GUIDANCE DOCUMENT

CAPPING OF INORGANIC AND SEMIVOLATILE CONTAMINANTS FOR THE IMPACT TO GROUND WATER PATHWAY

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New Jersey Department of Environmental Protection
Trenton, New Jersey

Background

Capping as a remedial option for the Impact to Ground Water Pathway was not previously permitted (as stated in Impact to Ground Water Frequently Asked Questions). This issue has been revisited, and capping as a remedy for addressing site specific exceedances of Impact to Ground Water Soil Remediation Standards (IGWSRSs) is now permitted under certain conditions for inorganic and semivolatile contaminants. Inorganic and semivolatile contaminants are defined as those with Henry's law constants less than 10^{-5} atm m^{-3} mol^{-1} or vapor pressures less than 1 mm Hg at 25°C . These contaminants are listed in Table 1. At a minimum, a capped site will require a deed notice and engineering controls and an approved Remedial Action Permit for Soils for the long term maintenance of the engineering control. The conditions under which contaminant exceedances of Impact to Ground Water Soil Screening Levels (IGWSSLs) may be capped, whether default or site-specific, are presented in this guidance document.

In 2012, the Department established a Committee to review and update some of the guidance for the Impact to Ground Water pathway. The Committee included Stakeholders and NJDEP staff. This Guidance document represents the work of the Committee and it supersedes previous Department guidance issued on this topic. The following people were on the Committee who prepared this document:

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Introduction

Contaminant concentrations in soil that exceed the site-specific Impact to Ground Water Soil Remediation Standard present a potential contamination threat to ground water. Inorganic and semivolatile contaminants are primarily mobilized and impact the ground water via ground water recharge from infiltrating rain water or runoff. For these chemicals, impermeable caps, which eliminate infiltration of rain water, may be useful as a means of addressing the Impact to Ground Water pathway.

Impermeable caps may include asphalt, concrete, buildings, engineered clay caps (if impermeable to water) or other appropriately designed impermeable caps. Permeable caps such as gravel caps, soil caps and soil with vegetative cover are not an appropriate remedy for this pathway because mobilization of contaminants may occur via infiltrating rain water.

The Department is currently developing a Capping Technical Guidance Document that will provide further information regarding the selection and design of caps. During cap design and selection, it is advisable to take into account the concentrations of remaining contaminants with respect to all exposure pathways and current and future land use.

This document is not meant to supersede any existing regulations. If capping is undertaken, conditions on site must still comply with all state, federal and local regulations.

Leaving contaminant concentrations in soil that are above the site specific Impact to Ground Water Soil Remediation Standards poses a risk to the underlying ground water if the cap is breached or if site conditions are such that a long-term stable cap cannot be maintained. Therefore, the suitability of capping as a permanent remedy for the impact to ground water pathway should be ascertained on a site-by-site basis.

Conditions under which Capping Is Permitted

a. New or existing caps must be impermeable to rain water and runoff. Existing caps such as parking lots may have numerous cracks or other preferential pathways for rainfall infiltration, and their suitability as impermeable caps should be assessed. In contrast to caps used for the direct contact pathway, cracks or other damage or deterioration must be repaired or sealed in order to prevent infiltration of water to the vadose zone.

b. The cap cover should extend far enough beyond the boundaries of the contaminated area to prevent infiltrating water near the edges of the cap from laterally moving underneath the cap and reaching the contaminated zone. This potential concern is magnified if there is no collection of runoff water from the cap, because it greatly increases the amount of infiltrating water around the edges of the cap. Therefore, at a minimum, all federal, state and local regulations for stormwater management should be implemented.

c. No free or residual product should be left under a cap, as per the Technical Requirements for Site Remediation N.J.A.C. 7:26E-1.10 and 5.1(e) which state that non-aqueous phase liquid (NAPL) or free and residual product must be treated or removed whenever practicable.

d. If the ground water is clean (i.e., contaminant concentrations are below the appropriate Ground Water Remediation Standard), there must be a minimum 2' clean soil buffer above the seasonal high water table (i.e. contaminant concentrations within the buffer are below the site specific IGWSRS). This will prevent contact between the contamination and the ground water, with resultant ground water contamination. No ground water monitoring shall be required in this scenario. However, because the cap is an engineering control, a deed notice and an approved Remedial Action Permit for Soil will be required.

e. Where contaminant concentrations in the ground water exceed the Ground Water Remediation Standard, periodic monitoring of the ground water is required to ensure that additional contamination does not occur. This scenario would typically require both an approved Classification Exception Area (CEA) and Remedial Action Permit for Ground Water. Additionally, since the cap is an engineering control, a deed notice and an approved Remedial Action Permit for Soil will be required.

Table 1
List of Inorganic and Semivolatile Contaminants that may be Capped

Contaminant	CAS Number
Acenaphthene	83-32-9
Acenaphthalene	208-96-8
Acetophenone	98-86-2
Aldrin	309-00-2
Aluminum	7429-90-5
Anthracene	120-12-7
Antimony	7440-36-0
Arsenic	7440-38-2
Atrazine	1912-24-9
Barium	7440-39-3
Benzaldehyde	100-52-7
Benzidine	92-87-5
Benzo(a)anthracene (1,2-Benzanthracene)	56-55-3
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene (3,4-Benzofluoranthene)	205-99-2
Benzo(ghi)perylene	191-24-2
Benzo(k)fluoranthene	207-08-9
Beryllium	7440-41-7
1,1’-Biphenyl	92-52-4
Bis(2-chloroisopropyl)ether	108-60-1
Bis(2-ethylhexyl)phthalate	117-81-7
Butyl benzyl phthalate	85-68-7
Cadmium	7440-43-9
Caprolactam	105-60-2
Carbazole	86-74-8
Chlordane (alpha and gamma)	57-74-9
Chrysene	218-01-9
Cobalt	7440-48-4
Copper	7440-50-8
Cyanide	57-12-5
4,4'-DDD	72-54-8
4,4'-DDE	72-55-9
4,4'-DDT	50-29-3
Dibenz(a,h)anthracene	53-70-3
1 ,2-Dibromo-3-chloropropane	96-12-8
3,3’-Dichlorobenzidine	91-94-1
2,4-Dichlorophenol	120-83-2
Dieldrin	60-57-1
Diethylphthalate	84-66-2
2,4-Dimethylphenol	105-67-9
Di-n-butyl phthalate	84-74-2
4,6-Dinitro-2-methylphenol (4,6-Dinitro-o-cresol)	534-52-1
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6 -Dinitrotoluene	606-20-2
2,4-Dinitrotoluene/2,6-Dinitro Dinitrotoluene (mixture)	25321-14-6
Di-n-octyl phthalate	117-84-0

Contaminant	CAS Number
1,2-Diphenylhydrazine	122-66-7
Endosulfan I and Endosulfan II	115-29-7
Endosulfan sulfate	1031-07-8
Endrin	72-20-8
Fluoranthene	206-44-0
Fluorene	86-73-7
alpha-HCH (alpha BHC)	319-84-6
beta-HCH (beta-BHC)	319-85-7
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
Hexachlorobenzene	118-74-1
Hexachloro-1,3-butadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Indeno(1,2,3-cd)pyrene	193-39-5
Isophorone	78-59-1
Lead	7439-92-1
Lindane (gamma-HCH) (gamma-BHC)	58-89-9
Manganese	7439-96-5
Mercury	7439-97-6
Methoxychlor	72-43-5
2-Methylnaphthalene	91-57-6
2 methylphenol (o-cresol)	95-48-7
4 methylphenol (p-cresol)	106-44-5
Naphthalene	91-20-3
Nickel (Soluble salts)	7440-02-0
2-Nitroaniline	88-74-4
Nitrobenzene	98-95-3
N-Nitrosodimethylamine	62-75-9
N-Nitrosodi-n-propylamine	621-64-7
N-Nitrosodiphenylamine	86-30-6
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Phenol	108-95-2
Polychlorinated biphenyls (PCBs)	1336-36-3
Pyrene	129-00-0
Selenium	7782-49-2
Silver	7440-22-4
Tertiary butyl alcohol (TBA)	75-65-0
Thallium	7440-28-0
Toxaphene	8001-35-2
1,2,4-Trichlorobenzene	120-82-1
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
Vanadium	7440-62-2
Zinc	7440-66-6