Georgia Department of Natural Resources

ENVIRONMENTAL PROTECTION DIVISION

RESPONSE AND REMEDIATION PROGRAM

GUIDANCE MANUAL FOR THE REPORTABLE QUANTITIES SCREENING METHOD

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INTRODUCTION

This document provides guidelines for scoring sites using the Reportable Quantities Screening Method (RSQM). The RSQM is based on the Resource Conservation and Recovery Act (RCRA) National Corrective Action Prioritization System (NCAPS). NCAPS was originally developed and is being used to prioritize corrective action at all hazardous waste treatment, storage, and disposal facilities (TSDFs) in the nation regulated under RCRA. NCAPS takes into consideration many of the same factors as the Hazardous Ranking System (HRS) which is used by the United States Environmental Protection Agency (USEPA) to determine which sites are placed on the National Priorities List (NPL). RQSM is a modification of NCAPS to adapt it to the particular needs of the Hazardous Site Response Act (HSRA) and Rules of the State of Georgia.

BACKGROUND

RQSM considers the following in determining whether a release exceeding a reportable quantity has occurred:

- **Type, quantity and toxicity of substance released;**
- **Whether or not a site is abandoned or uncontrolled;**
- **Characteristics of the routes of exposure;**
- **Likelihood of human or environmental exposure.**

Upon discovery that a release has occurred and is subject to notification requirements, the property owner is required to notify the Georgia Environmental Protection Division (EPD). EPD then evaluates information received about the release. Using RQSM, EPD determines if there has been a release exceeding a reportable quantity by determining if a RQSM threshold score has been exceeded. If the threshold is exceeded, EPD notifies the property owner that the release is deemed reportable and the site will be listed on the Hazardous Site Inventory (HSI). The Director will also have the ability to list sites that otherwise pose a danger to human health and the environment.

RQSM evaluates two migration pathways. The ground water pathway principally addresses impacts on ground water resources and the likelihood that a release will result in exposure to an actual receptor. The on-site exposure pathway addresses the possibility that people or sensitive environments will have direct physical contact with regulated substances or with soil contaminated by releases of regulated substances.

RQSM is not intended to provide a quantitative risk assessment for sites where there have been releases of regulated substances, nor is it intended to be used to rank or prioritize sites where releases have occurred for the purpose of determining which sites pose the greatest risks. It is designed to be used solely for identifying those sites where a release has occurred that may pose a threat to human health and the environment.

GROUND WATER PATHWAY

The ground water pathway addresses the likelihood that regulated substances at a site will migrate through the ground, contaminate ground water, and result in exposure.

A. Has there been a release?

The scorer should examine all available information to evaluate whether or not there has been a release to ground water and, if not, whether discarded waste or contaminated soil has the potential to cause a release to ground water in the foreseeable future. Here, a "release" is defined as a release of a regulated substance to ground water in excess of the concentrations listed in Appendix III: Table 1 Groundwater Criteria of Chapter 391-3-19 or for a regulated substance not listed in Table 1, a release in excess of the background concentration. Background is defined as the level unaffected by current or past treatment, storage, or disposal of a regulated substance. A known release is defined as a release for which adequate analytical data are available which indicate that background levels have been exceeded, or for which other direct evidence is available. If a release is not known, there may still be strong circumstantial evidence that a release to ground water has already occurred. Such releases are here treated as suspected releases to ground water. The category of suspected releases is intended to compensate for inadequacies in analytical data (e.g. ground water flow direction undefined, no background wells, no wells at all, poor sampling or analytical techniques, etc.) and allows the scorer to interpret site characteristics and apply professional judgment. If ground water quality data do not suggest contamination above background, but either (1) the overlying soil is contaminated in excess of the notification levels in Appendix I of Chapter 391-3-19 or (2) a release covered under Rule 391-3-19-.04(3)(d) has occurred of a regulated substance which has the potential to migrate to, and be detected in ground water, then the site should be evaluated as a potential future release to ground water. If a release to ground water is neither known nor suspected and other conditions that require notification under Rule 391-3-19-.04(3) do not exist, RQSM is not applicable to the situation. Examples of the appropriate selection among "known," "suspected," and "potential future" are presented below:

- **A regulated substance is detected in on-site monitoring wells at concentrations that are above background. The scorer would evaluate this as a known release to ground water (45 points).**

- **During an earthmoving operation, buried drums are discovered which have rusted through and released their liquid contents to the surrounding soil. Soil samples indicate heavy contamination by toxic regulated substances. The water table is expected to be less than 3 feet below the bottom of the buried drums and no barriers to migration exist. No monitoring wells have been installed, and private drinking water wells are more than ½ mile away and have not been sampled. Given this scenario, the scorer would evaluate the drum site as a suspected release to ground water (10 points).**

- **Soil contamination above a notification concentration is discovered. No information is available that would lead the scorer to suspect that a release to ground water has already occurred. Given the lack of information, the scorer would evaluate the site based on a potential future release to ground water (5 points).**

● A water sample from a private drinking water well exhibits concentrations of naturally–occurring substances in excess of what is considered normal by the analytical laboratory. Water quality data from other wells are not available. There is no knowledge that these particular substances have ever been used or disposed of in the general vicinity. If the owner determines, by calling EPD for example, that the concentrations do not indicate that a release has occurred, the site is not subject to notification requirements. If the owner notifies, yet EPD determines that the elevated concentrations have natural causes and thus are not in excess of background, a release has not occurred and RQSM is not applicable.

If a release to ground water is known, the "route characteristics" and "containment" factors are not evaluated. In all other cases, the scorer must evaluate "route characteristics" and "containment."

B. Route Characteristics

1b. Susceptibility Rating

The pollution susceptibility rating of a site is tentatively obtained from Georgia Geologic Survey Hydrologic Atlas 20. For the production of Hydrologic Atlas 20, all land areas of Georgia were given a numerical rating of their pollution susceptibility. The rating was derived by following the DRASTIC method developed by the United States Environmental Protection Agency (USEPA). The basic parameters of the rating system include soil type, topography, nature of the material above the water table (vadose zone), depth to ground water, expected rate of ground water recharge, aquifer media, and aquifer hydraulic conductivity. These seven parameters are deemed the most influential to pollution susceptibility. Some factors have greater significance (weight) than others in the rating of an area, and those areas having the more significant factors tend to get higher pollution susceptibility ratings. Numerical ratings within the ranges given in Hydrologic Atlas 20 result in an area being classified as having a "higher" (6), "average" (3), or "lower" (0) pollution susceptibility.

If a site scores either above or below the pathway threshold due only to Atlas 20's indication of a susceptibility rating for the site, the susceptibility rating should be reexamined using the DRASTIC manual and all available site information. A DRASTIC score of 141 separates "lower" from "average" and a score of 181 separates "average" from "higher". These breaking points are the same as those used in Atlas 20.

2b. Physical State

The physical state of the released regulated substance is the physical state at the time of the initial release to the environment, e.g. the liquid that entered the soil, not the solid that is the soil. If the initial physical state is not known, it may be inferred from standard reference sources such as the Condensed Chemical Dictionary.

C. Containment

"Containment" is a measure of the physical barriers in place that inhibit a regulated substance from entering or migrating within the environment. These barriers include dikes, liners, covers, and diversion systems. This category is rated on a scale ranging from poor (3) to very good (0). The scale used in this model is intended to allow the scorer to interpret descriptions contained in site reports and other file information. Ideally, the interpretation should be as follows:

Surface Impoundment	**Value**
Essentially nonpermeable liner (natural or artificial) which is compatible with the waste, and adequate leachate collection system	**0**
Essentially nonpermeable compatible liner with no leachate collection system	**1**
Moderately permeable compatible liner	**2**
No, or incompatible, liner	**3**
Container/Tank	
Sealed container/tank and sound secondary containment	**0**
Sealed container/tank and unsound secondary containment; or leaky container/tank and sound containment	**1**
Sealed container/tank and no secondary containment; or leaky container/tank and unsound secondary containment	**2**
Leaky containment/tank and no secondary containment	**3**
Pile	
Piles uncovered but waste stabilized; or piles with unstabilized wastes, but having either (1) water repellent cover or (2) essentially nonpermeable liner and leachate collection system	**0**
Piles uncovered, waste unstabilized, moderately permeable liner, and leachate collection system	**1**
Piles uncovered, waste unstabilized, moderately permeable liner, and no leachate collection system	**2**
Piles uncovered, waste unstabilized, and no liner	**3**
Landfill	
Essentially nonpermeable liner, liner compatible with waste, and adequate leachate collection system	**0**

Essentially nonpermeable compatible liner, no leachate collection …… 1
system but landfill cover minimizes infiltration

Moderately-permeable compatible liner but landfill cover minimizes infiltration 2

No liner or incompatible liner, moderately-permeable compatible ……. 3
liner but landfill surface does not induce runoff or prevent infiltration

Additional guidance for scoring containment for the ground water pathway is as follows:

- **Do not consider natural barriers (such as an underlying clay layer) when evaluating containment.**

- **For an underground storage tank where no information is available about tank integrity, assume that containment is good, and assign a score of 1. A double-walled underground storage tank (UST) is considered to have very good containment.**

- **Assume fair containment (a score of 2) for a container/tank storage area when no information is available.**

- **When scoring a site where a removal of a source or many sources has occurred, the score should only reflect the conditions that remain at the site after the removal. However, if post removal data is not available, the site shall be scored according to the most recent data available to EPD.**

- **For sites where there has been a surface or subsurface release to soil but the release did not occur within any type of discernable unit (e.g., a spill to the land surface), containment should be considered the same as for a landfill.**

D. Release Characteristics

The scorer should select the regulated substance that, when evaluated in conjunction with all others factors, will yield the largest overall release characteristics value. The selections made under items A, 2b, 2d, 3d, and 1e must all refer to the same regulated substance.

1d. Regulated Substance

Names for regulated substances are found in Appendix I of Chapter 391-3-19.

2d. Toxicity Values

The toxicity values are found in Table 1. These values are based on those toxicity factor values that were developed in accordance with 40 CFR 300 Appendix A, Section 2.4.1.1 (Hazard Ranking System). Cancer and non-cancer toxicity values were obtained from the latest version of U.S. EPA's Regional Screening Level (RSL) table and thus adhere to EPA's toxicity hierarchy provided in OSWER Directive 9285.7-53 (EPA, 2003). Since EPA conducts biannual updates to reflect current toxicological information, any regulated substance impacted by the updates will be revised within a year following the release of the updated toxicity value(s).

Toxicity values were combined with the appropriate weight of evidence (WOE) for carcinogenicity classification to obtain the factors provided in Table 1. The WOE cancer classifications were obtained from U.S. EPA's Integrated Risk Information System (IRIS) and when not available extracted from the World Health Organization's International Agency for Research on Cancer database (IARC Monographs; last updated April 7, 2015). In cases where the WOE classification is not provided in either source, the regulated substance shall be arbitrarily assigned a WOE classification of "D" for "inadequate information to assess carcinogenic potential" based on the 2005 EPA Cancer Guidelines (EPA/630/P-03/001F). It should be noted that the majority of substances impacted by this tend not to have any published cancer toxicity data in the sources reviewed. Therefore, this is expected to have limited to no impact on the weighted toxicity factor since it would be based on non-carcinogenicity.

Previously, Table 1 converted the base 10 values found in SCDM (1, 10, 100, 1000, 10000) to the base 2 values found in Table 1 (1, 2, 4, 8, 16). This was conducted in an effort to preserve the exponential relationship of the values in SCDM. This same approach shall be applied to the RSL toxicity data combined with WOE for carcinogens methodology. If none of the regulated substances involved in a release have toxicity values in Table 1, then a default value of 4 shall be assigned. However, if the released substance is one that becomes indistinguishable from natural constituents when released to ground water or soil and a MCL or notifiable soil concentration does not exist for any such natural constituent, the released substance shall be given a toxicity value of zero. If the substance remains in a distinguishable form (e.g., solid sodium hydroxide) it should be assigned the appropriate toxicity value from Table 1. Certain chemical groups or substances such as lead and asbestos (and its compounds) shall be assigned a toxicity factor of 16 based on sufficient toxicological evidence to support the high relative toxicity associated with exposure despite the lack of published toxicity data in the sources referenced above. In instances where more than one WOE classification exist for an individual substance based on route of exposure (e.g., hexavalent chromium – oral and inhalation), the more conservative WOE shall be used when establishing the weighted factor for carcinogenicity. For dioxins, toxicity data is available in the RSL Table for hexachlorodibenzo-p-dioxin (HxCDD) mixture and 2,3,7,8-TCDD only. Therefore, the weighted toxicity factor for all HxCDD congeners shall be based on the toxicity values available for HCDD mixture. All other dioxins and dioxin-like compounds shall be assigned a default value of 16 based on known carcinogenic potential.

3d. Quantity

Site reports typically do not specify the quality of regulated substance(s) contained in buried waste, contaminated soil, or contaminated ground water. Many times, the quantity cannot accurately be determined. When a release to ground water is discovered by monitoring a drinking water well, the source is often not apparent. The scorer should use professional judgment to determine the quantity of a contaminant source (and, if necessary, to tentatively identify the source). The scorer's objective is to select a quantity value (3d) that best represents what is known about the quantity. The scorer should recognize however that the ultimate quantity parameter is the actual mass of the regulated substance and that the other parameters are simply alternate means of estimating that mass. If a source has not been identified, the scorer's assumption should be that the source is significant and the quantity value should be 4. Similarly, if the source has been identified, e.g., buried waste in a landfill, but the magnitude of the source is unknown (or not amenable to quantification), the quantity value should be a minimum of 4. If a source is known to involve quantities less than the threshold quantities in Table 2, the pathway score equals zero.

The column labeled "cubic yard" refers to the volume of waste as released to the land or the volume of soil or ground water contaminated by that release, whichever can be more accurately quantified or estimated. The column labeled "acres" is applicable when the extent of surface contamination is known from visual signs, sampling, etc., and additional information about quantity is lacking. The column labeled "gallons" is not meant to be applied to dilute wastewaters or other solutions, but to concentrated liquids that are typically packaged on the basis of volume (commercial chemicals in drums or tanks) or that are more readily measured by volume (pumped sludges). The values in the column labeled "pounds" apply to the regulated substance, not the bulk waste or contaminated media.

Table 2
Regulated Substance Quantities

Find category below that best describes quantity of source *:				Then 3d equals the following:
YARD^3	ACRES	GALLONS	POUNDS	
10	0.003	50	1	1
50	0.05	250	5	2
250	0.25	500	25	3
500	0.5	1000	50	4
1000	1	2500	100	5
2500	5	5000	500	6
5000	25	10000	1000	7
10000	100	15000	5000	8

***The values in the first four columns indicate the lower end of a range. If source is unknown or unquantifiable, set 3d =4.**

E. Targets

1e. Exposure

Targets are defined as the populations that can be exposed to releases from the site. "Exposure" here means use of contaminated water as a drinking water supply for humans. No quantification of the size of the population is considered in RQSM. Exposure to a single person is sufficient to assign a value.

"MCLs" here means any primary maximum contaminant levels as promulgated in the Georgia Rules for Safe Drinking Water (Chapter 391-3-5). MCLs do not include secondary maximum contaminant levels, but do, for the purposes of RQSM, include action levels for lead and copper. All MCLs for substances regulated under HSRA are given in Table 1. When a substance of concern in ground water has no MCL established, the descriptor " no MCL" applies.

Groundwater concentrations could exceed MCLs near the source of contamination and be much lower at the nearest drinking water well. If a well that is intended as a drinking water well has been sampled, and been found to be contaminated by a released substance, a "known exposure" applies. If information concerning a contaminant plume indicates that drinking water wells that have not been sampled are likely to already be within that plume, then human exposure is "suspected." Where drinking water wells lie outside a known or suspected contaminant plume, the distance-to-well factor (see below) becomes operative.

Where a drinking water well has been taken out of service due to a release of a regulated substance, and an alternate supply of drinking water has been provided, the scorer should nonetheless consider the well to be intended as a drinking water well ("known exposure").

Where there is a known release to ground water and the highest concentrations in the plume are less than MCLs, the exposure level will be determined according to documented, observed, or inferred site characteristics. If a source remains that may raise ground water concentrations with time, the exposure level should be scored as "potential future." The exposure level should be scored as "known release less than MCL" if there is reason to believe that a source no longer exists for continuing releases to ground water, or that the remaining source will not generate higher concentrations than presently encountered.

2e. Distance to well or spring

The distance to well or spring is measured as the shortest distance, along the presumed flowpath, from a known location of the regulated substance to a well or spring that is used as a drinking water supply. A monitoring well at the edge of a detectable plume of contamination is one such "known location". The rating factor decreases with increasing distance to simulate dilution and attenuation of the substance as it migrates. If the ground water flow direction is known, as determined by ground water investigations conducted at the site, upgradient wells or springs should not be considered receptors. However, for those sites where the flowpath is uncertain, or where the regulated substance is is suspected to be present as a dense non-aqueous phase liquid (DNAPL), distance will be measured as the shortest distance to a well or spring. Typically, if the concentration of a DNAPL-forming regulated substances approaches 1% of the solubility concentration in groundwater, DNAPL is suspected. If the distance to the nearest well is unknown, use the distance between the regulated substance and the nearest residential area that is not supplied drinking water by a public system.

ON- SITE EXPOSURE

The on-site exposure pathway addresses the possibility that people or sensitive environments will have direct physical contact with a regulated substance. This pathway looks at resident individuals that may have direct access to a site, and sensitive environments that are within the area affected by the release.

A. <u>Access to Site</u>

The site accessibility factor quantifies the ease with which unauthorized people may enter a site. Access to a site is defined as follows:

Access to Site		**Value**
Inaccessible:	**A 24-hour surveillance system or barrier (fence, etc.) is in place which provides a means to control entry**	**0**
Limited access:	**Less than 24-hour surveillance system and no complete (all around perimeter) barrier, or a fence that is partially open**	**2**
Unlimited access:	**There is no barrier and no security guard**	**4**

Limited access should be scored for a large military base or other institutions with an on-site resident population, even though access to the base or institution is restricted. Limited access should not be used for partial fencing unless the fencing significantly impedes access to the property.

B. Release Determination

For purposes of the on-site exposure pathway under RQSM, a release has occurred if either of the following conditions exist:

1. Analysis of a representative soil sample taken from the zone of highest apparent concentration indicates that the concentration of a regulated substance exceeds the concentration found in Appendix I of Chapter 391-3-19.

2. Abandoned or discarded drums, containers and other closed receptacles, tanks, transportation vessels, or process units containing known regulated substances are present. Sampling information verifying the concentration of the regulated substance is not necessary, but sampling information may be needed where the identity of the substance is unknown.

EPD may determine that a release is suspected if there is strong visual evidence such as stained soil, visible substances, or stressed vegetation, combined with sufficient other evidence, such as knowledge of the chemicals handled at the site or facility. A determination that a release is suspected can also be based on strong historical evidence in the absence of current visual or sampling evidence.

The likelihood of exposure is assumed to be directly related to the depth below land surface that the release is found. Substances nearest the surface are assumed to pose the greatest threat of exposure through direct contact, ingestion and inhalation. When a removal has been performed at a site, the site score should be based on the regulated substances that still remain after removal; substances that have been removed should not be evaluated.

C. Containment

Containment is a measure of the physical barriers in place that prevent individuals from becoming exposed to regulated substances through direct contact, inhalation, or ingestion. Containment is evaluated separately for soil releases and aboveground releases.

Soil Releases. Determining containment for soil releases involves evaluation of the type of material covering a soil release and evaluation of the shallowest depth the release is known or suspected to reside. First select a cover value from the descriptions below, then select a containment value from Table 3 that corresponds to the depth to the release. The thickness of the cover itself is included in selecting the appropriate depth to release. Containment for releases such as landfills, surface impoundments, underground storage tanks, and buried drums, should be evaluated as soil releases due to their high probability of having caused a soil release. [Substances in containers, e.g. gas cylinders, drums, tanks, etc., should be evaluated as aboveground releases if the containers are actually exposed at the land surface.] The cover value for soil releases is selected from the following:

Value

Covered by a permanent or otherwise maintained, essentially……..… 0
impenetrable non-earthen material such as concrete or asphalt

Covered by an engineered and maintained earthen material …..……..…… 1
or compacted fill or a high density synthetic material

Covered by loose earthen fill or native soil ……..…… 2

No cover ……..……. 3

Note: If a release has no cover, is subject to surface erosion by wind or water, and can thus be transported beyond the barrier that would otherwise render the site inaccessible, the site shall be considered to have unlimited accessibility.

Table 3
Containment Values for Soil Releases

Cover Value	Depth To Release		
	Greater than 24"	6-24"	0-6"
0	0	1	2
1	1	2	3
2	2	3	4
3	3	4	5

Aboveground Releases. **Aboveground releases are not evaluated for cover. The containment value for aboveground releases is selected directly from the following:**

Value

Closed container/tank/process unit with sound secondary containment ……..…… 0

Closed container/tank/process unit with unsound secondary containment …… 1

Open container/tank/process unit with secondary containment …….. 2

Open container/tank/process unit with no secondary containment …..…… 3

Valves allowing gravity drainage not locked out; pumps ...……. 3
or other motors not disabled

Uncontainerized regulated substance; wastepile ……..……. 3

D. Release Characteristics

1d. Regulated Substance

Names for regulated substances are found in Appendix I of Chapter 391-3-19.

2d. Toxicity Values.

The toxicity values are found in Table 1 (see discussion under ground water pathway).

3d. Quantity.

The quantity values are found in Table 2 (see discussion under ground water pathway).

E. Targets

1e. Resident Individuals

The distance to the nearest resident represents the likelihood of ingress to the humans as well as the likelihood of human exposure via air transport of particulates or vapors. Distance to the nearest resident individual is measured from the outer edge of the area affected by the release to the nearest residence, day care facility, school, playground or other location frequented by sensitive individuals. Note that it is the employer's responsibility to minimize workplace exposures and to alert employees to those exposures.

2e. Sensitive Environments

Sensitive environments must be documented rather than presumed, must lie within the area of a regulated substance, and must be likely to be affected by the release. A sensitive environment does not have to lie within the property boundaries of the property on which the source of the release originated. Sensitive environments consist of the following:

- **Sensitive natural areas as defined by Georgia's Rule for Environmental Planning Criteria, Section 391-3-16-.04(2)(o);**
- **Wetlands as defined by protocols described in the Corps of Engineers Wetlands Delineation Manual (1987 Manual);**
- **Coastal Marshlands as defined by the Coastal Marshlands Protection Act;**
- **Sensitive environmental areas such as national or state parks, historic sites and wildlife preserves.**

Table 1. Currently Available Toxicity Values and Current MCLs

CAS No.	Chemical Name	ToxVal	MCLs (mg/L)
83329	ACENAPHTHENE	2	
75070	ACETALDEHYDE	8	
67641	ACETONE	1	
75058	ACETONITRILE	4	
98862	ACETOPHENONE	2	
591082	ACETYL-2-THIOUREA, 1-	4	
107028	ACROLEIN	16	
79061	ACRYLAMIDE	8	
79107	ACRYLIC ACID	16	
107131	ACRYLONITRILE	8	
124049	ADIPIC ACID	1	
116063	ALDICARB	8	
309002	ALDRIN	16	
107186	ALLYL ALCOHOL	16	
20859738	ALUMINUM PHOSPHIDE	16	
7664417	AMMONIA	4	
7773060	AMMONIUM SULFAMATE	2	
62533	ANILINE	16	
120127	ANTHRACENE	2	
7440360	ANTIMONY	16	0.006
7440382	ARSENIC	16	0.010
1332214	ASBESTOS (million fibers/L > 10um length)	16	7.000
2642719	AZINPHOS-ETHYL	4	
86500	AZINPHOS-METHYL	8	
151564	AZIRIDINE	16	
7440393	BARIUM	16	2.000
542621	BARIUM CYANIDE	4	
71432	BENZENE	8	0.005
98884	BENZENE CARBONYL CHLORIDE	4	
92875	BENZIDINE	16	
56553	BENZO (A) ANTHRACENE	8	
50328	BENZO (A) PYRENE	16	2E-4
205992	BENZO (B) FLUORANTHENE	8	
65850	BENZOIC ACID	1	
100470	BENZONITRILE	4	
100447	BENZYL CHLORIDE	16	
7440417	BERYLLIUM	16	0.004
92524	BIPHENYL, 1,1-	16	
111911	BIS(2-CHLOROETHOXY) METHANE	8	
111444	BIS(2-CHLOROETHYL) ETHER	8	
117817	BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	4	0.006
542881	BIS(CHLOROMETHYL) ETHER	16	
75274	BROMODICHLOROMETHANE	4	0.100
106990	BUTADIENE, 1,3-	16	
71363	BUTANOL (N-BUTANOL)	2	
85687	BUTYLBENZYL PHTHALATE	2	
7440439	CADMIUM	16	0.005
133062	CAPTAN	2	
63252	CARBARYL	2	
1563662	CARBOFURAN	4	0.040
75150	CARBON DISULFIDE	2	
56235	CARBON TETRACHLORIDE	8	0.005
786196	CARBOPHENOTHION	4	
57749	CHLORDANE	16	0.002
506774	CHLORINE CYANIDE	2	
59507	CHLORO-3-METHYLPHENOL, 4-	2	
106478	CHLOROANILINE, P-	8	
108907	CHLOROBENZENE	4	0.100
67663	CHLOROFORM	4	0.080
107302	CHLOROMETHYL METHYL ETHER	16	
106898	CHLOROMETHYLOXIRANE, 2- (EPICHLOROHYDRIN)	16	
91587	CHLORONAPTHALENE, 2-	2	
95578	CHLOROPHENOL, 2-	4	
2921882	CHLORPYRIFOS	8	
7440473	CHROMIUM	4	
16065831	CHROMIUM (III)	1	
18540299	CHROMIUM (VI)	16	
7440484	COBALT	16	
7440508	COPPER	4	1.300
544923	COPPER CYANIDE	4	
56724	COUMAPHOS	4	
8001589	CREOSOTE	4	
108394	CRESOL, M- (METHYLPHENOL, 3-)	2	
106445	CRESOL, P- (METHYLPHENOL, 4-)	2	

CAS No.	Chemical Name	ToxVal	MCLs (mg/L)
98828	CUMENE (ISOPROPYLBENZENE)	2	
57125	CYANIDES	16	0.200
460195	CYANOGEN	8	
506683	CYANOGEN BROMIDE	2	
110827	CYCLOHEXANE	1	
108941	CYCLOHEXANONE	2	
75990	DALAPON	4	0.200
72548	DDD	4	
72559	DDE	4	
50293	DDT	8	
84742	DI-N-BUTYL PHTHALATE	2	
117840	DI-N-OCTYL PHTHALATE	4	
333415	DIAZINON	8	
53703	DIBENZ(A,H)ANTHRACENE	16	
96128	DIBROMO-3-CHLOROPROPANE, 1,2- (DBCP)	16	2E-4
124481	DIBROMOCHLOROMETHANE	4	0.100
106934	DIBROMOMETHANE, 1,2- (ETHYLENE DIBROMIDE)	8	5E-5
1918009	DICAMBA	4	
95501	DICHLOROBENZENE, 1,2-	2	0.600
106467	DICHLOROBENZENE, 1,4-	2	0.075
91941	DICHLOROBENZIDINE, 3,3'-	8	
75718	DICHLORODIFLUOROMETHANE	4	
75343	DICHLOROETHANE, 1,1-	2	
107062	DICHLOROETHANE, 1,2-	8	0.005
75354	DICHLOROETHENE, 1,1-	2	0.007
156592	DICHLOROETHYLENE, CIS-1,2-	8	0.070
156605	DICHLOROETHYLENE, TRANS-1,2-	4	0.100
120832	DICHLOROPHENOL, 2,4-	8	
94757	DICHLOROPHENOXYACETIC ACID, 2,4- (2,4-D)	4	0.070
78875	DICHLOROPROPANE, 1,2-	8	0.005
542756	DICHLOROPROPENE, 1,3-	4	
62737	DICHLORVOS	16	
115322	DICOFOL	4	
60571	DIELDRIN	16	
84662	DIETHYL PHTHALATE	1	
60515	DIMETHOATE	16	
119904	DIMETHOXYBENZIDINE, 3,3-	4	
105679	DIMETHYL PHENOL, 2,4-	4	
131113	DIMETHYL PHTHALATE	4	
77781	DIMETHYL SULFATE	4	
99650	DINITROBENZENE, 1,3-	16	
51285	DINITROPHENOL, 2,4-	8	
121142	DINITROTOLUENE, 2,4-	8	
606202	DINITROTOLUENE, 2,6-	16	
88857	DINOSEB	8	0.007
123911	DIOXANE, 1,4-	4	
78342	DIOXATHION	4	
122667	DIPHENYLHYDRAZINE, 1,2-	8	
85007	DIQUAT	8	0.020
298044	DISULFOTON	16	
330541	DIURON	8	
115297	ENDOSULFAN (I & II)	4	
1031078	ENDOSULFAN SULFATE	4	
145733	ENDOTHALL	4	0.100
72208	ENDRIN	16	0.002
1116547	ETHANOL, 2,2-(NITROSOIMINO)BIS-	8	
563122	ETHION	8	
141786	ETHYL ACETATE	4	
100414	ETHYL BENZENE	2	0.700
75003	ETHYL CHLORIDE	1	
60297	ETHYL ETHER	2	
110805	ETHYLENE GLYCOL MONOETHYL ETHER	2	
7720787	FERROUS SULFATE	4	
206440	FLUORANTHENE	4	
86737	FLUORENE	4	
7782414	FLUORINE (-IDE)	8	4.000
50000	FORMALDEHYDE	8	
64186	FORMIC ACID	16	
110009	FURAN	8	
98011	FURFURAL	8	
765344	GLYCIGLYALDEHYDE	16	
76448	HEPTACHLOR	8	4E-4
1024573	HEPTACHLOR EPOXIDE	16	2E-4
35822469	HEPTACHLORINATED DIBENZO-P-DIOXIN, 1,2,3,4,6,7,8	16	
39227286	HEXACHLORINATED DIBENZO-P-DIOXIN, 1,2,3,4,7,8	16	
57653857	HEXACHLORINATED DIBENZO-P-DIOXIN, 1,2,3,6,7,8	16	
19408743	HEXACHLORINATED DIBENZO-P-DIOXIN, 1,2,3,7,8,9	16	
60851345	HEXACHLORINATED DIBENZOFURAN, 2,3,4,6,7,8	16	
118741	HEXACHLOROBENZENE	8	0.001

CAS No.	Chemical Name	ToxVal	MCLs (mg/L)
87683	HEXACHLOROBUTADIENE	8	
319846	HEXACHLOROCYCLOHEXANE, ALPHA-	16	
319857	HEXACHLOROCYCLOHEXANE, BETA- (BETA-HCH)	4	
319868	HEXACHLOROCYCLOHEXANE, DELTA-	4	
77474	HEXACHLOROCYCLOPENTADIENE	16	0.050
67721	HEXACHLOROETHANE	8	
70304	HEXACHLOROPHENE	16	
302012	HYDRAZINE/HYDRAZINE SULFATE	16	
7647010	HYDROCHLORIC ACID	4	
74908	HYDROGEN CYANIDE	16	
7783064	HYDROGEN SULFIDE	8	
78831	ISOBUTANOL	2	
78591	ISOPHORONE	2	
143500	KEPONE (CHLORDECONE)	16	
7439921	LEAD	16	0.015
58899	LINDANE (HEXACHLOROCYCLOHEXANE, GAMMA-)	16	2E-4
121755	MALATHION	4	
108316	MALEIC ANHYDRIDE	16	
123331	MALEIC HYDRAZIDE	1	
7439976	MERCURY, TOTAL	16	0.002
126987	METHACRYLONITRILE	16	
67561	METHANOL	1	
16752775	METHOMYL	4	
72435	METHOXYCHLOR	4	0.040
74839	METHYL BROMIDE	8	
74873	METHYL CHLORIDE	4	
79221	METHYL CHLOROCARBONATE	4	
78933	METHYL ETHYL KETONE (2-BUTANONE)	1	
108101	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	1	
80626	METHYL METHACRYLATE	2	
101144	METHYLENE BIS (2-CHLOROANILINE), 4,4-	8	
75092	METHYLENE CHLORIDE (DICHLOROMETHANE)	4	0.005
2385855	MIREX	16	
91203	NAPHTHALENE	8	
7440020	NICKEL	16	0.100
7697372	NITRIC ACID	4	
10102439	NITRIC OXIDE	4	
100016	NITROANILINE, P-	8	
98953	NITROBENZENE	8	
10102440	NITROGEN DIOXIDE	4	
55630	NITROGLYCERIN	16	
100027	NITROPHENOL, 4-	4	
924163	NITROSO-DI-N-BUTYLAMINE, N-	16	
615532	NITROSO-DI-N-METHYLURETHANE, N-	4	
55185	NITROSODIETHYLAMINE, N-	16	
62759	NITROSODIMETHYLAMINE, N-	16	
86306	NITROSODIPHENYLAMINE, N-	2	
930552	NITROSOPYRROLINDINE, N-	8	
23135220	OXAMYL	4	0.200
99990	NITROTOLUENE, 4-	8	
56382	PARATHION, ETHYL-	4	
298000	PARATHION, METHYL-	16	
1336363	PCBs (AROCHLORs)	16	5E-4
608935	PENTACHLOROBENZENE	8	
76017	PENTACHLOROETHANE	4	
82688	PENTACHLORONITROBENZENE	8	
87865	PENTACHLOROPHENOL	4	0.001
108952	PHENOL	2	
62384	PHENYLMERCURIC ACETATE	16	
298022	PHORATE	16	
75445	PHOSGENE	16	
13171216	PHOSPHAMIDON	4	
7803512	PHOSPHINE	16	
7664382	PHOSPHORIC ACID	8	
2104645	PHOSPHORODITHIOC ACID, PHENYL-O-ETHYL-O- (…	16	
7723140	PHOSPHORUS (ELEMENTAL)	16	
85449	PHTHALIC ANHYDRIDE	4	
506616	POTASSIUM SILVER CYANIDE	4	
23950585	PRONAMIDE	2	
129000	PYRENE	4	
110861	PYRIDINE	8	
91225	QUINOLINE	8	
108463	RESORCINOL	4	
299843	RONNEL	2	
7782492	SELENIUM	4	0.050
630104	SELENOUREA	4	
7440224	SILVER	4	
506649	SILVER CYANIDE	2	
57249	STRYCHNINE	16	

CAS No.	Chemical Name	ToxVal	MCLs (mg/L)
100425	STYRENE	2	0.100
7664939	SULFURIC ACID	16	
1746016	TCDD, 2,3,4,8- (“DIOXIN”)	16	3E-8
95943	TETRACHLOROBENZENE, 1,2,4,5-	16	
630206	TETRACHLOROETHANE, 1,1,1,2-	4	
79345	TETRACHLOROETHANE, 1,1,2,2-	4	
127184	TETRACHLOROETHENE	4	0.005
58902	TETRACHLOROPHENOL, 2,3,4,6-	4	
78002	TETRAETHYL LEAD	16	
3689245	TETRAETHYLDITHIOPYROPHOSPHATE	8	
109999	TETRAHYDROFURAN	1	
7440280	THALLIUM	16	0.002
62566	THIOUREA	4	
137268	THIRAM	4	
108883	TOLUENE	2	1.000
584849	TOLUENE DIISOCYANATE	4	
8001352	TOXAPHENE	8	0.003
75252	TRIBROMOMETHANE (BROMOFORM)	4	0.080
76131	TRICHLORO-1,2,2-TRIFLUOROETHANE, 1,1,2-	1	
75876	TRICHLOROACETYLALDEHYDE (CHLORAL)	4	
120821	TRICHLOROBENZENE, 1,2,4-	8	0.070
71556	TRICHLOROETHANE, 1,1,1-	1	0.200
79005	TRICHLOROETHANE, 1,1,2-	16	0.005
79016	TRICHLOROETHYLENE	8	0.005
75694	TRICHLOROFLUOROMETHANE	2	
95954	TRICHLOROPHENOL, 2,4,5-	2	
88062	TRICHLOROPHENOL, 2,4,6-	8	
93765	TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	4	
93721	TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (SILVEX)	4	0.050
96184	TRICHLOROPROPANE, 1,2,3-	16	
1582098	TRIFLURALIN	4	
99354	TRINITROBENZENE, 1,3,5-	4	
118967	TRINITROTOULENE (TNT)	8	
126727	TRIS (2,3-DIBROMOPROPYL) PHOSPHATE	8	
7440622	VANADIUM	16	
1314621	VANADIUM PENTOXIDE	16	
108054	VINYL ACETATE	2	
75014	VINYL CHLORIDE	16	0.002
81812	WARFARIN	16	
108383	XYLENE, M-	4	
95476	XYLENE, O-	4	
106423	XYLENE, P-	4	
1330207	XYLENES (TOTAL)	4	10.000
7440666	ZINC	2	
557211	ZINC CYANIDE	2	
1314847	ZINC PHOSPHIDE	16	
7733020	ZINC SULFATE	4	
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	Number of Substance Categories	=278	=63

GROUNDWATER PATHWAY

			SCORE:	
HAS A RELEASE TO GROUNDWATER OCCURRED? Known (45) Suspected (10) Potential Future (5) No Release (0) **(If 45, go to D)**			**A.**	
SUSCEPTIBILITY RATING: Higher (6) Average (3) Lower (0)			**1B.**	
PHYSICAL STATE: Stable Solid (0) Unstable Solid (1) Powder/Ash (2) Liquid/Gas/Sludge (3)			**2B.**	
CONTAINMENT: Very Good (0) Good (1) Fair (2) Poor (3)			**C.**	
REGULATED SUBSTANCE:	**CAS#**	**Name**	**1D.**	
TOXICITY: None (0) Low (1) (2) (3) (4) (8) (16) High			**2D.**	
QUANTITY: Threshold (1) (2) (3) (4) (5) (6) (7) (8) Very Large			**3D.**	
EXPOSURE TO GROUNDWATER RELEASE: Known release ≥ MCL and known human exposure ≥ MCL (25) Known release ≥ MCL and suspected human exposure (20) Known release, no MCL exists, and known human exposure (18) Known release ≥ MCL and known human exposure < MCL (15) Known release, no MCL, and suspected human exposure (12) Suspected release and human exposure suspected (8) Known release ≥ MCL but no human exposure suspected (4) Known release, no MCL and no human exposure suspected (3) Suspected release, but no human exposure suspected (2) Potential future release (1) Known release < MCL (0)			**1E.**	
DISTANCE TO WELL OR SPRING: < ½ mile (16) ½ - 1 mile (9) 1 – 2 miles (4) 2 – 3 miles (1) > 3 miles (0)			**2E.**	
		GROUNDWATER PATHWAY SCORE: **THRESHOLD: 10**		

S_{gw} = M x (2D + 3D) x (1E + 2E)/ 442.8
Where M = A + [(1B + 2B) x C]

If A = 45 then M = 45.
If 2D is unknown, then 2D = 4.
If 3D is unknown, then 3D = 4.
If 1E includes known or suspected human exposure, then 2E = 16.
If 1E = 0, then 2E = 1.

Note: The denominator of 442.8 normalizes the groundwater pathway score to a value between 0 and 100.

ON-SITE EXPOSURE PATHWAY

			SCORE:	
ACCESS TO THE SITE: Inaccessible (0) Limited Access (2) Unlimited Access (4)			**A.**	
HAS THERE BEEN A RELEASE? Yes (25) Suspected (15) No Release (0)			**B.**	
CONTAINMENT: Soil Releases Very Good (0) (1) (2) (3) (4) (5) Poor Aboveground Releases: (0) (1) (2) (3)			**C.**	
REGULATED SUBSTANCE:	**CAS #**	**Name**	**1D.**	
TOXICITY: None (0) Low (1) (2) (4) (8) (16) High			**2D.**	
QUANTITY: Threshold (1) (2) (3) (4) (5) (6) (7) (8) Very Large			**3D.**	
DISTANCE TO NEAREST RESIDENT INDIVIDUAL: <300 (8) 301 – 1000 (6) 1001 – 3000 (4) 3001 – 1 mile (2) > 1 mile (1)			**1E.**	
IS THERE AN ON-SITE SENSITIVE ENVIRONMENT? Yes (1) No (0)			**2E.**	
ON-SITE EXPOSURE PATHWAY SCORE: **THRESHOLD: 20**				

S_o = A x (B + C) x (2D + 3D) x (1E + 2E) / 259.2

If A or B is 0, then S_o = 0.
If 2D is unknown, the 2D = 4.
If 3D is unknown, the 3D = 4.

Note: The denominator of 259.2 normalizes the on-site exposure pathway score to a value between 0 and 100.