Assessment approach. The alternative RGs shall be reviewed and approved or disapproved by MDEQ on a case-by-case basis.

References

American Society for Testing and Materials (ASTM), Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM E 1739-95), 1995.

Agency for Toxic Substances and Disease Registry (ATSDR), Toxicological Profile for Mineral Oil Hydraulic Fluids, Organophosphate Ester Hydraulic Fluids, and Polyalphaolefin Hydraulic Fluids, 1994.

Massachusetts Department of Environmental Protection, Characterizing Risk posed by Petroleum Contaminated Sites: Implementation of MADEP VPH/EPH Approach, 1996.

Louisiana Department of Environmental Quality, April 1998, Risk Evaluation/Corrective Action Program (Proposed), April 1998.

U.S. Environmental Protection Agency (EPA), Handbook of RCRA Ground-Water Monitoring Constituents, Chemical and Physical Properties, 40 CFR Part 264, Appendix 9. September 1992.

U.S. Environmental Protection Agency (EPA), Soil Screening Guidance: Technical Background Document (EPA/540/R-95/128), May 1996.

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APPENDIX A

TIER 1 TARGET REMEDIAL GOAL TABLE

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MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TIER 1 TRG TABLE

CHEMICAL	CAS No.	Groundwater			Soil							
					Restricted				Unrestricted			
		ug/l	Notes		mg/kg	Notes			mg/kg	Notes		
ACENAPHTHENE	83329	3.65E+02	N	R	1.23E+05	N	Ing		4.69E+03	N	Ing	
ACENAPHTHYLENE	208968	2.19E+03	N		1.23E+05	N	Ing		4.69E+03	N	Ing	
ACEPHATE	30560191	7.70E+00	C		6.58E+02	C	Ing		7.34E+01	C	Ing	
ACETALDEHYDE	75070	1.63E+00	C	R	2.34E+01	C	Inh	1	1.53E+01	C	Inh	1
ACETOCHLOR	34256821	7.30E+02	N		4.09E+04	N	Ing		1.56E+03	N	Ing	
ACETONE (DIMETHYL KETONE)	67641	6.08E+02	N	R	1.04E+05		Csat		7.82E+03	N	Ing	
ACETONITRILE (CYANOMETHANE)	75058	1.25E+02	N	R	1.11E+02	N	Inh	1	1.11E+02	N	Inh	1
ACETOPHENONE	98862	4.16E-02	N	R	2.63E+03		Csat		2.63E+03		Csat	
ACROLEIN	107028	4.16E-02	N	R	4.09E+04	N	Ing		1.56E+03	N	Ing	
ACRYLAMIDE	79061	1.49E-02	C		1.27E+00	C	Ing		1.42E-01	C	Ing	
ACRYLONITRILE	107131	3.67E-02	C		1.06E+01	C	Ing		1.18E+00	C	Ing	
ALACHLOR	15972608	2.00E+00		MCL	7.15E+01	C	Ing		7.98E+00	C	Ing	
ALAR	1596845	5.48E+03	N		3.07E+05	N	Ing		1.17E+04	N	Ing	
ALDICARB	116063	3.65E+01	N	R	2.04E+02	N	Ing		7.82E+01	N	Ing	
ALDICARB SULFONE	1646884	3.65E+01	N		2.04E+03	N	Ing		7.82E+01	N	Ing	
ALDRIN	309002	3.94E-03	C	R	3.37E-01	C	Ing		3.76E-02	C	Ing	
ALUMINUM	7429905	3.65E+04	N		2.04E+06	N	Ing		7.82E+04	N	Ing	
AMINODINITROTOLUENES		2.19E+00	N		1.23E+02	N	Ing		4.69E+00	N	Ing	
4-AMINOPYRIDINE	504245	7.30E-01	N		4.09E+01	N	Ing		1.56E+00	N	Ing	
AMMONIA	7664417	2.09E+02	N									
ANILINE	62533	1.17E+01	C		1.00E+03	C	Ing		1.12E+02	C	Ing	
ANTHRACENE	120127	4.34E+01		Csol	6.13E+05	N	Ing		2.35E+04	N	Ing	
ANTIMONY	7440360	6.00E+00		MCL	8.17E+01	N	Ing		3.13E+01	N	Ing	
ANTIMONY PENTOXIDE	1314609	1.83E+01	N		1.02E+02	N	Ing		3.91E+01	N	Ing	
ANTIMONY TETROXIDE	1332816	1.46E+01	N		8.17E+01	N	Ing		3.13E+01	N	Ing	
ANTIMONY TRIOXIDE	1309644	1.46E+01	N		8.17E+01	N	Ing		3.13E+01	N	Ing	
ARSENIC	7440382	1.00E+01		MCL	3.82E+00	C	Ing		4.26E-01	C	Ing	
ARSINE	7784421	1.02E-01	N									
ASSURE	76578148	3.29E+02	N		1.84E+04	N	Ing		7.04E+02	N	Ing	
ATRAZINE	1912249	3.00E+00		MCL	2.58E+01	C	Ing		2.88E+00	C	Ing	
AZOBENZENE	103333	6.09E-01	C		5.20E+01	C	Ing		5.81E+00	C	Ing	
BARIUM	7440393	2.00E+03		MCL	1.43E+04	N	Ing		5.48E+03	N	Ing	
BAYGON	114261	1.46E+02	N		8.18E+03	N	Ing		3.13E+02	N	Ing	
BAYTHROID	68359375	9.13E+02	N		5.11E+04	N	Ing		1.96E+03	N	Ing	
BENTAZON	25057890	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
BENZ[A]ANTHRACENE	56553	9.17E-02	C	R	7.84E+00	C	Ing		8.75E-01	C	Ing	
BENZALDEHYDE	100527	3.65E+03	N		2.04E+05	N	Ing		7.82E+03	N	Ing	
BENZENE	71432	5.00E+00		MCL	1.36E+00	C	Inh	1	8.87E-01	C	Inh	1
BENZENETHIOL	108985	6.08E-02	N		2.04E+01	N	Ing		7.82E-01	N	Ing	
BENZIDINE	92875	2.91E-04	C		2.49E-02	C	Ing		2.78E-03	C	Ing	
BENZOIC ACID	65850	1.46E+05	N	R	8.17E+05	N	Ing		3.13E+05	N	Ing	
BENZO[A]PYRENE	50328	2.00E-01		MCL	7.84E-01	C	Ing		8.75E-02	C	Ing	
BENZO[B]FLUORANTHENE	205992	9.17E-02	C	R	7.84E+00	C	Ing		8.75E-01	C	Ing	
BENZO[G,H,I]PERYLENE	191242	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
BENZO[K]FLUORANTHENE	207089	9.17E-01	C	R	7.84E+01	C	Ing		8.75E+00	C	Ing	
BENZYL ALCOHOL	100516	1.10E+04	N		2.04E+05	N	Ing		2.35E+04	N	Ing	
BENZYL CHLORIDE (CHLOROMETHYLBENZENE)	100447	6.21E-02	C	R	3.37E+01	C	Ing		3.76E+00	C	Ing	
BERYLLIUM	7440417	4.00E+00		MCL	1.02E+03	N	Ing		1.56E+02	N	Ing	
BIPHENYL	92524	3.04E+02	N	R	1.02E+04	N	Ing		3.91E+03	N	Ing	
BIS(2-CHLOROETHYL)ETHER	111444	9.20E-03	C	R	4.19E-01	C	Inh	1	2.73E-01	C	Inh	1
BIS(2-CHLOROISOPROPYL)ETHER	108601	2.60E-01	C	R	9.08E+00	C	Inh	1	5.93E+00	C	Inh	1
BIS(CHLOROMETHYL)ETHER	542881	4.80E-05	C		2.60E-02	C	Ing		2.90E-03	C	Ing	
BIS(2-ETHYLHEXYL)PHTHALATE	117817	6.00E+00		MCL	4.09E+02	C	Ing		4.56E+01	C	Ing	
BORON	7440428	3.29E+03	N		4.08E+03	N	Ing		4.08E+03	N	Ing	
BROMODICHLOROMETHANE (DICHLOROBROMOMETHANE)	75274	1.68E-01	C	R	1.89E+00	C	Inh	1	1.24E+00	C	Inh	1
BROMOETHENE (VINYL BROMIDE)	593602	1.12E-01	C	R	1.26E-01	N	Inh	1	1.26E-01	N	Inh	1
BROMOFORM (METHYL TRIBROMIDE)	75252	8.48E+00	C	R	9.01E+01	C	Inh	1	5.88E+01	C	Inh	1
BROMOMETHANE (METHYL BROMIDE)	74839	8.52E+00	N	R	2.97E+00	N	Inh	1	2.97E+00	N	Inh	1
BROMOPHOS	2104963	1.83E+02	N		1.02E+04	N	Ing		3.91E+02	N	Ing	
1,3-BUTADIENE	106990	6.96E-03	C									
1-BUTANOL	71363	3.65E+03	N	R	1.05E+04		Csat		7.82E+03	N	Ing	
2-BUTANONE (METHYL ETHYL KETONE)	78933	1.91E+03	N	R	8.45E+01	N	Inh	1	8.45E+01	N	Inh	1
BUTYLBENZYLPHTHALATE	85687	2.69E+03		Csol	9.28E+02		Csat		9.28E+02		Csat	
BUTYLATE	2008415	1.83E+03	N		1.02E+04	N	Ing		3.91E+03	N	Ing	
N-BUTYLBENZENE	104518	2.43E+02	N		8.18E+04	N	Ing		3.13E+03	N	Ing	
SEC-BUTYLBENZENE	135988	2.43E+02	N		8.18E+04	N	Ing		3.13E+03	N	Ing	
TERT-BUTYLBENZENE	98066	2.43E+02	N		8.18E+04	N	Ing		3.13E+03	N	Ing	
CADMIUM	7440439	5.00E+00		MCL	1.02E+03	N	Ing		3.91E+01	N	Ing	
CALCIUM CYANIDE	592018	1.46E+03	N		8.17E+03	N	Ing		3.13E+03	N	Ing	

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TIER 1 TRG TABLE

CHEMICAL	CAS No.	Groundwater				Soil							
						Restricted				Unrestricted			
		ug/l		Notes		mg/kg		Notes		mg/kg		Notes	
CAPROLACTAM	105602	1.83E+04	N			1.02E+05	N	Ing		3.91E+04	N	Ing	
CARBARYL	63252	3.65E+03	N			2.04E+04	N	Ing		7.82E+03	N	Ing	
CARBAZOLE	86748	3.35E+00	C	R		2.86E+02	C	Ing		3.19E+01	C	Ing	
CARBOFURAN	1563662	4.00E+01		MCL		1.02E+03	N	Ing		3.91E+02	N	Ing	
CARBON CHLORIDE (CARBON TETRACHLORIDE)	56235	5.00E+00		MCL		5.69E-01	C	Inh	1	3.71E-01	C	Inh	1
CARBON DISULFIDE	75150	1.04E+03	N	R		7.97E+00	N	Inh	1	7.97E+00	N	Inh	1
CARBON TETRACHLORIDE (CARBON CHLORIDE)	56235	5.00E+00		MCL		5.69E-01	C	Inh	1	3.71E-01	C	Inh	1
CARBOSULFAN	55285148	3.65E+02	N			2.04E+04	N	Ing		7.82E+02	N	Ing	
CHLORAL HYDRATE	302170	3.65E+03	N			4.08E+03	N	Ing		4.08E+03	N	Ing	
CHLORANIL	118752	1.66E-01	C			1.42E+01	C	Ing		1.58E+00	C	Ing	
CHLORDANE	57749	2.00E+00		MCL		1.23E+01	N	Ing		1.82E+00	C	Ing	
CHLORINE	7782505	4.16E-01	N			2.04E+05	N	Ing		7.82E+03	N	Ing	
CHLORINE DIOXIDE	10049044	4.17E-01	N			6.13E+04	N	Ing		2.35E+03	N	Ing	
CHLORITE	7758192	1.10E+03	N			6.13E+04	N	Ing		2.35E+03	N	Ing	
CHLOROACETIC ACID	79118	7.30E+01	N			4.08E+03	N	Ing		1.56E+02	N	Ing	
4-CHLOROANILINE	106478	1.46E+02	N	R		8.17E+02	N	Ing		3.13E+02	N	Ing	
CHLOROBENZENE (MONOCHLOROBENZENE)	108907	1.00E+02		MCL		1.19E+00	N	Inh	1	1.19E+00	N	Inh	1
CHLOROBENZILATE	510156	2.48E-01	C			2.12E+01	C	Ing		2.37E+00	C	Ing	
P-CHLOROBENZOIC ACID	74113	7.30E+03	N			4.08E+05	N	Ing		1.56E+04	N	Ing	
CHLORO-1,3-BUTADIENE	126998	1.43E+01	N			4.08E+03	N	Ing		1.56E+03	N	Ing	
1-CHLOROBUTANE	109693	2.43E+03	N			1.84E+05	N	Ing		3.13E+04	N	Ing	
CHLORODIBROMOMETHANE (DIBROMOCHLOROMETHANE)	124481	1.26E-01	C	R		6.81E+01	C	Ing		7.60E+00	C	Ing	
1-CHLORO-1,1-DIFLUOROETHANE	75683	1.02E+05	N										
CHLORODIFLUOROMETHANE (DIFLUOROCHLOROMETHANE)	75456	1.02E+05	N										
CHLOROETHANE	75003	3.64E+00	C			1.97E+03	C	Ing		2.20E+02	C	Ing	
CHLOROETHENE (VINYL CHLORIDE)	75014	2.00E+00		MCL		9.39E-01	C	Inh	1	4.26E-01	C	Ing	
CHLOROFORM (METHANE TRICHLORIDE)	67663	1.55E-01	C	R		4.78E-01	C	Inh	1	3.12E-01	C	Inh	1
CHLOROMETHANE (METHYL CHLORIDE)	74873	1.43E+00	C			4.40E+02	C	Ing		4.91E+01	C	Ing	
4-CHLORO-2-METHYLANILINE	95692	1.15E-01	C			9.87E+00	C	Ing		1.10E+00	C	Ing	
CHLOROMETHYLBENZENE (BENZYL CHLORIDE)	100447	6.21E-02	C	R		3.37E+01	C	Ing		3.76E+00	C	Ing	
4-CHLORO-3-METHYLPHENOL (P-CHLORO-M-CRESOL)	59507	7.30E+04	N	R		4.08E+05	N	Ing		1.56E+05	N	Ing	
BETA-CHLORONAPHTHALENE	91587	4.87E+02	N			1.64E+05	N	Ing		6.26E+03	N	Ing	
O-CHLORONITROBENZENE	88733	4.22E-01	C			2.29E+02	C	Ing		2.55E+01	C	Ing	
P-CHLORONITROBENZENE	100005	5.86E-01	C			3.18E+02	C	Ing		3.55E+01	C	Ing	
2-CHLOROPHENOL	95578	3.04E+01	N	R		1.02E+04	N	Ing		3.91E+02	N	Ing	
2-CHLOROPROPANE	75296	2.12E+02	N										
O-CHLOROTOLUENE	95498	1.22E+02	N			4.08E+04	N	Ing		1.56E+03	N	Ing	
CHLORPYRIFOS	2921882	1.10E+02	N			6.13E+02	N	Ing		2.35E+02	N	Ing	
CHLORPYRIFOS-METHYL	5598130	3.65E+02	N			2.04E+03	N	Ing		7.82E+02	N	Ing	
CHROMIUM III	16065831	5.48E+04	N			3.07E+06	N	Ing		1.17E+05	N	Ing	
CHROMIUM VI	18540299	1.00E+02		MCL		3.81E+02	C	Inh	2	2.27E+02	C	Inh	2
CHRYSENE	218019	9.17E+00	C	R		7.84E+02	C	Ing		8.75E+01	C	Ing	
COBALT	7440484	2.19E+03	N			1.23E+04	N	Ing		4.69E+03	N	Ing	
COKE OVEN EMISSIONS (COAL TAR)	8007452	5.69E-03	C										
COPPER	7440508	1.30E+03		MCL		8.17E+03	N	Ing		3.13E+03	N	Ing	
COPPER CYANIDE	544923	1.83E+02	N			1.02E+04	N	Ing		3.91E+02	N	Ing	
o-CRESOL (2-METHLYPHENOL)	95487	1.83E+03	N			1.02E+05	N	Ing		3.91E+03	N	Ing	
m-CRESOL (3-METHYLPHENOL)	108394	1.83E+03	N			1.02E+05	N	Ing		3.91E+03	N	Ing	
p-CRESOL (4-METHYLPHENOL)	106445	1.83E+02	N			1.02E+04	N	Ing		3.91E+02	N	Ing	
CROTONALDEHYDE	123739	5.58E-03	C			3.01E+00	C	Ing		3.36E-01	C	Ing	
CUMENE (ISOPROPYL BENZENE)	98828	6.79E+02	N	R		9.43E+00	N	Inh	1	9.43E+00	N	Inh	1
CYANAZINE	21725462	7.97E-02	C			6.81E+00	C	Ing		7.60E-01	C	Ing	
CYANIDE (FREE)	57125	2.00E+02		MCL		4.08E+03	N	Ing		1.56E+03	N	Ing	
CALCIUM CYANIDE	592018	1.46E+03	N			8.17E+03	N	Ing		3.13E+03	N	Ing	
COPPER CYANIDE	544923	1.83E+02	N			1.02E+04	N	Ing		3.91E+02	N	Ing	
CYANAZINE	21725462	7.97E-02	C			6.81E+00	C	Ing		7.60E-01	C	Ing	
CYANOGEN	460195	2.43E+02	N			8.18E+04	N	Ing		3.13E+03	N	Ing	
CYANOGEN BROMIDE	506683	3.29E+03	N			1.84E+05	N	Ing		7.04E+03	N	Ing	
CYANOGEN CHLORIDE	506774	1.83E+03	N			1.02E+05	N	Ing		3.91E+03	N	Ing	
HYDROGEN CYANIDE	74908	6.22E+00	N			4.09E+04	N	Ing		1.56E+03	N	Ing	
POTASSIUM CYANIDE	151508	1.83E+03	N			1.02E+04	N	Ing		3.91E+03	N	Ing	
POTASSIUM SILVER CYANIDE	506616	7.30E+03	N			4.08E+04	N	Ing		1.56E+04	N	Ing	
SILVER CYANIDE	506649	3.65E+03	N			2.04E+04	N	Ing		7.82E+03	N	Ing	
SODIUM CYANIDE	143339	1.46E+03	N			8.17E+03	N	Ing		3.13E+03	N	Ing	
THIOCYANATE		1.83E+03	N			1.02E+05	N	Ing		3.91E+03	N	Ing	
ZINC CYANIDE	557211	1.83E+03	N			1.02E+04	N	Ing		3.91E+03	N	Ing	
CYANOMETHANE (ACETONITRILE)	75058	1.25E+02	N	R		1.11E+02	N	Inh	1	1.11E+02	N	Inh	1
CYCLOHEXANONE	108941	1.83E+05	N			1.02E+07	N	Ing		3.91E+05	N	Ing	
CYCLONITE (RDX)	121824	6.09E-01	C			5.20E+01	C	Ing		5.81E+00	C	Ing	

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TIER 1 TRG TABLE

CHEMICAL	CAS No.	Groundwater				Soil							
						Restricted				Unrestricted			
		ug/l	Notes			mg/kg	Notes			mg/kg	Notes		
CYHALOTHRIN/KARATE	68085858	1.83E+02	N			1.02E+04	N	Ing		3.91E+02	N	Ing	
CYPERMETHRIN	52315078	3.65E+02	N			2.04E+04	N	Ing		7.82E+02	N	Ing	
DACTHAL	1861321	3.65E+02	N			2.04E+04	N	Ing		7.82E+02	N	Ing	
DALAPON	75990	2.00E+02			MCL	6.13E+03	N	Ing		2.35E+03	N	Ing	
DDD	72548	2.79E-01	C		R	2.38E+01	C	Ing		2.66E+00	C	Ing	
DDE	72559	1.97E-01	C		R	1.68E+01	C	Ing		1.88E+00	C	Ing	
DDT	50293	1.97E-01	C		R	1.68E+01	C	Ing		1.88E+00	C	Ing	
DIAZINON	333415	3.29E+01	N			1.84E+03	N	Ing		7.04E+01	N	Ing	
DIBENZOFURAN	132649	2.43E+01	N			8.18E+03	N	Ing		3.13E+02	N	Ing	
DIBENZ[A,H]ANTHRACENE	53703	9.17E-03	C		R	7.84E-01	C	Ing		8.75E-02	C	Ing	
1,4-DIBROMOBENZENE	106376	3.65E+02	N			2.04E+04	N	Ing		7.82E+02	N	Ing	
DIBROMOCHLOROMETHANE (CHLORODIBROMOMETHANE)	124481	1.26E-01	C		R	6.81E+01	C	Ing		7.60E+00	C	Ing	
1,2-DIBROMO-3-CHLOROPROPANE	96128	2.00E-01			MCL	9.99E-02	N	Inh	1	9.99E-02	N	Inh	1
DIBROMOMETHANE (METHYLENE BROMIDE)	74953	6.08E+01	N			2.04E+04	N	Ing		7.82E+02	N	Ing	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106934	5.00E-02			MCL	6.73E-02	C	Ing		7.51E-03	C	Ing	
DI-N-BUTYLPHTHALATE	84742	3.65E+03	N		R	2.28E+03		Csat		2.28E+03		Csat	
DICAMBA	1918009	1.10E+03	N			6.13E+04	N	Ing		2.35E+03	N	Ing	
1,2-DICHLOROBENZENE	95501	6.00E+02			MCL	2.79E+02	N	Inh	1	2.79E+02	N	Inh	1
1,3-DICHLOROBENZENE	541731	5.48E+00	N			1.84E+03	N	Ing		7.04E+01	N	Ing	
1,4-DICHLOROBENZENE	106467	7.50E+01			MCL	2.38E+02	C	Ing		2.66E+01	C	Ing	
3,3'-DICHLOROBENZIDINE	91941	1.49E-01	C		R	1.27E+01	C	Ing		1.42E+00	C	Ing	
DICHLOROBROMOMETHANE (BROMODICHLOROMETHANE)	75274	1.68E-01	C		R	1.89E+00	C	Inh	1	1.24E+00	C	Inh	1
1,4-DICHLORO-2-BUTENE	764410	1.35E-03	C										
DICHLORODIFLUOROMETHANE	75718	3.48E+02	N			4.09E+05	N	Ing		1.56E+04	N	Ing	
1,1-DICHLOROETHANE	75343	7.98E+02	N		R	1.16E+02	N	Inh	1	1.16E+02	N	Inh	1
1,2-DICHLOROETHANE (ETHYLENE DICHLORIDE)	107062	5.00E+00			MCL	6.21E-01	C	Inh	1	4.06E-01	C	Inh	1
1,1-DICHLOROETHENE (1,1 - DCE)	75354	7.00E+00			MCL	1.18E-01	C	Inh	1	7.72E-02	C	Inh	1
CIS-1,2-DICHLOROETHENE	156592	7.00E+01			MCL	1.21E+03		Csat		7.82E+02	N	Ing	
TRANS-1,2-DICHLOROETHENE	156605	1.00E+02			MCL	3.07E+03		Csat		1.56E+03	N	Ing	
DICHLOROMETHANE (METHYLENE CHLORIDE)	75092	5.00E+00			MCL	2.19E+01	C	Inh	1	1.43E+01	C	Inh	1
2,4-DICHLOROPHENOL	120832	1.10E+02	N		R	6.13E+02	N	Ing		2.35E+02	N	Ing	
2,4-DICHLOROPHENOXYACETIC ACID (2,4-D)	94757	7.00E+01			MCL	2.04E+03	N	Ing		7.82E+02	N	Ing	
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94826	2.92E+02	N			1.64E+04	N	Ing		6.26E+02	N	Ing	
1,2-DICHLOROPROPANE	78875	5.00E+00			MCL	4.45E-01	N	Inh	1	4.45E-01	N	Inh	1
2,3-DICHLOROPROPANOL	616239	1.10E+02	N			6.13E+03	N	Ing		2.35E+02	N	Ing	
1,3-DICHLOROPROPENE (1,3-DICHLOROPROPYLENE, CIS + TRANS)	542756	8.42E-02	C		R	3.52E-01	N	Inh	1	3.52E-01	N	Inh	1
DICHLORVOS	62737	2.31E-01	C			1.97E+01	C	Ing		2.20E+00	C	Ing	
DICOFOL	115322	1.52E-01	C			1.30E+01	C	Ing		1.45E+00	C	Ing	
DICYCLOPENTADIENE	77736	4.38E-01	N			6.13E+04	N	Ing		2.35E+03	N	Ing	
DIELDRIN	60571	4.19E-03	C		R	3.58E-01	C	Ing		3.99E-02	C	Ing	
DIETHYLPHTHALATE	84662	2.92E+04	N		R	1.97E+03		Csat		1.97E+03		Csat	
DIETHYLENE GLYCOL, MONOETHYL ETHER	111900	7.30E+04	N			4.09E+06	N	Ing		1.56E+05	N	Ing	
DI(2-ETHYLHEXYL)ADIPATE	103231	4.00E+02			MCL	4.77E+03	C	Ing		5.32E+02	C	Ing	
DIETHYLSTILBESTROL	56531	1.42E-05	C			1.22E-03	C	Ing		1.36E-04	C	Ing	
DIFENZOQUAT (AVENGE)	43222486	2.92E+03	N			1.64E+05	N	Ing		6.26E+03	N	Ing	
DIFLUOROCHLOROMETHANE (CHLORODIFLUOROMETHANE)	75456	1.02E+05	N										
1,1-DIFLUOROETHANE	75376	8.03E+04	N										
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445756	2.92E+03	N			1.64E+05	N	Ing		6.26E+03	N	Ing	
3,3'-DIMETHOXYBENZIDINE	119904	4.78E+00	C			4.09E+02	C	Ing		4.56E+01	C	Ing	
2,4-DIMETHYLANILINE HYDROCHLORIDE	21436964	1.15E-01	C			9.87E+00	C	Ing		1.10E+00	C	Ing	
2,4-DIMETHYLANILINE	95681	8.93E-02	C			7.63E+00	C	Ing		8.52E-01	C	Ing	
N,N-DIMETHYLANILINE	121697	7.30E+01	N			4.08E+03	N	Ing		1.56E+02	N	Ing	
3,3'-DIMETHYLBENZIDINE	119937	7.28E-03	C			6.22E-01	C	Ing		6.94E-02	C	Ing	
1,1-DIMETHYLHYDRAZINE	57147	2.58E-02	C			2.20E+00	C	Ing		2.46E-01	C	Ing	
1,2-DIMETHYLHYDRAZINE	540738	1.81E-03	C			1.55E-01	C	Ing		1.73E-02	C	Ing	
DIMETHYL KETONE (ACETONE)	67641	6.08E+02	N		R	1.04E+05		Csat		7.82E+03	N	Ing	
2,4-DIMETHYLPHENOL	105679	7.30E+02	N		R	4.08E+04	N	Ing		1.56E+03	N	Ing	
2,6-DIMETHYLPHENOL	576261	2.19E+01	N			1.23E+03	N	Ing		4.69E+01	N	Ing	
3,4-DIMETHYLPHENOL	95658	3.65E+01	N			2.04E+03	N	Ing		7.82E+01	N	Ing	
DIMETHYLPHTHALATE	131113	3.65E+05	N			2.04E+07	N	Ing		7.82E+05	N	Ing	
1,2-DINITROBENZENE	528290	1.46E+01	N			8.17E+02	N	Ing		3.13E+01	N	Ing	
1,3-DINITROBENZENE	99650	3.65E+00	N			2.04E+02	N	Ing		7.82E+00	N	Ing	
1,4-DINITROBENZENE	100254	1.46E+01	N			8.17E+02	N	Ing		3.13E+01	N	Ing	
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131895	7.30E+01	N			4.09E+03	N	Ing		1.56E+02	N	Ing	
4,6-DINITRO-2-METHYLPHENOL	534521	3.65E+00	N			2.04E+02	N	Ing		7.82E+00	N	Ing	
2,4-DINITROPHENOL	51285	7.30E+01	N		R	4.08E+02	N	Ing		1.56E+02	N	Ing	
DINITROTOLUENE MIXTURE		9.85E-02	C			8.42E+00	C	Ing	3	9.39E-01	C	Ing	3
2,4-DINITROTOLUENE	121142	7.30E+01	N		R	4.08E+02	N	Ing	3	1.56E+02	N	Ing	3
2,6-DINITROTOLUENE	606202	3.65E+01	N		R	2.04E+03	N	Ing	3	7.82E+01	N	Ing	3

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CHEMICAL	CAS No.	Groundwater			Soil							
					Restricted				Unrestricted			
		ug/l		Notes	mg/kg		Notes		mg/kg		Notes	
DINOSEB	88857	7.00E+00		MCL	2.04E+02	N	Ing		7.82E+01	N	Ing	
DI-N-OCTYLPHTHALATE	117840	2.00E+01		Csol	4.08E+03	N	Ing		1.56E+03	N	Ing	
1,4-DIOXANE	123911	6.09E+00	C		5.20E+02	C	Ing		5.81E+01	C	Ing	
DIOXATHION	78342	5.48E+01	N		3.07E+03	N	Ing		1.17E+02	N	Ing	
DIOXINS & FURANS												
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)	1746016	3.00E-05		MCL	3.82E-05	C	Ing		4.26E-06	C	Ing	
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN (HpCDD)	35822469	4.46E-05	C		3.82E-03	C	Ing		4.26E-04	C	Ing	
1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN (HxCDD)	39227286	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN (HxCDD)	57653857	1.08E-05	C		9.23E-04	C	Ing		1.03E-04	C	Ing	
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN (HxCDD)	19408743	1.08E-05	C		9.23E-04	C	Ing		1.03E-04	C	Ing	
1,2,3,4,6,7,8,9-OCTACHLORODIBENZO-P-DIOXIN (OCDD)	3268879	4.46E-04	C		3.82E-02	C	Ing		4.26E-03	C	Ing	
1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN (PeCDD)	40321764	8.93E-07	C		7.63E-05	C	Ing		8.52E-06	C	Ing	
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN (HpCDF)	67562394	4.46E-05	C		3.82E-03	C	Ing		4.26E-04	C	Ing	
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN (HpCDF)	55673897	4.46E-05	C		3.82E-03	C	Ing		4.26E-04	C	Ing	
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN (HxCDF)	70648269	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN (HxCDF)	57117449	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN (HxCDF)	72918219	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN (HxCDF)	60851345	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN (OCDF)	39001020	4.46E-04	C		3.82E-02	C	Ing		4.26E-03	C	Ing	
1,2,3,7,8-PENTACHLORODIBENZOFURAN (PeCDF)	57117416	8.93E-06	C		7.63E-04	C	Ing		8.52E-05	C	Ing	
2,3,4,7,8-PENTACHLORODIBENZOFURAN (PeCDF)	57117314	8.93E-07	C		7.63E-05	C	Ing		8.52E-06	C	Ing	
2,3,7,8-TETRACHLORODIBENZOFURAN (TCDF)	51207319	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
DIPHENYLAMINE	122394	9.13E+02	N		5.10E+03	N	Ing		1.96E+03	N	Ing	
1,2-DIPHENYLHYDRAZINE	122667	8.37E-02	C		7.15E+00	C	Ing		7.98E-01	C	Ing	
DIQUAT	85007	2.00E+01		MCL	4.50E+03	N	Ing		1.72E+02	N	Ing	
DISULFOTON	298044	1.46E+00	N		8.17E+00	N	Ing		3.13E+00	N	Ing	
1,4-DITHIANE	505293	3.65E+02	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
DIURON	330541	7.30E+01	N		4.09E+03	N	Ing		1.56E+02	N	Ing	
ENDOSULFAN	115297	2.19E+02	N	R	1.23E+03	N	Ing		4.69E+02	N	Ing	
ENDRIN	72208	2.00E+00		MCL	6.13E+01	N	Ing		2.35E+01	N	Ing	
EPICHLOROHYDRIN	106898	2.03E+00	N		4.08E+02	N	Ing		6.45E+01	C	Ing	
ETHION	563122	1.83E+01	N		1.02E+03	N	Ing		3.91E+01	N	Ing	
2-ETHOXYETHANOL	110805	1.46E+04	N		1.02E+05	N	Ing		3.13E+04	N	Ing	
ETHYL ACETATE	141786	5.48E+03	N		1.84E+06	N	Ing		7.04E+04	N	Ing	
ETHYLBENZENE	100414	7.00E+02		MCL	3.95E+02		Csat		3.95E+02		Csat	
ETHYLENE DIAMINE	107153	7.30E+02	N		4.08E+03	N	Ing		1.56E+03	N	Ing	
ETHYLENE DIBROMIDE (1,2- DIBROMOETHANE)	106934	5.00E-02		MCL	6.73E-02	C	Ing		7.51E-03	C	Ing	
ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE)	107062	5.00E+00		MCL	6.21E-01	C	Inh	1	4.06E-01	C	Inh	1
ETHYLENE GLYCOL	107211	7.30E+04	N		4.08E+05	N	Ing		1.56E+05	N	Ing	
ETHYLENE GLYCOL MONOBUTYL ETHER (2-BUTOXYETHANOL)	111762	1.09E+04	N		1.02E+06	N	Ing		3.91E+04	N	Ing	
ETHYLENE OXIDE	75218	2.32E-02	C		5.61E+00	C	Ing		6.26E-01	C	Ing	
ETHYLENE THIOUREA	96457	6.09E-01	C		1.63E+01	N	Ing		5.81E+00	C	Ing	
ETHYL ETHER	60297	1.22E+03	N		4.08E+05	N	Ing		1.56E+04	N	Ing	
ETHYL METHACRYLATE	97632	5.48E+02	N		1.84E+04	N	Ing		7.04E+03	N	Ing	
FENAMIPHOS	22224926	9.13E+00	N		5.11E+02	N	Ing		1.96E+01	N	Ing	
FLUOMETURON	2164172	4.75E+02	N		2.66E+04	N	Ing		1.02E+03	N	Ing	
FLUORANTHENE	206440	1.46E+03	N	R	8.17E+04	N	Ing		3.13E+03	N	Ing	
FLUORENE	86737	2.43E+02	N	R	8.17E+04	N	Ing		3.13E+03	N	Ing	
FLUORINE (SOLUBLE FLUORIDE)	7782414	4.00E+03		MCL	1.23E+04	N	Ing		4.69E+03	N	Ing	
FOMESAFEN	72178020	3.52E-01	C		3.01E+01	C	Ing		3.36E+00	C	Ing	
FONOFOS	944229	7.30E+01	N		4.09E+03	N	Ing		1.56E+02	N	Ing	
FORMALDEHYDE	50000	7.30E+03	N		4.08E+04	N	Ing		1.56E+04	N	Ing	
FORMIC ACID	64186	7.30E+04	N		4.08E+05	N	Ing		1.56E+05	N	Ing	
FURAN	110009	6.08E+00	N		2.04E+03	N	Ing		7.82E+01	N	Ing	
FURAZOLIDONE	67458	1.76E-02	C		1.51E+00	C	Ing		1.68E-01	C	Ing	
FURFURAL	98011	1.10E+02	N		6.13E+03	N	Ing		2.35E+02	N	Ing	
GLYCIDALDEHYDE	765344	1.46E+01	N		8.17E+02	N	Ing		3.13E+01	N	Ing	
GLYPHOSATE	1071836	7.00E+02		MCL	2.04E+05	N	Ing		7.82E+03	N	Ing	
HEPTACHLOR	76448	4.00E-01		MCL	1.95E-01	C	Inh	1	1.27E-01	C	Inh	1
HEPTACHLOR EPOXIDE	1024573	2.00E-01		MCL	6.29E-01	C	Ing		7.02E-02	C	Ing	
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN (HpCDF)	67562394	4.46E-05	C		3.82E-03	C	Ing		4.26E-04	C	Ing	
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN (HpCDF)	55673897	4.46E-05	C		3.82E-03	C	Ing		4.26E-04	C	Ing	
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN (HpCDD)	35822469	4.46E-05	C		3.82E-03	C	Ing		4.26E-04	C	Ing	
HEXABROMOBENZENE	87821	7.30E+01	N		4.08E+03	N	Ing		1.56E+02	N	Ing	
HEXACHLOROBENZENE	118741	1.00E+00		MCL	1.65E+00	C	Inh	1	3.99E-01	C	Ing	
HEXACHLOROBUTADIENE	87683	8.59E-01	C	R	1.35E-01	C	Inh	1	8.82E-02	C	Inh	1
ALPHA-HCH	319846	1.06E-02	C	R	9.08E-01	C	Ing		1.01E-01	C	Ing	
BETA-HCH	319857	3.72E-02	C	R	3.18E+00	C	Ing		3.55E-01	C	Ing	
GAMMA-HCH (LINDANE)	58899	2.00E-01		MCL	4.40E+00	C	Ing		4.91E-01	C	Ing	
TECHNICAL HCH	608731	3.72E-02	C		3.18E+00	C	Ing		3.55E-01	C	Ing	

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TIER 1 TRG TABLE

CHEMICAL	CAS No.	Groundwater			Soil							
					Restricted				Unrestricted			
		ug/l	Notes		mg/kg	Notes			mg/kg	Notes		
HEXACHLOROCYCLOPENTADIENE	77474	5.00E+01		MCL	9.51E-01	N	Inh	1	9.51E-01	N	Inh	1
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN (HxCDF)	70648269	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN (HxCDF)	57117449	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN (HxCDF)	72918219	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN (HxCDF)	60851345	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN (HxCDD)	39227286	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN (HxCDD)	57653857	1.08E-05	C		9.23E-04	C	Ing		1.03E-04	C	Ing	
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN (HxCDD)	19408743	1.08E-05	C		9.23E-04	C	Ing		1.03E-04	C	Ing	
HEXACHLOROETHANE	67721	4.78E+00	C	R	9.33E+01	C	Inh	1	4.56E+01	C	Ing	
HEXACHLOROPHENE	70304	1.10E+01	N		6.13E+02	N	Ing		2.35E+01	N	Ing	
1,6-HEXAMETHYLENE DIISOCYANATE	822060	2.09E-02	N			C				N		
HEXANE	110543	3.50E+02	N	R	1.60E+00	N	Inh	1	1.60E+00	N	Inh	1
2-HEXANONE	591786	1.46E+03	N		8.18E+04	N	Ing		3.13E+03	N	Ing	
HEXAZINONE	51235042	1.20E+03	N		6.75E+04	N	Ing		2.58E+03	N	Ing	
HMX	2691410	1.83E+03	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
HYDRAZINE	302012	2.23E-02	C		1.91E+00	C	Ing		2.13E-01	C	Ing	
HYDROGEN CYANIDE	74908	6.22E+00	N		4.09E+04	N	Ing		1.56E+03	N	Ing	
HYDROGEN SULFIDE	7783064	1.10E+02	N		6.13E+03	N	Ing		2.35E+02	N	Ing	
HYDROQUINONE	123319	1.46E+03	N		8.17E+04	N	Ing		3.13E+03	N	Ing	
INDENO[1,2,3-C,D]PYRENE	193395	9.17E-02	C	R	7.84E+00	C	Ing		8.75E-01	C	Ing	
IRON	7439896	1.10E+04	N		6.13E+05	N	Ing		2.35E+04	N	Ing	
ISOBUTANOL	78831	1.83E+03	N		6.13E+05	N	Ing		2.35E+04	N	Ing	
ISOPHORONE	78591	7.05E+01	C	R	4.57E+03		Csat		6.72E+02	C	Ing	
ISOPROPALIN	33820530	5.48E+02	N		3.06E+04	N	Ing		1.17E+03	N	Ing	
ISOPROPYL BENZENE (CUMENE)	98828	6.79E+02	N	R	9.43E+00	N	Inh	1	9.43E+00	N	Inh	1
ISOPROPYL METHYL PHOSPHONIC ACID	1832548	3.65E+03	N		2.04E+05	N	Ing		7.82E+03	N	Ing	
LEAD	7439921	1.50E+01		MCL	1.70E+03	C	Ing		4.00E+02	C	Ing	4
LEAD (TETRAETHYL LEAD)	78002	3.65E-03	N		2.04E-01	N	Ing		7.82E-03	N	Ing	
LINDANE (GAMMA-HCH)	58899	2.00E-01		MCL	4.40E+00	C	Ing		4.91E-01	C	Ing	
LITHIUM	7439932	7.30E+02	N		4.09E+04	N	Ing		1.56E+03	N	Ing	
MALATHION	121755	7.30E+02	N		4.08E+03	N	Ing		1.56E+03	N	Ing	
MALEIC ANHYDRIDE	108316	3.65E+03	N		2.04E+04	N	Ing		7.82E+03	N	Ing	
MANGANESE	7439965	7.30E+02	N		4.08E+03	N	Ing		1.56E+03	N	Ing	5
MEPHOSFOLAN	950107	3.29E+00	N		1.84E+02	N	Ing		7.04E+00	N	Ing	
MEPIQUAT CHLORIDE	24307264	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
MERCURIC CHLORIDE	7487947	1.10E+01	N		6.13E+01	N	Ing		2.35E+01	N	Ing	
MERCURY (INORGANIC)	7439976	2.00E+00		MCL	6.13E+01	N	Ing		1.00E+01	N	Inh	2
METHYLMERCURY	22967926	3.65E+00	N		2.04E+02	N	Ing		7.82E+00	N	Ing	
METHACRYLONITRILE	126987	1.04E+00	N		2.04E+02	N	Ing		7.82E+00	N	Ing	
METHANE TRICHLORIDE (CHLOROFORM)	67663	#VALUE!	C	R	4.78E-01	C	Inh	1	3.12E-01	C	Inh	1
METHANOL	67561	1.83E+04	N		1.02E+06	N	Ing		3.91E+04	N	Ing	
METHIDATHION	950378	3.65E+01	N		2.04E+03	N	Ing		7.82E+01	N	Ing	
METHOXYCHLOR	72435	4.00E+01		MCL	1.02E+03	N	Ing		3.91E+02	N	Ing	
METHYL ACETATE	79209	6.08E+03	N		2.04E+06	N	Ing		7.82E+04	N	Ing	
METHYL ACRYLATE	96333	1.83E+02	N		6.13E+03	N	Ing		2.35E+03	N	Ing	
METHYL BROMIDE (BROMOMETHANE)	74839	8.52E+00	N	R	2.97E+00	N	Inh	1	2.97E+00	N	Inh	1
METHYL CHLORIDE (CHLOROMETHANE)	74873	1.43E+00	C		4.40E+02	C	Ing		4.91E+01	C	Ing	
2-METHYLANILINE	95534	2.79E-01	C		2.38E+01	C	Ing		2.66E+00	C	Ing	
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94815	3.65E+02	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94746	1.83E+01	N		1.02E+03	N	Ing		3.91E+01	N	Ing	
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	93652	3.65E+01	N		2.04E+03	N	Ing		7.82E+01	N	Ing	
METHYLENE BROMIDE (DIBROMOMETHANE)	74953	6.08E+01	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
METHYLENE CHLORIDE (DICHLOROMETHANE)	75092	5.00E+00		MCL	2.19E+01	C	Inh	1	1.43E+01	C	Inh	1
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101144	5.15E-01	C		4.40E+01	C	Ing		4.91E+00	C	Ing	
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101611	1.46E+00	C		1.24E+02	C	Ing		1.39E+01	C	Ing	
METHYL ETHYL KETONE (2-BUTANONE)	78933	1.91E+03	N	R	8.45E+01	N	Inh	1	8.45E+01	N	Inh	1
METHYL HYDRAZINE	60344	6.09E-02	C		5.20E+00	C	Ing		5.81E-01	C	Ing	
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108101	1.39E+02	N		1.63E+05	N	Ing		6.26E+03	N	Ing	
METHYL METHACRYLATE	80626	1.42E+03	N		1.63E+04	N	Ing		1.63E+04	N	Ing	
2-METHYLNAPHTHALENE	91576	1.22E+02	N		4.09E+04	N	Ing		1.56E+03	N	Ing	
2-METHYL-5-NITROANILINE	99558	2.03E+00	C		1.73E+02	C	Ing		1.94E+01	C	Ing	
METHYL PARATHION	298000	9.13E+00	N		4.08E+02	N	Ing		1.96E+01	N	Ing	
2-METHYLPHENOL (o-CRESOL)	95487	1.83E+03	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
3-METHYLPHENOL (m-CRESOL)	108394	1.83E+03	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
4-METHYLPHENOL (p-CRESOL)	106445	1.83E+02	N		1.02E+04	N	Ing		3.91E+02	N	Ing	
METHYLSTYRENE MIX	25013154	5.48E+01	N		1.23E+03	N	Ing		4.69E+02	N	Ing	
ALPHA-METHYLSTYRENE	98839	4.26E+02	N		1.43E+05	N	Ing		5.48E+03	N	Ing	
METHYL TERT BUTYL ETHER (MTBE)	1634044	4.00E+01		H	8.74E+03		Csat		3.91E+03	N	Ing	
METHYL TRIBROMIDE (BROMOFORM)	75252	8.48E+00	C	R	9.01E+01	C	Inh	1	5.88E+01	C	Inh	1

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CHEMICAL	CAS No.	Groundwater			Soil							
					Restricted				Unrestricted			
		ug/l	Notes		mg/kg	Notes			mg/kg	Notes		
METOLACHLOR (DUAL)	51218452	5.48E+03	N		3.06E+04	N	Ing		1.17E+04	N	Ing	
MIREX	2385855	7.30E+00	N		4.08E+01	N	Ing		1.56E+01	N	Ing	
MOLYBDENUM	7439987	1.83E+02	N		1.02E+03	N	Ing		3.91E+02	N	Ing	
MONOCHLORAMINE	10599903	3.65E+03	N		2.04E+04	N	Ing		7.82E+03	N	Ing	
MONOCHLOROBENZENE (CHLOROBENZENE)	108907	1.00E+02		MCL	1.19E+00	N	Inh	1	1.19E+00	N	Inh	1
NALED	300765	7.30E+01	N		4.09E+03	N	Ing		1.56E+02	N	Ing	
NAPHTHALENE	91203	6.20E+00	N	R	2.47E+02	N	Inh	1	1.94E+02	N	Inh	1
NICKEL	7440020	7.30E+02	N		4.08E+03	N	Ing	6	1.56E+03	N	Ing	6
NITRATE	14797558	1.00E+04		MCL	3.27E+05	N	Ing		1.25E+05	N	Ing	
NITRIC OXIDE	10102439	6.08E+02	N		2.04E+05	N	Ing		7.82E+03	N	Ing	
NITRITE	14797650	1.00E+03		MCL	2.04E+04	N	Ing		7.82E+03	N	Ing	
2-NITROANILINE	88744	4.17E-01	N	R	4.92E-01	N	Inh	1	4.92E-01	N	Inh	1
NITROBENZENE	98953	3.53E+00	N	R	8.41E+00	N	Inh	1	8.41E+00	N	Inh	1
NITROFURANTOIN	67209	2.56E+03	N		1.43E+05	N	Ing		5.48E+03	N	Ing	
NITROFURAZONE	59870	4.46E-02	C		3.82E+00	C	Ing		4.26E-01	C	Ing	
NITROGEN DIOXIDE	10102440	6.08E+03	N		2.04E+06	N	Ing		7.82E+04	N	Ing	
NITROGLYCERIN	55630	4.78E+00	C		4.09E+02	C	Ing		4.56E+01	C	Ing	
2-NITROPHENOL	88755	4.16E-01	N	R								
4-NITROPHENOL	100027	2.92E+02	N		1.64E+04	N	Ing		6.26E+02	N	Ing	
2-NITROPROPANE	79469	1.33E-03	C	R	2.38E-02	C	Inh	1	1.55E-02	C	Inh	1
N-NITROSO-DI-N-BUTYLAMINE	924163	1.89E-03	C		1.06E+00	C	Ing		1.18E-01	C	Ing	
N-NITROSODIETHANOLAMINE	1116547	2.39E-02	C		2.04E+00	C	Ing		2.28E-01	C	Ing	
N-NITROSODIETHYLAMINE	55185	4.46E-04	C		3.82E-02	C	Ing		4.26E-03	C	Ing	
N-NITROSODIMETHYLAMINE	62759	1.31E-03	C		1.12E-01	C	Ing		1.25E-02	C	Ing	
N-NITROSODIPHENYLAMINE	86306	1.37E+01	C	R	1.17E+03	C	Ing		1.30E+02	C	Ing	
N-NITROSODIPROPYLAMINE	621647	9.57E-03	C	R	8.18E-01	C	Ing		9.12E-02	C	Ing	
N-NITROSO-N-ETHYLUREA	759739	4.78E-04	C		4.09E-02	C	Ing		4.56E-03	C	Ing	
N-NITROSO-N-METHYLETHYLAMINE	10595956	3.04E-03	C		2.60E-01	C	Ing		2.90E-02	C	Ing	
N-NITROSOPYRROLIDINE	930552	3.19E-02	C		2.73E+00	C	Ing		3.04E-01	C	Ing	
M-NITROTOLUENE	99081	6.08E+01	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
O-NITROTOLUENE	88722	6.08E+01	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
P-NITROTOLUENE	99990	6.08E+01	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
NUSTAR	85509199	2.56E+01	N		1.43E+03	N	Ing		5.48E+01	N	Ing	
1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN (OCDF)	39001020	4.46E-04	C		3.82E-02	C	Ing		4.26E-03	C	Ing	
1,2,3,4,6,7,8,9-OCTACHLORODIBENZO-P-DIOXIN (OCDD)	3268879	4.46E-04	C		3.82E-02	C	Ing		4.26E-03	C	Ing	
ORYZALIN	19044883	1.83E+03	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
OXADIAZON	19666309	1.83E+02	N		1.02E+04	N	Ing		3.91E+02	N	Ing	
OXAMYL	23135220	2.00E+02		MCL	5.11E+04	N	Ing		1.96E+03	N	Ing	
OXYFLUORFEN	42874033	1.10E+02	N		6.13E+03	N	Ing		2.35E+02	N	Ing	
PARAQUAT DICHLORIDE	1910425	1.64E+02	N		9.20E+03	N	Ing		3.52E+02	N	Ing	
PARATHION	56382	2.19E+02	N		1.23E+03	N	Ing		4.69E+02	N	Ing	
PENTACHLOROBENZENE	608935	2.92E+01	N		1.63E+03	N	Ing		6.26E+01	N	Ing	
1,2,3,7,8-PENTACHLORODIBENZOFURAN (PeCDF)	57117416	8.93E-06	C		7.63E-04	C	Ing		8.52E-05	C	Ing	
2,3,4,7,8-PENTACHLORODIBENZOFURAN (PeCDF)	57117314	8.93E-07	C		7.63E-05	C	Ing		8.52E-06	C	Ing	
1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN (PeCDD)	40321764	8.93E-07	C		7.63E-05	C	Ing		8.52E-06	C	Ing	
PENTACHLORONITROBENZENE	82688	2.58E-01	C		2.20E+01	C	Ing		2.46E+00	C	Ing	
PENTACHLOROPHENOL	87865	1.00E+00		MCL	2.38E+01	N	Ing	7	2.66E+00	C	Ing	7
PERCHLOROETHENE (TETRACHLOROETHENE) (PCE)	127184	5.00E+00		MCL	1.82E+01	C	Inh	1	1.19E+01	C	Inh	1
PERMETHRIN	52645531	1.83E+03	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
PHENANTHRENE	85018	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
PHENOL	108952	2.19E+04	N	R	1.23E+05	N	Ing		4.69E+04	N	Ing	
M-PHENYLENEDIAMINE	108452	2.19E+02	N		1.23E+04	N	Ing		4.69E+02	N	Ing	
O-PHENYLENEDIAMINE	95545	1.42E+00	C		1.22E+02	C	Ing		1.36E+01	C	Ing	
P-PHENYLENEDIAMINE	106503	6.94E+03	N		3.88E+05	N	Ing		1.49E+04	N	Ing	
2-PHENYLPHENOL	90437	3.45E+01	C		2.95E+03	C	Ing		3.29E+02	C	Ing	
PHOSPHINE	7803512	5.92E-01	N		6.13E+01	N	Ing		2.35E+01	N	Ing	
PHOSPHORIC ACID	7664382	2.09E+01	N		5.72E+34	C	Ing		6.39E+33	C	Ing	
PHOSPHORUS (WHITE)	7723140	7.30E-01	N		4.09E+01	N	Ing		1.56E+00	N	Ing	
P-PHTHALIC ACID	100210	3.65E+04	N		2.04E+05	N	Ing		7.82E+04	N	Ing	
PHTHALIC ANHYDRIDE	85449	7.30E+04	N		4.08E+05	N	Ing		1.56E+05	N	Ing	
POLYBROMINATED BIPHENYLS (PBBs)		7.52E-03	C		6.43E-01	C	Ing		7.18E-02	C	Ing	
POLYCHLORINATED BIPHENYLS (PCBs)	1336363	5.00E-01		MCL	1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1016	12674112	9.57E-01	C		1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1221	11104282	3.35E-02	C		1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1232	11141165	3.35E-02	C		1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1242	53469219	3.35E-02	C		1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1248	12672296	3.35E-02	C		1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1254	11097691	3.35E-02	C		1.00E+01	C		9	1.00E+00	C		8
AROCLOR-1260	11096825	3.35E-02	C		1.00E+01	C		9	1.00E+00	C		8
POLYCHLORINATED TERPHENYLS	61788338	1.49E-02	C		1.27E+00	C	Ing		1.42E-01	C	Ing	

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CHEMICAL	CAS No.	Groundwater			Soil							
					Restricted				Unrestricted			
		ug/l	Notes		mg/kg	Notes			mg/kg	Notes		
POLYNUCLEAR AROMATIC HYDROCARBONS:												
ACENAPHTHENE	83329	3.65E+02	N	R	1.23E+05	N	Ing		4.69E+03	N	Ing	
ACENAPHTHYLENE	208968	2.19E+03	N		1.23E+05	N	Ing		4.69E+03	N	Ing	
ANTHRACENE	120127	4.34E+01		Csol	6.13E+05	N	Ing		2.35E+04	N	Ing	
BENZ[A]ANTHRACENE	56553	9.17E-02	C	R	7.84E+00	C	Ing		8.75E-01	C	Ing	
BENZO[A]PYRENE	50328	2.00E-01		MCL	7.84E-01	C	Ing		8.75E-02	C	Ing	
BENZO[B]FLUORANTHENE	205992	9.17E-02	C	R	7.84E+00	C	Ing		8.75E-01	C	Ing	
BENZO[G,H,I]PERYLENE	191242	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
BENZO[K]FLUORANTHENE	207089	9.17E-01	C	R	7.84E+01	C	Ing		8.75E+00	C	Ing	
CHRYSENE	218019	9.17E+00	C	R	7.84E+02	C	Ing		8.75E+01	C	Ing	
DIBENZ[A,H]ANTHRACENE	53703	9.17E-03	C	R	7.84E-01	C	Ing		8.75E-02	C	Ing	
FLUORANTHENE	206440	1.46E+03	N	R	8.17E+04	N	Ing		3.13E+03	N	Ing	
FLUORENE	86737	2.43E+02	N	R	8.17E+04	N	Ing		3.13E+03	N	Ing	
INDENO[1,2,3-C,D]PYRENE	193395	9.17E-02	C	R	7.84E+00	C	Ing		8.75E-01	C	Ing	
2-METHYLNAPHTHALENE	91576	1.22E+02	N		4.09E+04	N	Ing		1.56E+03	N	Ing	
NAPHTHALENE	91203	6.20E+00	N	R	2.47E+02	N	Inh	1	1.94E+02	N	Inh	1
PHENANTHRENE	85018	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
PYRENE	129000	1.83E+02	N	R	6.13E+04	N	Ing		2.35E+03	N	Ing	
POTASSIUM CYANIDE	151508	1.83E+03	N		1.02E+04	N	Ing		3.91E+03	N	Ing	
POTASSIUM SILVER CYANIDE	506616	7.30E+03	N		4.08E+04	N	Ing		1.56E+04	N	Ing	
PROMETON	1610180	5.48E+02	N		3.07E+04	N	Ing		1.17E+03	N	Ing	
PROMETRYN	7287196	1.46E+02	N		8.18E+03	N	Ing		3.13E+02	N	Ing	
PROPACHLOR	1918167	4.75E+02	N		2.65E+04	N	Ing		1.02E+03	N	Ing	
PROPANIL	709988	1.83E+02	N		1.02E+04	N	Ing		3.91E+02	N	Ing	
PROPARGITE	2312358	7.30E+02	N		4.09E+04	N	Ing		1.56E+03	N	Ing	
N-PROPYLBENZENE	103651	2.43E+02	N	R	4.90E+02		Csat		4.90E+02		Csat	
PROPYLENE GLYCOL	57556	7.30E+05	N		6.13E+06	N	Ing		1.56E+06	N	Ing	
PROPYLENE GLYCOL, MONOETHYL ETHER	52125538	2.56E+04	N		1.43E+06	N	Ing		5.48E+04	N	Ing	
PROPYLENE GLYCOL, MONOMETHYL ETHER	107982	2.56E+04	N		1.43E+06	N	Ing		5.48E+04	N	Ing	
PURSUIT	81335775	9.13E+03	N		5.11E+05	N	Ing		1.96E+04	N	Ing	
PYRENE	129000	1.83E+02	N	R	6.13E+04	N	Ing		2.35E+03	N	Ing	
PYRIDINE	110861	3.65E+01	N		2.04E+03	N	Ing		7.82E+01	N	Ing	
QUINOLINE	91225	5.58E-03	C		4.77E-01	C	Ing		5.32E-02	C	Ing	
RDX (CYCLONITE)	121824	6.09E-01	C		5.20E+01	C	Ing		5.81E+00	C	Ing	
RESMETHRIN	10453868	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
RONNEL	299843	1.83E+03	N		1.02E+04	N	Ing		3.91E+03	N	Ing	
ROTENONE	83794	1.46E+02	N		8.18E+03	N	Ing		3.13E+02	N	Ing	
SELENIOUS ACID	7783008	1.83E+02	N		1.02E+03	N	Ing		3.91E+02	N	Ing	
SELENIUM	7782492	5.00E+01		MCL	1.02E+03	N	Ing		3.91E+02	N	Ing	
SILVER	7440224	1.83E+02	N	MCL	1.02E+03	N	Ing		3.91E+02	N	Ing	
SILVER CYANIDE	506649	3.65E+03	N		2.04E+04	N	Ing		7.82E+03	N	Ing	
SIMAZINE	122349	4.00E+00		MCL	4.77E+01	C	Ing		5.32E+00	C	Ing	
SODIUM AZIDE	26628228	1.46E+02	N		8.18E+03	N	Ing		3.13E+02	N	Ing	
SODIUM DIETHYLDITHIOCARBAMATE	148185	2.48E-01	C		2.12E+01	C	Ing		2.37E+00	C	Ing	
SODIUM CYANIDE	143339	1.46E+03	N		8.17E+03	N	Ing		3.13E+03	N	Ing	
STRONTIUM, STABLE	7440246	2.19E+04	N		1.23E+05	N	Ing		4.69E+04	N	Ing	
STRYCHNINE	57249	1.10E+01	N		6.13E+02	N	Ing		2.35E+01	N	Ing	
STYRENE	100425	1.00E+02		MCL	3.84E+02	N	Inh	1	3.84E+02	N	Inh	1
2,3,7,8-TETRACHLORODIBENZOFURAN (TCDF)	51207319	4.46E-06	C		3.82E-04	C	Ing		4.26E-05	C	Ing	
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)	1746016	3.00E-05		MCL	3.82E-05	C	Ing		4.26E-06	C	Ing	
1,2,4,5-TETRACHLOROBENZENE	95943	1.10E+01	N		6.13E+02	N	Ing		2.35E+01	N	Ing	
1,1,1,2-TETRACHLOROETHANE	630206	4.06E-01	C		2.20E+02	C	Ing		2.46E+01	C	Ing	
1,1,2,2-TETRACHLOROETHANE	79345	5.27E-02	C	R	1.00E+00	C	Inh	1	6.56E-01	C	Inh	1
TETRACHLOROETHENE (PERCHLOROETHENE) (PCE)	127184	5.00E+00		MCL	1.82E+01	C	Inh	1	1.19E+01	C	Inh	1
2,3,4,6-TETRACHLOROPHENOL	58902	1.10E+03	N		6.13E+04	N	Ing		2.35E+03	N	Ing	
P,A,A,A-TETRACHLOROTOLUENE	5216251	2.18E-03	C		2.86E-01	C	Ing		3.19E-02	C	Ing	
TETRAETHYL LEAD	78002	3.65E-03	N		2.04E-01	N	Ing		7.82E-03	N	Ing	
1,1,1,2-TETRAFLUOROETHANE	811972	1.67E+05	N									
TETRYL	479458	3.65E+02	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
THALLIC OXIDE	1314325	2.56E+00	N		1.43E+02	N	Ing		5.48E+00	N	Ing	
THALLIUM	7440280	2.00E+00		MCL	1.43E+02	N	Ing		5.48E+00	N	Ing	
THALLIUM ACETATE	563688	2.00E+00		MCL	1.84E+02	N	Ing		7.04E+00	N	Ing	
THALLIUM CARBONATE	6533739	2.00E+00		MCL	1.63E+02	N	Ing		6.26E+00	N	Ing	
THALLIUM CHLORIDE	7791120	2.00E+00		MCL	1.63E+02	N	Ing		6.26E+00	N	Ing	
THALLIUM NITRATE	10102451	2.00E+00		MCL	1.84E+02	N	Ing		7.04E+00	N	Ing	
THALLIUM SULFATE (2:1)	7446186	2.00E+00		MCL	1.63E+02	N	Ing		6.26E+00	N	Ing	
THIOBENCARB	28249776	3.65E+02	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
THIOCYANATE		1.83E+03	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
TIN	7440315	2.19E+04	N		1.23E+05	N	Ing		4.69E+04	N	Ing	
TITANIUM	7440326	1.46E+05	N		8.18E+06	N	Ing		3.13E+05	N	Ing	

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TIER 1 TRG TABLE

CHEMICAL	CAS No.	Groundwater			Soil							
					Restricted				Unrestricted			
		ug/l	Notes		mg/kg	Notes			mg/kg	Notes		
TITANIUM DIOXIDE	13463677	1.46E+05	N		8.18E+06	N	Ing		3.13E+05	N	Ing	
TOLUENE	108883	1.00E+03		MCL	3.80E+01	N	Inh	1	3.80E+01	N	Inh	1
TOLUENE-2,4-DIAMINE	95807	2.09E-02	C		1.79E+00	C	Ing		2.00E-01	C	Ing	
TOLUENE-2,5-DIAMINE	95705	2.19E+04	N		1.23E+05	N	Ing		4.69E+04	N	Ing	
TOLUENE-2,6-DIAMINE	823405	7.30E+03	N		4.08E+04	N	Ing		1.56E+04	N	Ing	
P-TOLUIDINE	106490	3.52E-01	C		3.01E+01	C	Ing		3.36E+00	C	Ing	
TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE ORGANICS (TPH-GRO)		3.50E+02	N	R	3.00E+02	N	Inh	1	2.00E+02	N	Inh	1
TOTAL PETROLEUM HYDROCARBONS-DIESEL RANGE ORGANICS (TPH-DRO)		6.50E+02	N	R	3.50E+02		Csat		3.00E+02	N	Inh	1
TOXAPHENE	8001352	3.00E+00		MCL	5.20E+00	C	Ing		5.81E-01	C	Ing	
1,2,4-TRIBROMOBENZENE	615543	1.83E+02	N		1.02E+04	N	Ing		3.91E+02	N	Ing	
TRIBUTYLTIN OXIDE	56359	1.10E+01	N		6.13E+02	N	Ing		2.35E+01	N	Ing	
2,4,6-TRICHLOROANILINE	634935	1.97E+00	C		1.68E+02	C	Ing		1.88E+01	C	Ing	
1,2,4-TRICHLOROBENZENE	120821	7.00E+01		MCL	8.24E+02	N	Inh	1	7.82E+02	N	Ing	
1,1,1-TRICHLOROETHANE	71556	2.00E+02		MCL	1.19E+03		Csat		1.19E+03		Csat	
1,1,2-TRICHLOROETHANE	79005	5.00E+00		MCL	1.67E+00	C	Inh	1	1.09E+00	C	Inh	1
TRICHLOROETHENE (TCE)	79016	5.00E+00		MCL	7.92E+00	C	Inh	1	5.17E+00	C	Inh	1
TRICHLOROFLUOROMETHANE	75694	1.29E+03	N		1.43E+05	N	Ing		2.35E+04	N	Ing	
2,4,5-TRICHLOROPHENOL	95954	3.65E+03	N	R	2.04E+05	N	Ing		7.82E+03	N	Ing	
2,4,6-TRICHLOROPHENOL	88062	6.09E+00	C	R	3.14E+02	C	Inh	1	5.81E+01	C	Ing	
2,4,5-TRICHLOROPHENOXYACETIC ACID (2,4,5-T)	93765	3.65E+02	N		2.04E+04	N	Ing		7.82E+02	N	Ing	
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID (2,4,5-TP SILVEX)	93721	5.00E+01		MCL	1.63E+03	N	Ing		6.26E+02	N	Ing	
1,1,2-TRICHLOROPROPANE	598776	3.04E+01	N		1.02E+04	N	Ing		3.91E+02	N	Ing	
1,2,3-TRICHLOROPROPANE	96184	6.23E-03	C		8.18E-01	C	Ing		9.12E-02	C	Ing	
1,2,3-TRICHLOROPROPENE	96195	3.04E+01	N		1.02E+03	N	Ing		3.91E+02	N	Ing	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76131	5.94E+04	N		6.13E+05	N	Ing		6.13E+05	N	Ing	
1,2,4-TRIMETHYLBENZENE	95636	1.23E+01	N		1.02E+05	N	Ing		3.91E+03	N	Ing	
1,3,5-TRIMETHYLBENZENE	108678	1.23E+01	N	R	4.36E+02		Csat		4.36E+02		Csat	
TRIMETHYL PHOSPHATE	512561	1.81E+00	C		1.55E+02	C	Ing		1.73E+01	C	Ing	
1,3,5-TRINITROBENZENE	99354	1.10E+03	N		1.02E+02	N	Ing		1.02E+02	N	Ing	
2,4,6-TRINITROTOLUENE	118967	2.23E+00	C		1.02E+02	N	Ing		2.13E+01	C	Ing	
URANIUM (SOLUBLE SALTS)		1.10E+02	N		6.13E+03	N	Ing		2.35E+02	N	Ing	
VANADIUM	7440622	2.56E+02	N		1.43E+03	N	Ing		5.48E+02	N	Ing	
VANADIUM PENTOXIDE	1314621	3.29E+02	N		1.84E+03	N	Ing		7.04E+02	N	Ing	
VANADIUM SULFATE	16785812	7.30E+02	N		4.08E+03	N	Ing		1.56E+03	N	Ing	
VINCLOZOLIN	50471448	9.13E+02	N		5.11E+04	N	Ing		1.96E+03	N	Ing	
VINYL ACETATE	108054	4.12E+02	N	R	9.13E+00	N	Inh	1	9.13E+00	N	Inh	1
VINYL BROMIDE (BROMOETHENE)	593602	1.12E-01	C	R	1.26E-01	N	Inh	1	1.26E-01	N	Inh	1
VINYL CHLORIDE (CHLOROETHENE)	75014	2.00E+00		MCL	9.39E-01	C	Inh	1	4.26E-01	C	Ing	
WARFARIN	81812	1.10E+01	N		6.13E+01	N	Ing		2.35E+01	N	Ing	
M-XYLENE	108383	1.22E+04	N	R	4.18E+02		Csat		4.18E+02		Csat	
O-XYLENE	95476	1.22E+04	N	R	4.13E+02		Csat		4.13E+02		Csat	
P-XYLENE	106423	1.22E+04	N	R	4.61E+02		Csat		4.61E+02		Csat	
XYLENES	1330207	1.00E+04		MCL	3.18E+02		Csat		3.18E+02		Csat	
ZINC	7440666	1.10E+04	N		6.13E+04	N	Ing		2.35E+04	N	Ing	
ZINC CYANIDE	557211	1.83E+03	N		1.02E+04	N	Ing		3.91E+03	N	Ing	
ZINC PHOSPHIDE	1314847	1.10E+01	N		6.13E+02	N	Ing		2.35E+01	N	Ing	
ZINEB	12122677	1.83E+03	N		1.02E+04	N	Ing		3.91E+03	N	Ing	

NOTES:
C = Carcinogenic effects as to the identification of appropriate TRG
N = Noncarcinogenic effects as to the identification of appropriate TRG
H = EPA Health Advisory
Csat = Soil Saturation Concentration
Csol = Aqueous Solubility Concentration - For mixtures of chemicals (e.g., gasoline, diesel, etc.) the EFFECTIVE Solubility should be used.
MCL = Maximum Contaminant Level from Safe Drinking Water Act
R = Risk-based value utilizing equations developed by EPA Region III for its RBC Table.
1 = Inhalation values apply to ambient air volatilization only. Enclosed space accumulation is not addressed in the Inhalation TRGs. For such scenarios, a site-specific evaluation is required.
2 = Inhalation values apply to ambient fugitive particulates only.
3 = If both the 2,4- and 2,6- isomers of 2,4-Dinitrotoluene are detected at a site, then the TRG for Dinitrotoluene Mixture must be met. If only one or the other isomer is detected, then the isomer specific value can be applied.
4 = According to "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities," OSWER Directive #9355.4-12, July 14, 1994, Laws EP.
5 = The reference dose is for the total oral intake of manganese. As discussed in the Principal and Supporting Studies and Uncertainty and Modifying Factors Sections of IRIS, it is recommended that a modifying factor of 3 be applied.
6 = The inhalation exposure is from nickel refinery dust.
7 = For Pentachlorophenol, the Ingestion value has been divided in half to account for increased exposure via the dermal route.
8 = According to EPA's Federal Register June 29, 1998, "Mega Rule," PCBs (total) must not exceed 1 ppm. If PCB concentrations are reported as individual Aroclors, the sum of the individual Aroclors must not exceed 1 ppm.
9 = According to EPA's Federal Register June 29, 1998, "Mega Rule," PCBs (total) must not exceed 10 ppm provided BOTH institutional and engineering controls are in place for a high occupancy site. Concentrations above the restricted level require a Tier 2 Risk Evaluation and the use of low occupancy criteria must be approved by MDEQ. All institutional and engineering controls must be consistent with the EPA "Mega Rule." If PCB concentrations are reported as individual Aroclors, the sum of the individual Aroclors must not exceed 10 ppm.

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APPENDIX B

PETROLEUM HYDROCARBON TABLES

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TABLE 1

PETROLEUM HYDROCARBON INDICATOR COMPOUNDS[1]

Type of Release								
Indicator Compound	Gasoline	Kerosene, Jet Fuel	Diesel, Light Fuel Oils	Heavy Fuel Oils	Crude Oil	Highly Refined Base Oils[2]	Used Motor Oil, Lubricating Oil	Unknown
TPH-GRO	X	X						X
TPH-DRO		X	X	X	X	X	X	X
Volatiles	X	X						X
Acenaphthene		X	X	X	X	X	X	X
Acenaphthylene		X	X	X	X	X	X	X
Anthracene		X	X	X	X	X	X	X
Benz[a]anthracene		X	X	X	X	X	X	X
Benzo[a]pyrene		X	X	X	X	X	X	X
Benzo[b]fluoranthene		X	X	X	X	X	X	X
Benzo[g,h,i]perylene		X	X	X	X	X	X	X
Benzo(k)fluoranthene		X	X	X	X	X	X	X
Chrysene		X	X	X	X	X	X	X
Fluoranthene		X	X	X	X	X	X	X
Fluorene		X	X	X	X	X	X	X
Indeno[1,2,3-c,d]pyrene		X	X	X	X	X	X	X
2-Methylnaphthalene		X	X	X	X	X	X	X
Naphthalene		X	X	X	X	X	X	X
Phenanthrene		X	X	X	X	X	X	X
Pyrene		X	X	X	X	X	X	X
Metals							X	X
Methyl tertbutyl ether	X							X
Methyl ethyl ketone	X[3]							X
Methyl isobutyl ketone	X[3]							X

NOTES:

1 ASTM 1995 and TPH Criteria Working Group; for large releases additional indicator constituents may be identified for evaluation.

2 Applies to oils formulated with highly refined base oils including hydraulic fluids (Mineral-oil based hydraulic fluids, Toxicological Profile for Mineral Oil Hydraulic Fluids, Organophosphate Ester Hydraulic Fluids, and Polyalphaolefin Hydraulic Fluids, ATSDR 1994), motor oils, industrial oils, and automatic transmission fluid-type oils (i.e., severely refined base oils).

3 When suspected to be present.

TABLE 2

TIER 2 PETROLEUM HYDROCARBON TARGET REMEDIATION GOALS (TRGS)

Carbon Fraction	Method	Groundwater (μg/L)	Soils Unrestricted (mg/kg)	Soils Restricted (mg/kg)
C_5-C_8	Aliphatic	400	100	500
C_9-C_{12}	Aliphatic	4,000	1,000	5,000
C_9-C_{10}	Aromatic	200	100	100
C_9-C_{18}	Aliphatic	4,000	1,000	5,000
C_{19}-C_{36}	Aliphatic	5,000	2,500	5,000
C_{11}-C_{22}	Aromatic	200	200	200

APPENDIX D

ECOLOGICAL CHECKLIST

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MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
BROWNFIELD VOLUNTARY CLEANUP PROGRAM
ECOLOGICAL CHECKLIST

Section I- Facility Information

1. Name of Facility: _____
2. Location of Facility: _____
   County: _____
3. Mailing Address: _____
4. Type of Facility: _____
5. Describe land use at and in the vicinity of the release site _____

6. Attach a USGS topographic map of the facility and aerial and other photographs of the release site and surrounding areas.

Section 2-Surrounding Land Use Information

1. Describe land use adjacent to the facility.

2. Provide the following information regarding the nearest water body:
   Name of surface water body: _____
   Type of surface water body (pond, lake, river etc: _____
3. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State Monuments, wetlands, etc.

Section 3 - Release Information

1. Nature of release. _____
2. Location of the release (within the facility) _____
3. Location of the release with respect to the facility property boundaries:

4. Chemicals of Concern (COC) known or suspected to have been released: _____

5. Indicate which media are known or suspected to be impacted and if sampling data are available:

Soil 0-6 feet bgs	yes	no
groundwater	yes	no
surface water/sediment	yes	no

6. Has migration occurred outside the facility property boundaries? yes no
   If yes, describe the designated use of the land impacted: _____

Section 4 - Criteria for Further Assessment

If the Area of Impact (AOI) meets all of the criteria presented below, then typically no further ecological evaluation shall be required. If the AOI does not meet all of the criteria, then a screening level ecological risk shall be conducted. The Submitter should make the initial decision regarding whether or not a screening level ecological risk assessment is warranted based on compliance of the AOI with criteria listed below. After review of the ecological checklist and other available site information, the Mississippi Department of Environmental Quality will make a final determination on the need for a screening level ecological risk assessment. If site conditions at the AOI change such that one or more of the criteria are not met, then a screening level ecological risk assessment shall be conducted.

The criteria for exclusion from further ecological assessment include:

The area of impacted soil is approximately 1 acre or less in size;

There is no current (or potential) release (via runoff or groundwater discharge) of COCs from the AOI to a surface water body;

Recreational species, commercial species, threatened or endangered species, and/or their habitats are not currently being exposed, or expected to be exposed, to COCs present at or migrating from the AOI; and

There are no obvious impacts to ecological receptors or their habitats.

Section 5 - Site Summary

The ecological checklist submittal shall include a site summary which presents sufficient information to verify that the AOI meets or does not meet the criteria for further assessment.

Section 6 - Submitter Information

Date: _____

Name of person submitting this check list: _____

Affiliation: _____

Signature _____

Additional Preparers: _____