

Public Discussion Draft
RSR Wave 2 - Potential Changes to RSRs
Alternative Groundwater Protection Criteria
Class B Cleanup
August 5, 2013

The Department of Energy and Environmental Protection is developing “public discussion drafts” of ideas for potential future amendment to DEEP regulations, or new provisions for regulations, to address remediation of releases and sites where hazardous substances have been released. Many of the subject matters for these drafts grew out of the Cleanup Transformation workgroup recommendations from November 2012. The purpose of the public discussion drafts is to provide more detail to the concepts set forth in the November 2012 Workgroup reports and the February 2013 Cleanup Transformation draft report. As a discussion draft, the language is not structured to read exactly as regulation language would, and does not attempt to propose section and subsection outline format. Also, this discussion draft is not a public hearing draft of a proposed regulation. DEEP will further shape and refine the discussion draft after considering public feedback, before proposing any formal proposed regulation for amendment/adoption and before initiating the formal regulation adoption process.

Purpose:

The goal of an Alternative Groundwater Protection Criteria (Alternative GWPC) is to provide more flexibility in meeting groundwater cleanup goals in certain GA areas that are served by public water, based on reasonable assumptions regarding risk and known resource allocation. Use of an Alternative GWPC would be classified as a Class B Cleanup.

Background Concept:

The Remediation Standard Regulations (RSRs) currently have essentially two paths for meeting groundwater cleanup goals, contingent upon whether the groundwater quality classification is GA or GB. Areas currently designated as GA require the groundwater to be remediated to either background conditions or the Groundwater Protection Criteria (GWPC), unless it is technically impracticable to meet these criteria. Groundwater in GA areas must also meet the Surface Water Protection Criteria (SWPC) and Volatilization Criteria (VolC); however, background or GWPC are most often the criteria which drive remediation. Areas currently designated as GB require groundwater to meet the SWPC and VolC and to protect or maintain any existing use. If an existing use of the groundwater in a GB area is for human consumption, the GWPC cleanup goal remains applicable.

The addition of a self-implementing Alternative GWPC and provision for Commissioner approval of a site-specific Alternative GWPC would be beneficial in resolving groundwater cleanup compliance at many of the older industrial areas in the state. It is estimated that the

Alternative GWPC may be applicable to 8% of the state, which contains approximately 14% of sites currently in the Property Transfer Program, for example. It appears that such a provision for use of Alternative GWPC would have widespread application and usefulness.

Diminishing State Groundwater Plume: A diminishing state groundwater plume is one whose three-dimensional and temporal (seasonal) extent is characterized, which is not migrating in any direction (steady state or shrinking geographically), whose concentrations decrease over time, and whose breakdown components do not pose a continued or future threat to human health or the environment (i.e., breakdown products do not and will not exceed Alternative GWPC).

Applicability:

The dissolved phase plume associated with a release may be afforded an alternative interim cleanup goal because long-term attenuation through natural processes would be expected to dissipate a typical contamination plume without further active groundwater remediation under the circumstances listed below, ultimately achieving the GWPC.

Self-Implementing Option:

It may be acceptable to remediate to an Alternative GWPC in a GA area if the groundwater plume meets certain eligibility characteristics described below.

Eligibility with regard to spatial characteristics is determined using the Department's Map of GA Areas Where an Alternative GWPC is Potentially Eligible for Use (Figure 1) and there is no current use or future plan to utilize the water resource for drinking purposes. The Map indicates areas which are served by public water and are not within existing or proposed source areas for public water supply.

Eligibility with regard to site and groundwater plume characteristics is determined based on the following:

Soil Compliance:

- Releases to soil that constitute a source of pollution shall be remediated to applicable default direct exposure and pollutant mobility criteria or approved Additional Polluting Substance Criteria for the substances for which an Alternative GWPC is being used.
- Alternative PMC may be used (as approved by the Commissioner) for compliance for any substances other than those for which an Alternative GWPC is being used.

Groundwater Characterization:

- The groundwater plume has been investigated in accordance with prevailing standards and guidelines, including the SCGD or equal alternative approach.
- The three-dimensional and seasonal extent of the groundwater plume must be fully characterized.
- Groundwater monitoring has been completed in accordance with 22a-133k-3(g) for any plume and for any remediated release area.
- The groundwater plume is not located within a bedrock aquifer.

- There must be documented confirmation that all properties overlying the plume and within 500 feet of the plume are connected to public water through a Water Supply Well Receptor Survey.
- Public water must be available to all areas between the plume and the downgradient surface water discharge point.

Groundwater Compliance:

- The groundwater shall comply with applicable default SWPC and Volatilization Criteria or approved Additional Polluting Substance Criteria, pursuant to the RSRs.
- The plume shall be a Diminishing State Groundwater Plume with the mass of contaminants in the groundwater plume decreasing over time.
- A map of the area of non-conforming groundwater quality shall be provided to the DEEP.
- The non-conforming groundwater plume shall be registered with the DEEP.

Notice for use of the self-implementing option. The Party shall submit a form, stamped/signed by an LEP describing the applicability of this option in terms of spatial characteristics and site and plume characteristics, as described above, and register the groundwater plume with the Department. This information shall be provided to the commissioner on a form prescribed by the commissioner and certified by the LEP. These provisions must also be clearly documented in the release area closure report or verification report. Although registry of the non-conforming groundwater plume is required, documentation may be provided at a future time which may allow the plume to be removed from the registry when compliance with the GWPC is demonstrated and which may allow revision of cleanup classification to Class A Cleanup, if applicable.

Commissioner-Approved Option:

In circumstances where the above self-implementing provisions cannot be met, a Party may request the Commissioner's Approval of site-specific use of the Alternative GWPC by providing additional information for locations where an area is not currently mapped on the Department's Map of GA Areas Where an Alternative GWPC is Potentially Eligible for Use - where public water supply is available, the LEP may provide documentation of water service extension, including a map illustrating the updated water service area.

Appendix: Alternative GWPC Equations, Terms, and Values for Use of Alternative Groundwater Protection Criteria

The Alternative GWPC is based on a calculation using exposure scenarios for non-drinking water uses that allow for minor groundwater impacts to naturally attenuate in areas where groundwater is not used for drinking water purposes. The tables in the Appendix provide Alternative GWPC based upon non-drinking water (agricultural) uses of the groundwater and involving the GWPC and Volatilization Criteria listed in RSR Appendices C and E. If a substance is not included in this Appendix, a request for commissioner approval to use criteria as additional polluting substances must be submitted to and approved by the Department. For any contaminant that does not have an established GWPC, an Additional Polluting Substance (APS) request shall be made in accordance with the RSRs. Once an APS has been established, all requirements under the Alternative GWPC are applicable.

The Alternative GWPC are not to exceed one hundred times the Groundwater Protection Criteria listed in Appendix C and are not to exceed fifty percent of the applicable Volatilization Criteria listed in Appendix E.

The Alternative Groundwater Protection Criteria for volatiles and for semi-volatiles/metals have been calculated separately based upon fate and transport properties and exposure scenarios specific to these chemical classes. The calculations are shown below.

Volatile Organic Compounds:

Greenhouse irrigation scenario - objective to not exceed the I/C Target Indoor Air Concentration

$$C_{air} = C_{water} * f * WHF / (HV * ER * MC)$$

C_{air} = indoor air conc. (ug/m³)

C_{water} = water conc. (ug/l)

f = fraction volatilized – for a range of VOCs assume 50%; given warm temperature and long residence time in a greenhouse, there is ample opportunity for volatilization although some losses (water runoff down drain) will occur; this is in range of volatilization efficiency reported elsewhere (e.g., McKone et al. 1987).

WHF = whole greenhouse water flow rate (L/day) – 3183 (based on water use estimate from UMass (<http://extension.umass.edu/floriculture/fact-sheets/sizing-greenhouse-water-system>))

HV = volume = 1000 m³ (UMass assumptions on sq footage, see below)

ER = greenhouse air exchange rate/d (2/hr in cold weather x 5 months; 10/hr in warm weather x 4 months = 5.6 /hr TWA;

(<http://www.greenhousecatalog.com/winter-greenhouse-ventilation>);

MC = mixing coefficient (unitless) - 0.5 (Brown, 1997), 0.15 (Andelman, 1985) – this factor makes it more likely for inhalation exposure as workers doing the watering will have more direct contact with air receiving the VOC. Choose midpoint of these 2 estimates: 0.33

Semi Volatile Organic Compounds, Inorganic and Pesticides:

Outdoor field irrigation – objective to not exceed the residential Direct Exposure Criterion

$$(0.02)*((0.2)(DEC/GWPC)) = \text{Alternative GWPC Multiplier}$$
$$(\text{Alt. GWPC Multiplier}) * (\text{GWPC}) = \text{Alternative GWPC}$$

Where: (0.02) is the water to soil concentration factor (based upon accumulation of arsenic in soil (Moyano et al. 2009; Dahal et al. 2008)

(0.2) is the relative source concentration (RSC) to account for other background contributions to semi-volatile in soil

DEC is the residential Direct Exposure Criterion in the RSRs

GWPC is the groundwater protection criterion in the RSRs

Table of Volatile Organic Substances

	GWPC (µg/L)	Alternative GWPC (ug/L)
Acetone	700	13928
Acrylonitrile	0.5	Not Applicable
Benzene	1	92
Bromoform	4	271
2-Butanone (MEK)	400	13928
Carbon tetrachloride	5	8
Chlorobenzene	100	900
Chloroform	6	18.6
Dibromochloromethane	0.5	Not Applicable
1,2-Dichlorobenzene	600	15227
1,3-Dichlorobenzene	600	12100
1,4-Dichlorobutene	75	668
1,1-Dichloroethane	70	7000
1,2-Dichloroethane	1	10.5
1,1-Dichloroethylene (1,1 Dichloroethene)	7	Not Applicable
cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)	70	3714
trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)	100	7428
1,2-Dichloropropane	5	7
1,3-Dichloropropene	0.5	3
Ethylbenzene	700	10770
Ethylene dibromide (EDB)	0.05	1.4
Methylene chloride	5	500
Methyl isobutyl ketone (MIBK)	350	7428
Methyl tert butyl ether (MTBE)	70	7000
Styrene	100	290
1,1,1,2-Tetrachloroethane	1	6
1,1,2,2-Tetrachloroethane	0.5	5.2
Tetrachloroethylene (PCE)	5	139
Toluene	1000	11750
1,1,1-Trichloroethane	200	10200
1,1,2-Trichloroethane	5	446
Trichloroethylene (TCE)	5	28
Vinyl chloride	2	Not Applicable
Xylenes	530	10650

Table of Semivolatile Organic Substances

	GWPC (µg/L)	Alternative GWPC (µg/L)
Acenaphthylene	420	4000
Anthracene	2000	4000
Benzo(a)anthracene	0.06	4
Benzo(k)fluoranthene	0.5	33.6
Benzo(a)pyrene	0.2	4
Benzo(b)fluoranthene	0.08	4
Bis(2-chloroethyl)ether	12	4
Bis(2-chloroisopropyl)ether	12	35.2
Bis(2-ethyl hexyl)phthalate	2	176
Butyl benzyl phthalate	1000	4000
2-Chlorophenol	35	1356
2,4-Dimethylphenol	140	4000
Di-n-butyl phthalate	700	4000
Di-n-octyl phthalate	100	4000
Fluoranthene	280	4000
Fluorene	280	4000
Hexachlorobenzene	1	4
Hexachloroethane	3	176
Naphthalene	280	4000
Pentachlorophenol	1	20.4
Phenanthrene	200	4000
Phenol	4000	4000
Pyrene	200	4000

Table of Inorganic Substances

	GWPC (µg/L)	Alternative GWPC (µg/L)
Antimony	6	108
Arsenic	50	40
Asbestos	7 mfl	Not Applicable
Barium	1000	18800
Beryllium	4	8
Cadmium	5	136
Chromium, trivalent	Not Established	Not Applicable
Chromium, hexavalent	Not Established	Not Applicable
Chromium, total	50	Not Applicable
Copper	1300	10000
Cyanide	200	5600
Lead	15	1500
Mercury	2	80
Nickel	100	5600
Selenium	50	1360
Silver	36	1360
Thallium	5	21.6
Vanadium	50	1880
Zinc	5000	80000

Table of PCBs and Pesticides

	GWPC (µg/L)	Alternative GWPC (µg/L)
Polychlorinated Biphenyls (PCBs)	0.5	4
Alachlor	2	30.8
Aldicarb	3	56
Atrazine	3	11.2
Chlordane	0.3	1.96
Dieldrin	0.002	0.152
Endrin	Not Established	Not Applicable
2-4 D	70	2720
Heptachlor epoxide	0.2	0.268
Heptachlor	0.4	0.56
Lindane	0.2	20
Methoxychlor	40	1360
Simazine	4	NE
Toxaphene	3	2.24

For all tables: Not Applicable = Calculation could not be completed because the 1996 RSRs do not have established values for Res DEC or GWPC for that particular chemical or the calculated value is less than the GWPC.

Figure: GA Areas Where an Alternative GWPC is Potentially Eligible for Use

