APPENDIX G~~I~~

A SITE-SPECIFIC RECAP EVALUATION FOR TYPICAL UST SITES AND OTHER SMALL PETROLEUM HYDROCARBON RELEASE SITES

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GI1.0 APPENDIX GI UNDERGROUND STORAGE TANK (UST) AND OTHER SMALL PETROLEUM RELEASES RECAP STANDARDS

Relative to sites at large facilities (landfills, RCRA facilities, chemical plants, etc.), UST sites are unique because: (1) most sites are about the same size, (2) the constituents of concern (COC) are relatively limited, (3) the sources of COC are generally limited (i.e. tank hold, pipe chase, and dispenser islands), and (4) the exposure pathways and receptors are similar. Due to these factors and the abundance of information that has been obtained from numerous UST sites in Louisiana and across the country, a site-specific MO-2 analysis of typical UST sites was conducted and RECAP Standards (RS) have been calculated for a range of conditions found at typical UST sites. as an example of a MO-2 analysis that may be developed under RECAP. This analysis is consistent with the requirements for MO-2 evaluations for all sites but uses information that will be gathered during site investigation activities at UST sites. These MO-2 RS This example may be used to assist in evaluation of the numerous UST sites in Louisiana. These MO-2 RS . This example may also be used to assist in the evaluation of other types of small petroleum releases (i.e., source area is < 0.5 acre) to that meet the criteria given in Section G2.0. A more site-specific MO-2 analysis or a MO-3 analysis may be required by the Department based on site conditions. Additional guidance on addressing petroleum hydrocarbon releases is presented in Appendix D. Refer to Table D-2 for the COC for various types of petroleum hydrocarbon releases.

The Appendix GI Department-derived MO-2 RECAP Standards RS include $Soil_i$, $Soil_{ni}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, $Soil_{sat}$, GW_1, GW_2, GW_{3DW}, GW_{3NDW}, and $Water_{sol}$ (refer to Section 2.12 for a description of the RS). The GW_{air} RS shall be obtained from Table 3 of the main document. These RS represent are constituent concentrations in soil and groundwater that are protective of human health and the environment. The comparison of the MO-2 Appendix GI RS with the soil AOIC and/or groundwater CC serves to provide predictable, consistent guidance regarding when further evaluation and/or corrective action is warranted at a UST or other small petroleum release site. The Appendix G RS were developed for non-industrial and industrial exposure scenarios using protective assumptions with regard to the protection of human health and the prevention of cross-media transfer. The Appendix G RS comply with ARAR and consider the protection of resource aesthetics. Appendix G RS may be used to: (1) document that an AOI complies with target risk levels and hence, does not warrant further action at this time; (2) identify areas of a facility, media, or COC that warrant further evaluation or remediation using a site-specific MO-2 or MO-3 assessment. If the soil AOIC and groundwater CC are less than or equal to the respective MO-2 limiting Appendix I RS, then typically, NFA-ATT is required for soil and groundwater. If the soil AOIC and/or groundwater CC exceeds the limiting RS, then: (1) a more site-specific evaluation of that medium shall be conducted; or (2) corrective action shall be implemented and the MO-2 limiting RS shall be used as the corrective action standard.

Soil and groundwater pathways not addressed by Appendix I: For the volatile emissions from soil to an enclosed structure pathway, the $Soil_{es}$ in Table 2 of the main document may be used or a site-specific $Soil_{es}$ may be developed under MO-2. For the

~~volatile emissions from groundwater to an enclosed structure pathway, the GW_{es} in Table 3 of the main document may be used or a site-specific GW_{es} may be developed under MO-2. For other pathways, a MO-2 assessment, when applicable, shall be conducted in conjunction with the Appendix I assessment.~~

G1.1 Site Categorization

UST and other small petroleum release sites evaluated using Appendix G~~I~~ shall be categorized into one of seven categories (Category 1 - Category 7) based on the site-specific fraction of organic carbon (f_{oc}) of soil representative of the vadose zone: ~~(Category 1-Category 16) in accordance with Figure I-1. Figure I-2 presents the longitudinal dilution factors (DF) that are applied for sites evaluated using Appendix I. The site-specific data **required** to categorize a UST site for evaluation under Appendix I include: (1) the source length (L) (See Figure I-3); (2) source width (S_w) (See Figure I-3); and (3) the fractional organic carbon (f_{oc}) present in soil (the f_{oc} shall be obtained from unimpacted soil that is representative of the impacted area). This information shall be obtained during site investigation activities. For sites where it is expected that the soil to groundwater pathway will be a limiting pathway: (1) a site-specific soil protective of groundwater RS may be developed; or (2) a leach test may be conducted using guidelines in Appendix H.~~

Fraction of Organic Carbon (f_{oc}) (Refer to Appendix B for f_{oc} Determination)	**Category**	**Table**
< 0.006	1	G-1
> 0.006 – 0.01	2	G-2
> 0.01 – 0.02	3	G-3
> 0.02 – 0.03	4	G-4
> 0.03 – 0.04	5	G-5
> 0.04 - 0.05	6	G-6
> 0.05 – 0.06	7	G-7

The f_{oc} shall be obtained during site investigation activities from an area of unimpacted soil that is representative of the characteristics of the soil within the vadose zone of the AOI. The Appendix G MO-2 RECAP Standards for soil are presented in Category Tables G-1 through G-7 at the end of this appendix.

G1.2 General D~~d~~ata R~~r~~equirements for an Appendix G~~I~~ MO-2 assessment:

(1) ~~Identification of impacted media;~~

~~(2)~~ Horizontal and vertical boundaries of the soil and groundwater AOI;

(2~~3~~) Groundwater classification of the impacted zone based on aquifer yield and TDS or~~-~~ using data from a nearby site as described in Section 2.3.2~~location, depth, and use of groundwater wells within a 1-mile radius of the AOI~~;

(3~~4~~) Groundwater CC ~~at the POC~~ for each COC and identification of the POE;

(5) Depth to groundwater within the impacted zone and thickness of the groundwater plume (S_d)~~, POE~~;

(6) Distance to the nearest downgradient property boundary or the nearest downgradient location a well could be placed (if applicable);

(7) Designated use of, and distance to, the nearest downgradient surface water body (if applicable);

(8) Delineation of the soil source area ~~Area (acres) of impacted soil~~ within the vadose zone including~~,~~ source length of impacted soil within the vadose zone (L), ~~and~~ source width of impacted soil within the vadose zone (S_w), and the soil AOIC~~(refer to Figure I-3)~~;

~~(9) Distribution (lognormal, normal, etc.) of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);~~

(9) SPLP data for COC where it is expected that the soil to groundwater pathway will be a limiting pathway (recommended);

(10) ~~Soil leachate data (SPLP) (optional);~~

~~(11)~~ Fraction of~~al~~ organic carbon (f_{oc}) present in soil representative of the vadose zone;

(11~~2~~) Exposure pathways associated with current and future land use; ~~Critical effects/target organs for each COC that elicits noncarcinogenic health effects (refer to Appendix G);~~

(12~~3~~) Critical effects/target organs for each COC that elicits noncarcinogenic health effects (refer to Appendix D); and~~Exposure pathways associated with current and future land use (refer to Section 2.7); and~~

(13~~4~~) Environmental fate and transport pathways for constituent migration.

(14) When a fuel containing ethanol (E10) is released to the environment, the Department may require that ethanol be included as a COC for the site investigation/RECAP assessment. In general, the assessment of ethanol shall include the collection of a groundwater sample from the most heavily impacted area. If warranted by site conditions, the department may require additional sampling to characterize the distribution of ethanol with in the AOI. When a fuel containing greater than 10% ethanol (e.g., E15, E20, E85, E95) is released to the environment, the Department may require that additional COC (e.g. methane) and media (e.g. soil) be addressed during site investigation/evaluation.

~~For further guidance on conducting an Appendix I evaluation refer to:~~

~~(1) Appendix B for site investigation requirements for a MO-2 assessment;~~

~~(2) Section 2.6 for the requirements for identifying the AOI and the COC;~~

~~(3) Section 2.8 for guidelines on determining the soil AOIC and groundwater CC.~~

~~(4) Section 2.12 for a description of the Appendix I RS;~~

~~(5) Appendix D for additional guidelines on addressing TPH constituents under the RECAP;~~

~~(6) Appendix G for guidance on addressing additive health effects; and~~

~~(7) Appendix H for the methods and assumptions used in the development of the Appendix I soil and groundwater RS.~~

GI2.0 CRITERIA FOR MANAGEMENT OF A UST OR OTHER SMALL PETROLEUM RELEASE SITE (SOIL AND GROUNDWATER) UNDER APPENDIX GI

In order to develop Appendix GI MO-2UST RS, assumptions were made with regard to: (1) exposure potential at the AOC or the AOI (receptors, exposure pathways, exposure frequency and duration, intake rates, and cumulative exposures); and (2) site characteristics that influence constituent fate and transport (site size, soil characteristics, hydrogeological conditions, etc.). The application of risk-based and cross-media transfer standards is protective only if the AOI shares the same (or reasonably similar) characteristics as those assumed in the development of the standards. Therefore, the Appendix GI RS are only applicable at UST or other small petroleum release sites that meet the criteria listed below.

An AOC or an AOI that meets the criteria presented below may be managed under Appendix GI. Application of the Appendix GI MO-2 RS at an AOC or an AOI that does not meet all of the criteria for management under MO-2 shall receive Department approval prior to submission of the MO-2 assessment. Appendix G management criteria include:

(1) A non-industrial or industrial exposure scenario is applicable at the AOC.

(2) All likely human and cross-media transfer exposure pathways associated with soil and groundwater at or adjacent to the AOC are addressed by the Appendix G MO-2 RS. Other impacted media, exposure or cross-media pathways shall be addressed under MO-3. The potential for vapor intrusion from shall be addressed in accordance with Section G5.0 and Appendix G.

(3) The impacted soil and/or groundwater under investigation are in declining conditions, i.e., the constituent mass is not increasing, the source of the release has been mitigated, and the area of constituent concentrations above the MO-2 RS is not expanding. [The environmental fate and transport models used to develop the cross-media transfer RS assume steady-state concentrations over the AOI.]

(4) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the adsorbed concentrations in soil and/or the dissolved concentrations in groundwater may be addressed in the MO-2 evaluation.) [Note: The environmental fate and transport models used to develop the cross-media transfer RS assume that NAPL is not present.] MO-2 may be applied at a soil AOC/AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-2 limiting RS).

The area of impacted soil is approximately 0.5 acre or less. [The Q/C parameter for the calculation of the volatilization factor and particulate emission factor for

$Soil_i$ and $Soil_{ni}$ and the Summer's default dilution factor for the $Soil_{gw}$ is based on an area of impacted soil that is 0.5 acre in size.]

(5)

Exceptions to this criterion:

~~Inorganic COC (the VF is not used in the development of RS for inorganic constituents); or~~

The limiting MO-2 RS is based on a quantitation limit, the soil saturation concentration ($Soil_{sat}$), the ceiling concentration of 100,000 ppm, or an approved background concentration.

~~The limiting MO-1 RS is based on the GW_1 (a DF is not applicable).~~

Note: If exposure and/or environmental concerns (e.g., vapor intrusion) are present at the AOI that are not addressed by the Appendix G MO-2 soil and groundwater RS then these concerns shall be addressed under an appropriate tier of assessment. If a COC is discharging via groundwater to a surface water body, then surface water, sediment, and/or biota (if applicable) shall be addressed under MO-3.

~~I2.1 GENERAL CRITERIA~~

~~(1) A non-industrial or industrial exposure scenario is under consideration and there are no sensitive subpopulations on or near the AOI. [The MO-2 Appendix I RS only consider residential and industrial exposure scenarios.]; and~~

~~(2) There are no likely human exposure pathways at or adjacent to the AOI other than the ingestion of soil, the ingestion of groundwater, the inhalation of volatile emissions from soil to the ambient air, the inhalation of volatile emissions from groundwater to indoor air during household groundwater use, the inhalation of volatile emissions from groundwater to the ambient air; and dermal contact with soil. The inhalation of volatile emissions from soil to an enclosed structure and the inhalation of volatile emissions from groundwater to an enclosed structure may be addressed under Appendix I using the $Soil_{es}$ and GW_{es} RS presented in Tables 2 and 3, respectively, of the main document. [The MO-2 Appendix I RS do not address the following pathways: ingestion of surface water, the inhalation of volatile emissions from surface water, dermal contact with surface water, the ingestion of sediment, dermal contact with sediment, the inhalation of volatile emissions from sediment, or the ingestion of biota (recreational or subsistence fishing and/or fish/shellfish propagation or production; meat or dairy production, agricultural crop production)].~~

~~*I2.2 Criteria for Impacted Soil*~~

~~(1) The area of impacted soil is approximately 0.5 acre or less. [The Q/C parameter for the calculation of the volatilization factor for $Soil_i$ and $Soil_{ni}$ and the S_w parameter for the calculation of the dilution factors (DF) for $Soil_{GW2}$ and $Soil_{GW3}$ are based on an area of impacted soil that is 0.5 acre in size.];~~

~~**Exception to this criterion:** The MO-2 Appendix I RS may be applied to an area of impacted soil greater than 0.5 acres if:~~

~~(a) The limiting MO-2 RS is the $Soil_i$ or $Soil_{ni}$ and the COC is an inorganic constituent (the VF is not used in the development of RS for inorganic constituents);~~

~~(b) The limiting MO-2 RS is based on a quantitation limit, the soil saturation concentration, the ceiling concentration of 10,000 ppm for TPH, or an approved background concentration (the VF and DF are not applicable); and~~

~~(c) The limiting MO-2 RS is based on the $Soil_{GW1}$ (a DF is not applicable).~~

~~(2) The impacted soil is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer Appendix I RS assume steady-state concentrations over the AOI.];~~

~~(3) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the adsorbed concentrations in soil may be addressed in the MO-2 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer Appendix I RS assume that NAPL is not present.];~~

~~**Exception to this criterion:** The MO-2 RS may be applied at a soil AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-2 RS).~~

~~(4) Soil impacted with volatile constituents is not present beneath an enclosed structure (the release of volatile emissions from soil to an enclosed structure shall be addressed under MO-2 or MO-3); and~~

~~(5) High fugitive dust emissions are not present [Examples of conditions that contribute to potentially high fugitive dust emissions include dry soil (moisture content less than 8 percent), finely divided or dusty soils (high silt or clay content), high average annual wind speeds (greater than 5.3 m/s), and less than 50~~

~~percent vegetative cover. Examples of activities that may generate high dust levels include heavy truck traffic on unpaved roads or other construction related activities. High fugitive dust emissions shall be addressed under MO-2 or MO-3].~~

~~**I2.3 Criteria for Impacted Groundwater**~~

~~(1) The area of impacted soil that is responsible for the impact to a Groundwater 2 or 3 zone is approximately 0.5 acre or less. [The MO-2 DF2 (GW_2) and DF3 (GW_3) are based on an area of impacted soil that is 0.5 acre in size (S_w parameter).]~~

~~**Exception to this criterion:** The Appendix I MO-2 GW_1 may be applied to a Groundwater 1 Zone regardless of the size of the area of impacted soil because a DF is not applied to the GW_1 RS;~~

~~(2) A COC(s) is not discharging via groundwater to a surface water body. [The MO-2 Appendix I RS do not address exposure via surface water, sediment, or biota.];~~

~~(3) The impacted groundwater is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer Appendix I RS assume steady-state concentrations over the AOI.]; and~~

~~(4) NAPL is not present (If NAPL was present at the site but has been, or will be, removed to the extent practicable, the dissolved concentrations in groundwater may be addressed in the MO-2 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer RS assume that NAPL is not present].~~

~~**Exception to this criterion:** MO-2 may be applied at a groundwater AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) (or current remedial measures) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-1 limiting RS).~~

The Submitter shall demonstrate to the Department that the AOI for soil and groundwater meets the above criteria to qualify for management under Appendix G~~I~~ and that a site investigation has been conducted in accordance with the guidelines in Appendix B. If an AOI does not meet **all** of these criteria, then LDEQ considers the AOI to be sufficiently complex to warrant a more detailed assessment of risk and the AOI shall be addressed under a more site-specific MO-2 or MO-3 depending on site-specific ~~exposure~~ conditions.

Management of an AOC/AOI under Appendix G requires that groundwater be classified in accordance with Section 2.3.2. Refer to Appendices B and F for additional guidance on classifying groundwater. Refer to Section 2.3.2.2 and Figure 6 for guidance on establishing the groundwater POC and POE. Refer to Section G3.2 for GW_1, GW_2, GW_{3DW}, and GW_{3NDW} definitions.

Different AOI within a facility may be managed under different Management Options if the areas meet the criteria for management under the Options selected by the Submitter. ~~Exposure pathways and media not addressed by the soil and groundwater MO-2 Appendix I RS shall be addressed under MO-2 or MO-3.~~

An ecological checklist shall be completed (refer to Appendix C, RECAP Form 11~~8~~). If the ecological checklist indicates that an ecological assessment is warranted, then an ecological risk assessment shall be required in addition to the MO-2 human health assessment.

G3.0 APPENDIX G MO-2 RECAP STANDARDS

G3.1 Soil RECAP Standards

$Soil_{ni}$ The $Soil_{ni}$ represents a constituent concentration in soil that is protective of human health for non-industrial (residential) land use. The exposure pathways addressed by the $Soil_{ni}$ include the ingestion of soil, the inhalation of volatile emissions and particulates released from soil to the ambient air, and dermal contact with soil. The $Soil_{ni}$ is applicable to surface soil and is expressed in units of mg/kg.

$Soil_{i}$ The $Soil_{i}$ represents a constituent concentration in soil that is protective of human health for industrial/commercial land use. The exposure pathways addressed by the $Soil_{i}$ include the ingestion of soil, the inhalation of volatile emissions and particulates released from soil to the ambient air, and dermal contact with soil. The $Soil_{i}$ is applicable to surface soil and is expressed in units of mg/kg.

$Soil_{GW}$ The $Soil_{GW}$ represents a constituent concentration in soil that does not result in the leaching of an unacceptable constituent concentration from soil to groundwater. The $Soil_{GW}$ shall be based on the classification of the groundwater to be protected: **$Soil_{GW1}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 1 (the $Soil_{GW1}$ shall not result in a groundwater concentration that exceeds the GW_1); **$Soil_{GW2}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 2 (the $Soil_{GW2}$ shall not result in a groundwater concentration that exceeds the GW_2 at the POE); **$Soil_{GW3DW}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 3 that may potentially discharge to a surface water body designated as a drinking water source (the $Soil_{GW3DW}$ shall not result in a groundwater concentration that exceeds the GW_{3DW} at the POE); and **$Soil_{GW3NDW}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 3 that may potentially discharge to a surface water body designated as a non-drinking water source (the $Soil_{GW3NDW}$ shall not result in a groundwater concentration that exceeds the GW_{3NDW} at the POE). The **$Soil_{GW1}$** shall not be multiplied by a dilution factor. The **$Soil_{GW2}$** shall be multiplied by a dilution factor (DF2) that accounts for the reduction in constituent concentration with groundwater migration from the POC to the nearest downgradient property boundary or the nearest downgradient location a water well can be placed (POE). The **$Soil_{GW3}$** shall be multiplied by a dilution factor (DF3) that accounts for the reduction in constituent concentration with groundwater migration from the POC to the nearest downgradient surface water body (POE). The dilution factor (DF) shall be obtained from Section G.3.3. As an alternative to the $Soil_{GW}$ RS, the soil to groundwater pathway may be evaluated using SPLP and the $Soil_{LS}$. The soil to groundwater pathway shall be evaluated for surface soil and subsurface soil. The $Soil_{GW}$ is expressed in units of mg/kg.

$Soil_{LS}$ The $Soil_{LS}$ is the soil RECAP standard that is compared to the soil leachate test result for the evaluation of the soil to groundwater pathway. The $Soil_{LS}$ is the constituent concentration (mg/l) in leachate (as determined by SPLP analysis) that is not expected to result in an unacceptable constituent concentration in groundwater. ~~The soil leachate concentration shall be representative of the most heavily impacted soils within the AOI. The soil leachate standard is based on the groundwater RS multiplied by the applicable dilution factor(s).~~ **$Soil_{LS1}$** shall not result in a groundwater concentration that exceeds the GW_1; **$Soil_{LS2}$** shall not result in a groundwater concentration that exceeds the GW_2 at the POE; **$Soil_{LS3DW}$** shall not result in a groundwater concentration that exceeds the GW_{3DW} at the POE; and **$Soil_{LS3NDW}$** shall not result in a groundwater concentration that exceeds the GW_{3NDW} at the POE. The soil leachate concentration shall be representative of the most heavily impacted soils within the AOI. A site-specific soil leachate test and the $Soil_{LS}$ may be used in place of the $Soil_{GW}$ for the evaluation of the soil to groundwater pathway. The $Soil_{LS}$ is expressed in units of mg/l.

$Soil_{sat}$ The $Soil_{sat}$ concentration represents a chemical-physical limit where saturation of the soil occurs. A constituent concentration in soil at or above the $Soil_{sat}$ indicates the potential for NAPL to be present in the soil. If the $Soil_{sat}$ is exceeded, the potential for NAPL to be present may be evaluated using an alternate approach. This approach shall address the most heavily impacted soils within the AOI and is subject to Department approval. The $Soil_{sat}$ parameter is only applicable to constituents present in a liquid phase at ambient temperatures (constituents with melting points greater than 20°C). The $Soil_{sat}$ is applicable to surface soil and subsurface soil and is expressed in units of mg/kg.

The soil RECAP Standards shall be obtained from the appropriate Category Table based on the site-specific f_{oc} (Tables G-1 through G-7).

If there are multiple constituents that elicit noncarcinogenic effects on the same target organ or have the same critical effect, then the $Soil_{ni}$ or $Soil_i$ shall be adjusted to account for additive health effects. Refer to Section 2.5.2 for further guidance and Appendix D, Table D-5 for the targets for the MO-2 RS based on noncarcinogenic health effects.

The petroleum hydrocarbon concentration in soil shall not exceed: 1) a total of 5,800 mg/kg for aliphatics C_5-C_{10} and aromatics $C_{>8}$-C_{10}; 2) a total of 13,000 mg/kg for aliphatics $C_{>10}$-C_{16} and aromatics $C_{>10}$-C_{16}; and 3) a total of 30,000 mg/kg for aliphatics $C_{>16}$-C_{35} (and $C_{>35}$) and aromatics $C_{>21}$-C_{35} without Department approval (Alaska, 2006; Brost and Devaull 2000; Fussel, et. al. 1981; Ohio EPA, 2010; Sanders 2009). Refer to Appendix D for further guidance on addressing petroleum hydrocarbon concentration limits.

The **MO-2 Soil Limiting RECAP** Standard (LRS) shall be the lowest of: 1) $Soil_{ni}$ or $Soil_i$ (adjusted for additive health effects if applicable); 2) $Soil_{GW}$ x DF (if applicable); and 3) $Soil_{sat.}$ Refer to Section G3.3 for the DF.

G3.2 Groundwater RECAP Standards

GW_1 The GW_1 represents a constituent concentration in groundwater that is protective of human health. The SDWA MCL serves as the GW_1. If a MCL is not available, then a risk-based standard serves as the GW_1. The GW_1 shall not be multiplied by a dilution factor. The exposure pathways addressed by the risk-based GW_1 include the ingestion of groundwater, dermal contact with groundwater, and the inhalation of volatile emissions associated with indoor groundwater use. The GW_1 RS is applicable to groundwater meeting the definition of Groundwater Classification 1 and is expressed in units of mg/l.

GW_2 The GW_2 represents a constituent concentration in groundwater that is protective of human health. The SDWA MCL serves as the GW_2. If a MCL is not available, then a risk-based standard serves as the GW_2. The exposure pathways addressed by the risk-based GW_2 include the ingestion of groundwater, dermal contact with groundwater, and the inhalation of volatile emissions associated with indoor groundwater use. The GW_2 shall be multiplied by a dilution factor (DF2) that accounts for the reduction in constituent concentration with groundwater migration from the source to the nearest downgradient property boundary or the nearest downgradient location a water well can be placed (POE). The dilution factor (DF2) shall be obtained from Section G3.3. The GW_2 RS is applicable to groundwater meeting the definition of Groundwater Classification 2 and is expressed in units of mg/l.

GW_3 The GW_3 represents a constituent concentration in groundwater that will not result in the cross-media transfer of a constituent from groundwater to a downgradient surface water body. The **GW_{3DW}** shall be based on the protection of a downgradient surface water that is classified as a drinking water source. The **GW_{3NDW}** shall be based on the protection of a downgradient surface water that is classified as a non-drinking water source. The GW_{3DW} or the GW_{3NDW} shall be multiplied by a dilution factor (DF3) that accounts for the reduction in constituent concentration with groundwater migration from the POC to the nearest downgradient surface water body (POE). The default dilution factor (DF3) shall be obtained from Section G3.3. A GW_3 standard shall not result in a constituent concentration in groundwater that poses unacceptable health risk for other pathways of exposure such as the inhalation of vapors in an enclosed structure do to vapor intrusion from a subsurface source. The GW_3 RS is applicable to groundwater meeting the definition of Groundwater Classification 3 and is expressed in units of mg/l.

$Water_{sol}$ The $Water_{sol}$ represents a chemical-physical limit where saturation of the water occurs. Constituent concentrations in water at or above the water solubility limit indicate a potential for NAPL to be present. The $Water_{sol}$ is expressed in units of mg/l.

The groundwater RECAP standards shall be obtained from Table G-8.

If there are multiple constituents that elicit noncarcinogenic effects on the same target organ or have the same critical effect, then the GW_1 and GW_2 shall be adjusted to account for additive health effects. A GW_1 or GW_2 based on a Safe Drinking Water Act (SDWA) Maximum Contaminant Level (MCL), Treatment Technique (TT), or Taste/Odor (T/O) Advisory Level is not required to be adjusted for additive health effects. GW3 is a transport/cross-media RS and therefore does not require adjustment for additive health effects. Refer to Section 2.5.2 for additional guidance and Appendix D, Table D-5 for the noncarcinogenic health targets.

The **MO-2 Groundwater Limiting RECAP Standard (LRS)** shall be the lower of: 1) GW_1, GW_2 x DF2, or GW_3 x DF3; and 2) $Water_{sol}$. Refer to Section G3.3 for the DF.

G3.3 Appendix G MO-2 Dilution Factors

For $Soil_{GW2}$, $Soil_{GW3}$, GW_2, and GW_3, identify the Appendix G MO-2 dilution factor from the table below based on: (1) the shortest distance (X) between the source/point of compliance (POC) and the nearest downgradient point of exposure (POE); the POE for a GW 2 zone shall be the nearest downgradient property boundary or the nearest downgradient location a water well can be placed; and the POE for a GW 3 zone shall be the nearest downgradient surface water body; and (2) the source width (S_w) and the source length (L). If the distance from the source to the POE is greater than 2000 feet, then: (1) the DF for 2000 feet may be used; or (2) a site-specific dilution factor may be calculated. **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF values presented below are not valid and shall not be used.

Identification of the Source Width (S_w) and Length (L)

The soil source area is defined as the area of impacted soil that is serving or may serve as a source for the transfer of constituents of concern (COC) from one medium to another (e.g., soil that may release volatile emissions to air and/or leach constituents to groundwater) (refer to Section 2.3.1.4). Residual constituent concentrations in an environmental medium may serve as a source of constituent transport and/or transfer to another environmental medium. However, it should be noted that RECAP is applicable to sites that are in a declining condition (i.e., the primary source/original source of the contaminant release has been removed or mitigated and the constituent mass is not increasing). RECAP was not designed, or intended to be used to address sludges or other

non-media sources. The objective of RECAP is to identify residual constituent levels in impacted media that do not pose unacceptable risk to human health or the environment.

For the identification of the Appendix G dilution factors, the soil source area is defined as the contiguous area of impacted soil within the vadose zone having COC concentrations that exceed the limiting standard applicable for the Option being implemented. The source length (L) is defined as the longest length of the soil source area parallel to groundwater flow and source width (S_w) is defined as the longest length of the soil source area perpendicular to groundwater flow (refer to Figure G-1). For LNAPL impacted sites, the soil source area should not include the impacted soil within the zone of groundwater fluctuation or smear zone present at the soil-groundwater interface (refer to Figure G-2).

X = Distance from source (POC) to POE (feet)	**Appendix G~~H~~ MO-2 Longitudinal Dilution Factors (DF) (dimensionless)**			
	S_w & L =			
	30 ft x 30 ft	65 ft x 65 ft	100 ft x 100 ft	148 ft x 148 ft
0 - 50	2.8	1.2	1.0	1.0
51 - 100	9.1	2.5	1.5	1.1
101 - 150	20.0	4.7	2.4	1.5
151 - 250	53.0	12.0	5.5	2.9
251 - 500	212.0	46.0	20.0	9.4
501 – 750	476.0	102.0	44.0	20.0
751 – 1000	846.0	182.0	78.0	36.0
1001 – 1250	1321.0	283.0	121.0	56.0
1251 - 1500	1902.0	408.0	174.0	80.0
1501 - 1750	2588.0	555.0	237.0	108.0
1751 - 2000	3380.0	724.0	310.0	141.0

POC = point of compliance
POE = point of exposure
S_w = source width
L = source length

G3.4 Other Considerations in the Selection of the Limiting RECAP Standard

Refer to Section 2.5.3 of the main document for other factors that require consideration in the identification of the limiting RECAP MO-2 Standards.

G4.0 APPENDIX G MO-2 SOIL AND GROUNDWATER ASSESSMENT

G4.1 Soil

To determine if soil warrants further evaluation under Appendix G, the soil LRS shall be compared to the soil AOIC. If the AOIC exceeds the LRS, then the Submitter may: (1) remediate to the Appendix G MO-2 RS and comply with closure and/or post-closure requirements; or (2) conduct a site-specific MO-2 or MO-3 evaluation. If the AOIC is less than or equal to the LRS, then the COC does not require further evaluation. Refer to Section 2.3.1.3 for guidelines on determining the AOIC.

If SPLP testing is used in lieu of the $Soil_{GW}$ to evaluate the soil to groundwater pathway, then the SPLP testing shall be conducted on the soil sample(s) exhibiting the highest constituent concentration(s). The SPLP results shall be compared to the appropriate leachate standards as follows:

Groundwater Classification 1 Leachate Standard ($Soil_{LS1}$) = GW_1 x 20*

Groundwater Classification 2 Leachate Standard ($Soil_{LS2}$) = GW_2 x 20* x DF2**

Groundwater Classification 3 Leachate Standard ($Soil_{LS3}$) = GW_3 x 20* x DF3***

Note:

~~If the SPLP results are less than or equal to leachate standard, then no further evaluation of the soil to groundwater pathway is warranted. If the leachate test results are greater than leachate standard, then further evaluation of the soil to groundwater pathway is required.~~ * The MO-2 default Summers Dilution Factor ($DF_{Summers}$) is 20.
** Domenico longitudinal dilution factor (DF2) for a GW 2 zone; refer to Section G3.3.
***Domenico longitudinal dilution factor (DF3) for a GW 3 zone; refer to Section G3.3.

If the SPLP results are less than or equal to leachate standard, then no further evaluation of the soil to groundwater pathway is warranted. If the leachate test results are greater than leachate standard, then further evaluation of the soil to groundwater pathway is required.

G4.2 Groundwater

To determine if groundwater warrants further evaluation, the groundwater LRS shall be compared to the groundwater CC. If the groundwater CC exceeds Appendix G MO-2 LRS, then the Submitter may: (1) remediate to the Appendix G MO-2 limiting RS and comply with closure and/or post-closure requirements; or (2) proceed with a site-specific MO-2 or MO-3 evaluation. If the CC is less than or equal to the LRS, then the COC does not require further evaluation. Refer to Section 2.3.2.4 for guidelines on determining the CC.

G5.0 APPENDIX G SUBMITTAL REQUIREMENTS

An Appendix G Management Option 2 Submittal Report shall be submitted to the Department for approval. This report shall, at a minimum, meet the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the Appendix G MO-2 Submittal Report. Refer to Appendix C for the RECAP Forms.

Submittal Requirements
RECAP Form 1 Submittal Summary
RECAP Form 2 Soil Analytical Data Summary
RECAP Form 3 Groundwater Analytical Data Summary
RECAP Form 4 Groundwater Monitoring Well Characteristics
RECAP Form 5 Groundwater Monitoring Well Sampling Event Summary
RECAP Form 6 Screening Option Summary for Soil (if applicable)
RECAP Form 7 Management Option Summary for Soil 0-15 ft bgs
RECAP Form 8 Management Option Summary for Soil > 15 ft bgs
RECAP Form 9 Screening Option Summary for Groundwater (if applicable)
RECAP Form 10 Management Option Summary for Groundwater
RECAP Form 11 Ecological Checklist
RECAP Form 12 NFA-ATT Documentation (if applicable)
RECAP Form 13 Conveyance Notice (if applicable)
RECAP Forms for the lower tiers of assessment completed for each AOI
A topographic map with AOI labeled and name of quadrangle*
A vicinity map with adjoining properties, cross streets, and land use*
A site map with all significant features*
Identification of the horizontal and vertical boundaries of the AOI for each impacted medium and a detailed AOI map with all sampling locations identified*
A description of the site including history, setting, size, geology, hydrology, and hydrogeology
Geotechnical data and soil boring logs
A description of land characteristics (such as surface water bodies) and current and future land use at and in the vicinity of the AOI including identification of receptors
The groundwater classification(s) of the zone(s) under evaluation and information used to arrive at this determination; identification of the POC, POE, and CC
A description of groundwater use at and in the vicinity (one-mile radius) of the AOI including, at a minimum, a LDNR well survey obtained within the last 12 months
Identification of all known underground utilities (≤ 15 feet bgs) within or adjacent to the AOI
Identification of the AOIC and/or CC for each COC (including all calculations and identification of the sampling locations/results used) for each AOI
Inputs, methods, and supporting calculations for submitter-derived SS and/or RS
An environmental fate and transport analysis including identification and justification of models used, a discussion on the appropriateness of the model(s) for site conditions, model outputs, boundary conditions, calibration data and sensitivity analyses, and model limitations and uncertainties
Identification of the areas/media/COC requiring further evaluation or corrective action; if recommending NFA-ATT, the basis of the recommendation
Identification of areas/media where remedial action has been conducted
Identification of landowners, lessees, and/or servitude holders

~~I3.0 IDENTIFICATION AND APPLICATION OF APPENDIX I SOIL AND GROUNDWATER RECAP STANDARDS~~

~~I3.1 Soil Appendix I RECAP Standards~~

~~The Appendix I soil RS include $Soil_i$, $Soil_{ni}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, and $Soil_{sat}$ and are presented in Tables I-1 - I-16. If the release of volatile emissions from soil (< 15 ft bgs) to an enclosed structure is a pathway of concern at the AOI, include the $Soil_{es}$ RS in Table 2 (or calculate a site-specific $Soil_{es}$ under MO-2, refer to Appendix H) in the identification of the limiting soil RS. For detailed guidance on the application of the $Soil_{es}$ RS, refer to Section H1.1.3.4 of Appendix H. The algorithms and assumptions used to calculate the Appendix I RS are presented in Appendix H. The RfD, SF and chemical-specific values used to calculate the RS are presented in Tables I-17 and I-18. The calculations for the Appendix I RS are presented in spreadsheet format at the end of this Appendix.~~

~~Overview:~~

~~1. Identify the $Soil_{ni}$ or $Soil_i$, $Soil_{GW}$ (multiply by a DF2 or DF3 if applicable), and $Soil_{sat}$ in the appropriate Appendix I site categorization table;~~

~~2. If the soil is present at < 15 ft bgs, contains a volatile COC, and an enclosed structure is present over the AOI, identify the $Soil_{es}$ in Table 2;~~

~~3. Identify the lowest of the these values as the limiting soil RS; and~~

~~4. Compare the limiting soil RS to the lower of the maximum detected concentration and the 95%UCL-AM concentration.~~

~~Detailed guidance on the identification and application of the Appendix I RS is presented in the following sections.~~

~~I3.1.1 Identification and Application of the Limiting Appendix I Soil RECAP Standard~~

~~(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 of the main document. Categorize the site in accordance with Figure I-1. Identify the appropriate risk-based RS ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) in the appropriate site categorization table (Tables I-1 - I-16). If more than one constituent is present in soil that elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G.~~

~~(2) Identify the appropriate soil concentration protective of groundwater ($Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) based on the classification of the groundwater to be protected (refer to Section 2.10 of the main document for the Groundwater Classifications). Categorize the site in accordance with Figure I-1. Use the following guidelines to identify the appropriate $Soil_{GW}$ value to be applied at the area of investigation (AOI):~~

~~If the groundwater to be protected meets the criteria for Groundwater Classification 1 ($Soil_{GW1}$):~~

~~Identify the $Soil_{GW1}$ presented in the appropriate site categorization table (Tables I-1 - I-16) or develop a site-specific $Soil_{GW1}$ using the guidelines for development of soil protective of groundwater (Method 2 or Method 3) in Appendix H.~~

~~If the groundwater to be protected meets the criteria for Groundwater Classification 2 ($Soil_{GW2}$):~~

~~(a) Identify the $Soil_{GW2}$ presented in the appropriate site categorization table (Tables I-1 - I-16) (note if the $Soil_{GW2}$ is footnoted with a DF2) or develop a site-specific~~

~~$Soil_{GW2}$ using the guidelines for development of soil protective of groundwater (Method 2 or Method 3) in Appendix H.~~

~~(b) If the $Soil_{GW2}$ value in the appropriate site categorization table (Table I-1 - I-16) is footnoted with DF2 or if a site-specific $Soil_{GW2}$ is developed, identify the longitudinal dilution factor (DF2) to be applied to the $Soil_{GW2}$ from figure I-2 based on: (1) the shortest distance between the point of compliance (POC) and the nearest downgradient property boundary or the nearest downgradient point off-site that could be reasonably considered for the installation of a drinking water well within the aquifer to be protected/restored (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) a DF2 for 2000 feet may be used under MO-2; or (2) a site-specific DF2 may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF2 may be developed under MO-3.~~

~~(c) If the $Soil_{GW2}$ is footnoted with a DF2 or if a site-specific $Soil_{GW2}$ is developed, multiply the $Soil_{GW2}$ value identified in Step (a) by the longitudinal DF2 identified in Step (a). If the $Soil_{GW2}$ is not footnoted with a DF2, then do not multiply by the DF2. If a $Soil_{GW2}$ (after multiplying by the DF2) is less than a $Soil_{GW1}$, then the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ standard. Note: A DF shall not be applied to the $Soil_{GW1}$ prior to application at the AOI.~~

~~If the groundwater to be protected meets the criteria for Groundwater Classification 3 ($Soil_{GW3DW}$ or $Soil_{GW3NDW}$):~~
~~(a) Identify the nearest downgradient surface water body (segment or subsegment) that may receive discharge from the groundwater zone to be protected.~~

~~(b) Determine if the surface water body (segment or sub-segment) is classified as a drinking water source ($Soil_{GW3DW}$) or a non-drinking water source ($SoilGW_{3NDW}$) (LAC 33:IX Chapter 11) and identify the appropriate $Soil_{GW}$ in the appropriate site categorization table (Tables I-1 - I-16) (note if the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ is footnoted with a DF3) or develop a site-specific $Soil_{GW3}$ using the guidelines for development of soil protective of groundwater (Method 2 or Method 3) in Appendix H.~~

~~(c) If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ is footnoted with a DF3 or a site-specific $Soil_{GW3}$ is developed, identify the longitudinal dilution factor (DF3) to be applied to the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ from Figure I-2 based on: (1) the shortest distance between the POC and the nearest downgradient surface water body (POE) identified in Step (a); and (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the POC (source) to the POE is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-2; or (2) a~~

~~site-specific DF3 may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF3 may be developed under MO-3.~~

~~(d) If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ is footnoted with a DF3 or a site-specific $Soil_{GW3}$ is developed, multiply the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ obtained in Step (b) by the longitudinal DF3 identified in Step (c). If the $Soil_{3DW}$ or $Soil_{3NDW}$ is not footnoted with a DF3, do not multiply the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ by a DF3.~~

~~If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ (after applying the DF3) is less than the $Soil_{GW2}$, then the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ standard. Note: A DF2, not a DF3, shall be applied to the $Soil_{GW2}$ prior to application at the AOI. If the $Soil_{GW2}$ (after applying the DF2) is less than the $Soil_{GW1}$, then the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ standard. Note: A DF shall not be applied to the $Soil_{GW1}$ prior to application at the AOI.~~

~~Note: In lieu of applying the $Soil_{GW}$ RS to evaluate the soil to groundwater pathway, a leach test may be conducted (refer to Section I3.1.2 and Appendices B and H).~~

~~(3) If appropriate, identify the $Soil_{sat}$ in the appropriate site categorization table (Tables I-1 – I-16).~~
~~(4) Identify and apply the limiting soil RS as follows:~~
~~Surface soil (ground surface to 15 ft bgs):~~
~~(a) Compare: (1) the $Soil_{ni}$ or $Soil_{i}$ identified in Step 1; (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$ identified in Step 2; and (3) the $Soil_{sat}$ identified in Step 3; select the lowest of the three values as the limiting surface soil RS;~~
~~(b) Determine the AOIC for surface soil in accordance with Section 2.8; and~~
~~(c) Compare the AOIC to the limiting RS:~~
~~If the AOIC is less than or equal to the limiting RS, then typically NFA-ATT is warranted for surface soil.~~
~~If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-2 or MO-3 or remediated to the Appendix I limiting RS.~~
~~Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to 15 ft bgs.~~
~~Subsurface soil (>15 ft bgs):~~
~~(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ identified in Step 2; and (2) the $Soil_{sat}$ identified in Step 3; select the lower of the two values as the limiting RS;~~
~~(b) Determine the AOIC for suburface soil in accordance with Section 2.8; and~~
~~(c) Compare the AOIC to the limiting RS:~~
~~If the AOIC is less than or equal to the limiting RS, then typically, NFA-ATT is warranted for subsurface soil.~~

~~If the AOIC is greater than the limiting RS then the suburface soil shall be further evaluated under MO-2 or MO-3 or remediated to the Appendix I limiting RS.~~

~~I3.1.2 Evaluation of Soil Using a Leach Test and Appendix I RECAP Standards ($Soil_{ni}$ or $Soil_i$ and $Soil_{sat}$)~~

~~Surface Soil (ground surface to 15 ft bgs):~~

~~(1) Compare the leach test results (e.g., SPLP) to the appropriate groundwater standard based on the classification of the groundwater to be protected as follows:~~

~~For the protection of groundwater meeting the definition of Groundwater Classification 1:~~

~~(a) Identify the GW_1 in the appropriate categorization Table (I-1 - I-16);~~

~~(b) Determine the product of GW_1 x 20 (default value for $DF_{Summers}$);~~

~~(c) Compare the leach test results to the product of GW_1 x 20:~~

~~If the leach test results are less than or equal to the product of GW_1 x 20, then the soil AOIC is protective of groundwater. Therefore, this pathway is eliminated from further consideration.~~

~~If the leach test results are greater than the product of GW_1 x 20, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway or corrective action is required.~~

~~For the protection of groundwater meeting the definition of Groundwater Classification 2:~~

~~(a) Identify the GW_2 in the appropriate categorization Table (I-1 - I-16);~~

~~(b) If the GW_2 is footnoted with a DF2, identify the longitudinal dilution factor (DF2) using Figure I-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient property boundary or the nearest downgradient point off-site that could be reasonably considered for the installation of a drinking water well within the aquifer to be protected/restored (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-2; or (2) a site-specific DF2 may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented in Figure I-2 are not valid and shall not be used. The Submitter may develop a site-specific DF2 under MO-3;~~

~~(c) Determine the product of GW_2 x 20 (default value for $DF_{Summers}$) x DF2;~~

~~(d) Compare the leach test results to the product of GW_2 x 20 x DF2:~~

~~If the leach test results are less than or equal to the product of GW_2 x 20 x DF2, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.~~

~~If the leach test results are greater than the product of GW_2 x 20 x DF2, then the AOIC in the soil may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required or corrective action is required.~~

~~For the protection of groundwater meeting the definition of Groundwater Classification 3:~~

~~(a) Identify the GW_{3DW} or GW_{3NDW} in the appropriate categorization Table (I-1 - I-16);~~
~~(b) If the GW_{3DW} or GW_{3NDW} is footnoted with a DF3, identify the longitudinal dilution factor (DF3) using Figure K-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient surface water body (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-2; or (2) a site-specific DF3 may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented in Figure I-2 are not valid and shall not be used. The Submitter may develop a site-specific DF3 under MO-3;~~
~~(c) Determine the product of GW_3 x 20 (default value for $DF_{Summers}$) x DF3;~~

~~(d) Compare the leach results to the product of GW_3 x 20 x DF3:~~

~~If the leach test results are less than or equal to the GW_{3DW} or GW_{3NDW} x 20 x DF3, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.~~

~~If the leach test results are greater than the GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DF3, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required or corrective action is required.~~

~~(2) Identify the $Soil_{sat}$ in the appropriate site categorization table (Tables I-1 – I-16).~~
~~(3) Identify and apply the limiting RS as follows:~~
~~Surface Soil (ground surface to 15 ft bgs):~~
~~(a) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 of the main document. Categorize the site in accordance with Figure I-1. Identify the appropriate risk-based RS ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) in the appropriate site categorization table (Tables I-1 – I-16). If more than one constituent is present in soil that elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G.~~
~~(b) Compare: (1) the $Soil_{ni}$ or $Soil_i$ identified in Step (a); and (2) the $Soil_{sat}$ identified in Step 2; select the lower of the two values as the limiting RS;~~
~~(c) Determine the AOIC for surface soil in accordance with Section 2.8; and~~
~~(d) Compare the AOIC to the limiting RS:~~

If the AOIC is less than or equal to the limiting RS for all COC, then typically, NFA-ATT of the surface soil is warranted for the direct contact exposure pathways or for the protection of resource aesthetics.
If the AOIC is greater than the limiting soil RS, then the surface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-2 Appendix I limiting soil RS.
Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.
Subsurface soil (>15 ft bgs):

(a) Determine the AOIC for subsurface soil in accordance with Section 2.8;
(b) Compare the AOIC to the $Soil_{sat}$ identified in Step 2:
If the AOIC is less than or equal to the $Soil_{sat}$ for all COC, then typically, NFA-ATT of the subsurface soil is warranted for the protection of resource aesthetics.
If the AOIC is greater than the $Soil_{sat}$, then the subsurface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 $Soil_{sat}$.

If there is potential for exposure to constituents present in, or released from, soil via pathways not considered in the development of $Soil_i$, $Soil_{ni}$, or $Soil_{GW}$, then these pathways shall be addressed under a more site-specific MO-2 or MO-3. The inhalation of volatiles due to emissions from soil to an enclosed structure and the inhalation of soil particulates may be evaluated under MO-2. A MO-2 evaluation of these pathways may be conducted in conjunction with the Appendix I evaluation.

If the $Soil_{ni}$, $Soil_i$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, or $Soil_{sat}$ developed under Appendix I was below the analytical quantitation limit, the analytical quantitation limit was presented in the appropriate categorization table (Tables I-1 – I-16) as the RS. An Appendix I Soil RS based on the analytical quantitation limit shall not be multiplied by a DF.

If the limiting soil RS is below a Department-approved (refer to Section 2.13 of the main document) background concentrations, the background concentration shall be identified as the limiting soil RS. An Appendix I Soil RS based on an approved background concentration shall not be multiplied by a DF.

An Appendix I $Soil_{GW}$ shall not result in an unacceptable (> GW_1 or GW_2) constituent concentration in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2.

Application of Appendix I soil RS shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V).

If the Department determines that impacted soil is a source medium only (exposure to impacted soil is not likely based on current or future land use and site-specific conditions), then it shall not be required that the risk-based standard for soil ($Soil_{ni}$ or $Soil_i$) be considered in the identification of the limiting RS.

In applying the MO-2 Appendix I limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in soil shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D for further guidance on addressing petroleum hydrocarbon releases.

The procedures used in the development of the soil Appendix I RECAP standards are illustrated in Figures 11 and 14 of the main document.

I3.2 Groundwater Appendix I RECAP Standards

The groundwater RS include GW_1, GW_2, GW_{3DW}, GW_{3NDW}, GW_{air}, and $Water_{sol}$ and are presented in Tables I-1 – I-16. The GW_{air} RS shall be obtained from Table 3 of the main document. If the release of volatile emissions from groundwater (< 15 ft bgs) to an enclosed structure is a pathway of concern at the AOI, include the GW_{es} RS in Table 3 (or calculate a site-specific GW_{es} under MO-2, refer to Appendix H) in the identification of the limiting soil RS. For detailed guidance on the application of the GW_{es} RS, refer to Section H1.2.3.4 of Appendix H. The algorithms and assumptions used to calculate the RS are presented in Appendix H. The RfD, SF and chemical-specific values used to calculate the RS are presented in Tables I-17 and I-18. The calculations for the Appendix I RS are presented in spreadsheet format at the end of this Appendix.

Overview for GW_1:

1. Identify the GW_1 in the appropriate Appendix I site categorization table;
2. If the GW_1 zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;
3. Select the lower of these values as limiting groundwater RS; and
4. Compare the limiting groundwater RS to the CC.

Overview for GW_2:

1. Identify the GW_2 (if applicable, multiply by DF2) and $Water_{sol}$ in the appropriate Appendix I site categorization table;
2. If the GW_2 zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;
3. If the GW_2 zone is present at < 15 ft bgs and an enclosed structure is over the AOI, identify the GW_{es} in Table 3;
4. Select the lowest of these values as limiting groundwater RS; and
5. Compare the limiting groundwater RS to the CC.

Overview for GW_3:

1. Identify the GW_3 (if applicable, multiply by DF3) and $Water_{sol}$ in the appropriate Appendix I site categorization table;
2. If the GW_3 zone is present at < 15 ft bgs and a COC is volatile, identify the GW_{air} in Table 3;
3. If the GW_3 zone is present at < 15 ft bgs and an enclosed structure is over the AOI, calculate a GW_{es} in Table 3;
4. Select the lowest of these values as limiting groundwater RS; and

~~5. Compare the limiting groundwater RS to the CC.~~

~~Detailed guidance on the identification and application of the Appendix I groundwater RS is presented in the following section.~~

~~Identification of the limiting Appendix I Groundwater RECAP Standard:~~

~~(1) Determine the groundwater classification for the impacted zone using the guidelines presented in Section 2.10 of the main document;~~

~~(2) Categorize the site in accordance with Figure I-1;~~

~~(3) Identify the appropriate risk-based groundwater RS (GW_1, GW_2, GW_{3DW} and/or GW_{3NDW}) as follows:~~

~~If the groundwater to be protected meets the criteria for Groundwater Classification 1:~~

~~(a) Identify the GW_1 in the appropriate categorization table (I-1 – I-16). If more than one noncarcinogenic constituent is present in groundwater that elicits effects on the same target organ/system, modify the GW_1 to account for additivity according to the guidelines presented in Appendix G;~~

~~(b) If the groundwater zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;~~

~~(c) Compare the GW_1 value obtained in Step (a) to: (1) the constituent's water solubility ($Water_{sol}$) (refer to Tables I-1 – I-16); and (2) if applicable, the GW_{air} identified in Step (b); select the lowest of the values as the limiting Appendix I GW_1.~~

~~If the groundwater to be protected meets the criteria for Groundwater Classification 2:~~

~~(a) Identify the GW_2 in the appropriate categorization table (I-1 – I-16). If more than one noncarcinogenic constituent is present in groundwater that elicits effects on the same target organ/system, modify the GW_2 to account for additivity according to the guidelines presented in Appendix G;~~

~~(b) If the GW_2 is footnoted with a DF2, identify the longitudinal dilution factor (DF2) to be applied to the GW_2 using Figure I-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient property boundary or the nearest downgradient point off-site that could be reasonably considered for the installation of a drinking water well within the aquifer to be protected/restored (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-2; or (2) a site-specific DF may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF2 may be developed under MO-3;~~

~~(c) If the GW_2 is footnoted with a DF2, multiply the GW_2 value identified in Step (a) by the DF2 identified in Step (b). If the GW_2 is not footnoted with a DF2, do not multiply by a DF2. If the GW_2 (after applying the DF2) is less than the GW_1, then the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the GW RS. Note: A DF shall not be applied to the GW_1 prior to application at the AOI;~~

~~(d) If the groundwater zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;~~

~~(e) Identify the $Water_{sol}$ (refer to Tables I-1 – I-16); and~~

~~(f) Compare: (1) the GW_2 value obtained in Step (c); (2) the GW_{air} identified in Step (d) (if applicable); and (3) the $Water_{sol}$ identified in Step (e); select the lowest of these values as the limiting Appendix I groundwater RS.~~

~~If the groundwater to be protected meets the criteria for Groundwater Classification 3:~~

~~(a) Identify the nearest downgradient surface water body that may receive discharge from the impacted zone;~~

~~(b) Determine if the surface water body (segment or subsegment) to be protected is classified as a drinking water source or a non-drinking water source (LAC 33:IX Chapter 11) and identify the appropriate human health criterion based on the use classification of the surface water body to be protected (GW_{3NDW} for a surface water body classified as a non-drinking water source or the GW_{3DW} for a surface water body classified as a drinking water source) in Tables I-1 – I-16;~~

~~(c) If the GW_{3DW} or GW_{3NDW} is footnoted with a DF3, identify the longitudinal dilution factor (DF3) to be applied to the GW_{3NDW} or the GW_{3DW} using Figure I-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient surface water body (POE) identified in Step (a); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-2; or (2) a site-specific DF may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF3 may be developed under MO-3.~~

~~(d) If the GW_{3DW} or GW_{3NDW} is footnoted with a DF3, multiply the GW_{3NDW} or GW_{3DW} identified in Step (b) by the DF3 identified in Step (c). If the GW_{3DW} or GW_{3NDW} is not footnoted with a DF3, do not multiply the GW_{3NDW} or GW_{3DW} by a DF3. If the GW_3 (after applying the DF3) is less than the GW_2, then the aquifer shall be managed as a Groundwater 2 aquifer and the GW_2 shall be identified as the GW RS. Note: A DF2, not a DF3, shall be applied to the GW_2 prior to application at the AOI. If the GW_2 (after applying the DF2) is less than the GW_1, then the aquifer shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the GW RS. Note: A DF shall not be applied to the GW_1 prior to application at the AOI;~~

~~(e) If the groundwater zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;~~

~~(f) Identify the $Water_{sol}$ (refer to Tables I-1 – I-16); and~~

~~(g) Compare: (1) the GW_3 value obtained in Step (d); (2) the GW_{air} identified in Step (e) (if applicable); and (3) the $Water_{sol}$ identified in Step (f); select the lowest of these values as the limiting Appendix I groundwater RS.~~

~~(4) The limiting Appendix I groundwater RS shall be compared to the compliance concentration determined for the impacted groundwater zone at the AOI:~~

~~If the compliance concentration in groundwater for the AOI is less than or equal to the limiting groundwater RS, then no corrective action is typically required.~~

~~If the compliance concentration exceeds the limiting groundwater RS, then corrective action shall be instituted or the AOI shall be evaluated further under MO-3.~~

~~If exposure is occurring at a POE for a Groundwater 1 or 2 aquifer:~~

~~(1) The limiting Appendix I groundwater RS shall be compared to the compliance concentration determined for the impacted groundwater zone at the AOI:~~

~~If the compliance concentration in groundwater for the AOI is less than or equal to the limiting groundwater RS, then no corrective action is typically required;~~

~~If the compliance concentration exceeds the limiting groundwater RS, then a corrective action plan shall be submitted under MO-2 or the groundwater AOI shall be evaluated under MO-3; and~~

~~(2) The limiting groundwater RS shall be compared to the concentration at the POE (exposure concentration) (Note: A DF shall not be applied to a GW RS applied at the POE):~~

~~If the concentration at the POE is less than or equal to the limiting groundwater RS, then typically, no further action shall be required.~~

~~If the concentration at the POE exceeds the limiting groundwater RS, then a corrective action plan shall be submitted under MO-2 or the groundwater AOI shall be evaluated under MO-3.~~

~~A limiting Appendix I groundwater RS shall not result in an unacceptable constituent concentration in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2. If there is concern that a limiting Appendix I GW_3 may result in unacceptable constituent concentrations in a deeper Groundwater 1 or 2 Zone, the potential for constituent migration from the Groundwater 3 Zone to a Groundwater 1 or 2 Zone shall be addressed under MO-3. Criteria for this determination shall include constituent mobility, constituent concentration, vertical distance from Groundwater 3 Zone to a Groundwater 1 or 2 Zone, and probability of public/domestic well installation at or in the vicinity of the AOI.~~

~~If there is potential for exposure to constituents present in, or released from, groundwater via pathways not considered in the development of GW_1, GW_2, or GW_3, then these pathways shall be addressed under a more site-specific MO-2 or MO-3.~~

~~If the GW_1, GW_2, or GW_3 developed under Appendix I was below the analytical quantitation limit, the analytical quantitation limit was reported as the RS. An Appendix I GW RS based on the analytical quantitation limit shall not be multiplied by a DF.~~

~~If the limiting Appendix I GW_1, GW_2 (after applying the DF2), or GW_3 (after applying the DF3), is less than the Department-approved (refer to Section 2.13 of the main document) background concentration, then the background concentration shall be identified as the GW_3 RS. An Appendix I GW RS based on an approved background concentration shall not be multiplied by a DF.~~

~~In applying the MO-2 Appendix I limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in groundwater~~

~~shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D for further guidance on addressing petroleum hydrocarbon releases.~~

I4.0 USE OF APPENDIX I RECAP STANDARDS

The Appendix I RS (Tables I-1 – I-16) may be used as action standards or corrective action standards. Prior to applying an Appendix I RS at an AOI, it is important to recognize that:

(1) An Appendix I RS is not appropriate as an action standard or corrective action standard for an AOI where exposure pathways other than ingestion of soil, inhalation of volatile emissions released from soil to the ambient air, dermal contact with soil, ingestion of groundwater, inhalation of volatile emissions released from groundwater to indoor air due to the household groundwater use, and inhalation of volatile emissions from groundwater to the ambient air are possible or where media other than soil and groundwater (and air due to volatile emissions from soil or groundwater) are impacted. Soil or groundwater impacted with a volatile COC located beneath an existing or future enclosed structure (building, residence, etc.) may be addressed under Appendix I using the $Soil_{es}$ and GW_{es} RS presented in Table 3. Examples of pathways and media that may be present at an AOI that are not considered in the development of Appendix I soil and groundwater RS include:

(a) areas of impacted soil with high dust generation such as heavily traveled unpaved roads, uncovered dirt piles, etc. [Appendix I RS have not been developed for exposure due to the inhalation of soil particulates. A MO-2 evaluation of this pathway may be conducted in conjunction with the Appendix I evaluation.]

(b) impacted surface water, sediment, and/or biota [Appendix I RS have not been developed for exposure via surface water, sediment or biota. Impacted surface water, sediment, and biota shall be addressed under MO-3.]

Other pathways not listed above, but determined to be present at an AOI, shall be addressed under MO-3.

An Appendix I RS is not appropriate as an action standard or corrective action standard at an AOI where a receptor may be exposed to both impacted soil and groundwater (e.g., a residential receptor exposed to a COC in soil and drinking water, i.e., groundwater meeting the definition of Groundwater Classification 1 or 2). The methods used in the development of Appendix I RS are based on exposure to a single medium and may not be adequately protective of receptors exposed to both soil and groundwater. Therefore, the MO-2 Appendix I risk-based RS ($Soil_i$, $Soil_{ni}$, GW_1, and GW_2) shall be adjusted to account for additive health effects associated with exposure to two media in accordance with the guidelines presented in Appendix G.

(2) Appendix I RS are based on the protection of human health and environmental resources - they do not address ecological risks. Further site evaluation may be required if the ecological checklist (Appendix C, RECAP Form 18) indicates the AOI may pose a risk to ecological receptors. An ecological checklist shall be included in the Appendix I submittal.

I4.1 Use of Appendix I Soil and Groundwater RECAP Standards to Screen an AOI or to Support a NFA-ATT Decision

The Appendix I RS may be used as an action standard to: (1) screen an AOI (i.e., identify areas, media, constituents, and/or pathways which warrant further

~~evaluation under MO-2 or MO-3); or (2) support a NFA-ATT decision (i.e., document that the soil AOIC and/or groundwater CC are less than or equal to a constituent concentration that is protective of human health and the environment). The Appendix I RS shall be compared to the soil AOIC and groundwater CC as defined in Section 2.8. If the AOIC and CC for all COC present in soil and groundwater are less than or equal to the Appendix I RS, then typically no further action is required. Requests to the Department for a NFA-ATT determination under Appendix I shall demonstrate that: (1) the AOI meets the criteria for management under Appendix I; (2) current site conditions meet the RS set forth under Appendix I without the use of removal, decontamination, or control measures; and (3) the Appendix I RS have been modified to account for additive health effects due to exposure to multiple constituents which elicit the same critical effect or the affect the same target organ/system and/or exposure to more than one impacted medium by the same receptor. If the soil AOIC or groundwater CC for a COC exceeds the Appendix I RS, the Submitter shall: (1) conduct a more site-specific evaluation under MO-2 or MO-3, or (2) use the Appendix I RS to define the extent of corrective action required at the AOI for the protection of human health and the environment. If the soil AOIC or groundwater CC for a COC is less than or equal to the Appendix I limiting RS, then the COC does not require further assessment at this time for that medium (i.e., the COC is screened out under Appendix I). If the AOIC or CC is less than the Appendix I RS for all COC, then that medium does not require further assessment at this time (i.e., the medium is screened out under MO-2).~~

~~I4.2 Application of Appendix I MO-2 RS as Corrective Action Standards~~

~~If a soil AOIC or groundwater CC (as defined in Section 2.8 of the main document) exceeds the Appendix I limiting RS (as identified in accordance with guidelines in Section I3.0), and the Submitter does not wish to conduct a more site-specific evaluation under MO-2 or MO-3, then the AOI shall be remediated to the Appendix I RS (refer to Section 2.18).~~

~~I5.0 APPENDIX I SUBMITTAL REQUIREMENTS~~

~~An Appendix I Submittal Report shall be submitted to the Department for approval for sites evaluated using Appendix I. This report shall, at a minimum, meet the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the MO-2 report:~~

~~(1) RECAP Form 1 Submittal Summary;~~

~~(2) RECAP Form 2 Analytical Data Summary;~~

~~(3) RECAP Form 3 Analytical Data Evaluation;~~

~~(4) RECAP Form 4 Sampling Information Summary;~~

~~(5) RECAP Form 5 Groundwater Monitoring Well Characteristics (if applicable);~~

~~(6) RECAP Form 6 Groundwater Monitoring Well Sampling Event Summary (if applicable);~~

~~(7) RECAP Form 7 Site-Specific Environmental Fate and Transport Data Summary;~~

~~(8) RECAP Form 8 Chemical-Specific Data Summary (if applicable);~~

~~(9) RECAP Form 13 Management Option 2 Summary for Soil 0-15 ft bgs (if applicable);~~

~~(10) RECAP Form 14 Management Option 2 Summary for Soil > 15 ft bgs (if applicable);~~

~~(11) RECAP Form 17 Management Option 2 Summary for Groundwater (if applicable);~~

~~(12) RECAP Form 18 Ecological Checklist;~~

~~(13) A summary of the results of the SO evaluation and/or the results of the MO-1 evaluation (if applicable);~~

~~(14) Site ranking and justification for the ranking;~~

~~(15) Topographic map with AOI labeled and name of quadrangle*;~~

~~(16) Vicinity map with adjoining properties, cross streets and land use*;~~

~~(17) Site map with all significant features*;~~

~~(18) Identification of the AOI for each impacted medium and a detailed site map with all sampling locations*;~~

~~(19) A description of the site including site history, setting, size, geology, and hydrogeology;~~

~~(20) A description of land use at and in the vicinity of the AOI;~~

~~(21) A description of groundwater use at and in the vicinity (1-mile radius) of the AOI including a DOTD well survey obtained within the last 12 months;~~

~~(22) The groundwater classifications of the zones under evaluation and information used to arrive at this determination; identification of the POC and the POE;~~

~~(23) Identification of all known underground utilities (≤ 15 feet bgs) within or adjacent to the AOI;~~

~~(24) Documentation that the soil and/or groundwater meets the criteria for management under MO-2 Appendix I;~~

~~(25) Identification of the AOIC for each COC in soil (including all calculations and identification of the sampling locations used in the calculations);~~

~~(26) Documentation of the methods used to identify the limiting MO-2 Appendix I RS; identification of the critical effects/target organs for each noncarcinogenic COC and~~

~~demonstration of the modifications of RS to account for additive effects (including calculations);~~

~~(27) A conceptual site model (refer to Section 2.7);~~

~~(28) Identification of areas/media where action has been taken (if applicable);~~

~~(29) Identification of the AOI and COC for further assessment or for remediation under MO-2 (if applicable); and~~

~~(30) Notification of landowners, lessees, and servitude holders (if applicable, refer to Section 2.20).~~

*Note: All maps must have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams, and cross sections submitted must be legible and unless otherwise approved by the Department, not larger than 11 inches by 17 inches and must be folded to a standard report format (8.5 inches by 11 inches).