

## Background

The 2014 amendments to the Massachusetts Contingency Plan, effective June 20, 2014, redefined Background to include both Natural Background and Anthropogenic Background. By definition, Background is a condition of No Significant Risk and those Oil and Hazardous Materials (OHM) determined to be from Background can be eliminated as Contaminants of Concern from a quantitative Risk Characterization. Therefore, it is important that sufficient documentation be provided to support the determination of background. The 2014 amendments also defined a new term, Historic Fill, which is a subset of Anthropogenic Background (310 CMR 40.006(12)).

## Purpose

This Technical Update provides guidance for both LSPs preparing reports and MassDEP staff reviewing reports on the appropriate level of effort and lines of evidence to support the conclusion that OHM present at a disposal site are the result of Anthropogenic Background (in general) and Historic Fill (specifically). Sites where the OHM is limited to Anthropogenic Background may be closed with a Permanent Solution with Conditions and no Activity and Use Limitation is required.

This document provides guidance on the relevant definitions, level of effort, guidelines for evaluation (including numeric references), and appropriate documentation in support of Anthropogenic Background determinations.

For the purposes of this guidance, it is presumed that notification has been provided for the disposal site and appropriate response actions are being conducted under the MCP. Since certain OHM found in Anthropogenic Background may also be chemicals with reporting exemptions and/or chemicals associated with another regulated release, it is important to conduct sufficient due diligence to differentiate the source of the contamination using all lines of evidence. A well-developed Conceptual Site Model should be the basis for this evaluation.

## Definitions

The MCP defines Anthropogenic Background, Fill and Historic Fill at 310 CMR 40.0006(12) as follows:

Anthropogenic Background means those levels of oil and hazardous material that would exist in the absence of the disposal site of concern and which are:

- (a) attributable to atmospheric deposition of industrial process or engine emissions and are ubiquitous and consistently present in the environment at and in the vicinity of the disposal site of concern;
- (b) attributable to Historic Fill;
- (c) associated with sources specifically exempt from the definitions of disposal site or release as those terms are defined in MGL c. 21E and 310 CMR 40.0006;
- (d) releases to groundwater from a public water supply system; or
- (e) petroleum residues that are incidental to the normal operation of motor vehicles.

Fill Material means soil, sediments, rock and/or stone obtained off-site that is used to fill holes or depressions, create mounds, or otherwise artificially change the grade or elevation of real property.

Historic Fill means Fill Material that based on the weight of evidence and consistent with the Conceptual Site Model:

- (a) was emplaced before January 1, 1983 (the effective date of MGL c21E);
- (b) may contain, but is not primarily composed of, construction and demolition debris, reworked soils, dredge spoils, coal, coal ash, wood ash or other solid waste material;

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- (c) was contaminated with metals, hydrocarbons, and/or polycyclic aromatic hydrocarbons prior to emplacement, at concentrations consistent with the pervasive use and release of such materials prior to 1983;
- (d) does not contain oil or hazardous materials originating from operations or activities at the location of emplacement;
- (e) is not and does not contain a generated hazardous waste, other than Oil or Waste Oil;
- (f) does not contain chemical production waste, manufacturing waste, or waste from processing of metal or mineral ores, residues, slag or tailings; and
- (g) does not contain waste material disposed in a municipal solid waste dump, burning dump, landfill, waste lagoon or other waste disposal location.

## Historic Fill Considerations

It is important to note that Historic Fill is Fill Material which was brought into the disposal site from another location and is *not primarily composed of debris*. Fill Material is defined as “soil, sediments, rock and/or stone obtained off-site that is used to fill holes or depressions...”. but may contain other material. Off-site means originating outside of the disposal site of concern, but could be mixed with materials deposited within the property. It is expected that Fill Material would include a certain amount of other materials including; construction and demolition debris, reworked soils, dredge spoils, coal ash, wood ash or other solid waste material. However, where these other materials are the source of OHM and they comprise the majority of the filled area, that condition would not be considered Historic Fill. This restriction would also apply to sub-areas and/or significant horizons or layers within a larger filled area.

Another criterion is that the OHM must be consistent with the pervasive use and release of such materials. Pervasive use means the use was common or typical across the Commonwealth such as motor vehicle use, atmospheric fallout from power plants, ash and debris from wood or coal burning stoves/furnaces and not specific to an individual parcel or locale. The historical source(s) of the OHM should be identified to the extent known, such as highways, bridges, incinerators, power plants, etc.

Since the chemical components included in the definition of Historic Fill are broad in scope, MassDEP staff should consider the following general guidelines when reviewing determinations of this nature. These are ONLY Rules of Thumb, and may not be true in ALL cases. While staff should not categorically dismiss assertions that soils containing these contaminants in excess of these guidelines meet the definition of Historic Fill, LSPs must present a robust argument in this regard, including, as appropriate, literature citations, multiple lines of evidence and/or forensic analytical data.

The Historic Fill designation applies to a solid soil matrix. It is not expected that most Historic Fill locations would have OHM in groundwater at levels of concern which is discussed later in this document.

## Compound Specific Discussion

By definition, Historic Fill may contain metals, hydrocarbons and polycyclic aromatic hydrocarbons (PAHs), but may also include *de minimis* levels of other contaminants.

### Metals

Arsenic, beryllium, cadmium, copper, lead, nickel, zinc may be present as Natural Background, Anthropogenic Background and/or Historic Fill.

Elevated arsenic concentrations may be due to naturally occurring in the soil (central Massachusetts), from sediment fill (Boston blue clay), due to the application of pesticides or from coal ash. Beryllium, cadmium, copper, nickel and zinc are not likely to trigger risk thresholds at levels typically found in fill. While the Boston Blue clay can contain arsenic up to 75 mg/kg, (Swanson & Lamie, 2007), higher concentrations outside of central and northeastern Massachusetts “arsenic belt”, could indicate pesticide and/or coal ash as the source.

## **Lead**

Lead warrants special consideration as it is a metal commonly found in Massachusetts soil and attributable to a number of different sources. Lead was used as a pigment in paints through the 1970s, where it was widely applied to buildings, bridges and water towers. Paint removal from these structures was often conducted without the controls in place today. Lead was also a widely-used additive in gasoline until the mid 1980s, and used in many manufacturing applications including plumbing and building materials, inks, solder, and in pesticides/herbicides.

Lead present in pre-1983 Fill may have originated in whole or in part from lead-based paints that were either used on-site or at the site from where the soil originated. Lead found at residential properties particularly near the drip line of the house is likely from lead based paint. Commercial/industrial properties that have the potential for other on-property sources require a higher level of effort to support the conclusion that the lead is from lead-based paint. Paint chips may or may not be visible in soil but forensics could be used to confirm the presence of lead-based paint. A typical signature of lead-based paint in soil:

- ❖ highly variable lead concentrations throughout the site;
- ❖ higher concentrations near buildings and in shallow soils (presuming undisturbed)
- ❖ an average lead concentration of 500 to 1000 mg/kg; and
- ❖ a few lead values as high as 5000 to 10,000 mg/kg

Reworking soils at a property could homogenize the distribution of OHM away from a typical pattern. A thorough site history indicating no other source(s) of lead at the property is a critical component to determine Historic Fill. Higher concentrations, or areas of consistently high concentrations, require a case-specific evaluation and justification, including microscopy (to identify the presence of paint chips) and/or other forensic testing. Of particular concern are situations where the elevated lead may have originated from smelting/foundry operations, pesticide manufacturing, the manufacturing or disposal of lead-acid batteries, or concentrated pockets of lead-paint wastes (all of which would NOT be considered lead consistent with Historic Fill).

## **Hydrocarbons - VPH, EPH and TPH**

Volatile petroleum hydrocarbons used in small quantities and released in a manner associated with pervasive use prior to 1983 would not be expected at concentration which would warrant concern. Such small quantities would either biodegrade, volatilize or be leached/diluted to very low concentrations in soil. Therefore, VPH at elevated concentrations is likely due to a release/condition that would not meet the definition of Historic Fill.

Heavier petroleum compounds such as those identified in the Extractable Petroleum Hydrocarbon (EPH) analysis or Total Petroleum Hydrocarbons (TPH) could be found at low concentrations in the 200-500 mg/kg range, but most likely not in excess of the RCS-1 value of 1000 mg/kg TPH. Data from the Central Artery Project collected along the right of way found Total Petroleum Hydrocarbons (TPH) at a median concentration of 160 mg/kg and the 90<sup>th</sup> percentile of 2900 mg/kg. Concentrations in excess of 1000 mg/kg TPH or EPH fractions would need very strong evidence to demonstrate Historic Fill applied and that a separate petroleum release is not present.

## **PAHs**

PAHs are ubiquitous in the environment as demonstrated by the Central Artery dataset collated by CDM and by others including Bradley et al (1994) who sampled three urban New England cities. A starting reference is Table 1 of the 2002 Technical Update entitled "Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil". Concentrations of PAHs in soil above these reference values warrant closer evaluation of the potential sources, distribution and type of PAH, including petrogenic vs. pyrogenic PAHs, PAH ratios and chemical forensic fingerprinting.

## **Other contaminants**

### **VOCs**

Chlorinated solvents and other VOCs used in small quantities are not expected to be detected at levels of concern. Elevated concentrations of VOCs indicate a release condition which warrants further investigation. Similarly to VPH compounds, VOCs would either biodegrade, volatilize or be leached/diluted to very low concentrations in soil. Therefore, if chlorinated solvents are present at concentrations which could cause a risk, they are likely due to a release/condition that would not meet the definition of Historic Fill.

### **Coal Ash**

Published reports on coal ash composition indicate that arsenic, barium, and chromium are the metals in coal ash most likely to exceed RCs, with arsenic often 2X the RC S-1/2 (EPA,2009). Lead is typically less than 200 mg/kg in coal ash. Levels of nickel, vanadium and zinc in ash sometimes exceed the values identified by MassDEP as background levels in soil ("Table 1") by more than 50% (even if the ash is "diluted" by 50% soil, these values could still exceed the Table 1 values). Nickel, vanadium and zinc from ash are unlikely to pose a risk and be a significant concern at a site.

### **Arochlor PCBs by EPA Method 8082**

Polychlorinated biphenyls (PCBs) were commonly used historically in hundreds of industrial and commercial products. Elevated concentrations of PCBs would indicate a release condition and would not be considered Historic Fill. Absent a release, it is unlikely that PCBs would be present in "Historic Fill" at concentrations which consistently and/or significantly exceed 1 mg/kg. The USEPA (1990) considers PCB's at concentrations between 0.1 and 1.0 mg/kg to be background.

## **Site Assessment**

Where notification has been made for OHM attributable to Historic Fill (i.e., a notification exemption was not otherwise applied at the time of notification) the assessment of the site would need to proceed through the MCP process. At a minimum, an Initial Site Investigation is required to support a Permanent Solution with Conditions. The Conceptual Site Model that some or all of the OHM is due to Historic Fill will help dictate the sampling and analysis plan to support that hypothesis. Only those contaminants that are considered ubiquitous in the environment and emplaced prior to 1983 are eligible for consideration as Historic Fill. Those OHM include metals (typically arsenic, beryllium, cadmium, copper, lead, mercury and zinc), non-volatile petroleum hydrocarbons and/or poly nuclear aromatic hydrocarbons (PAHs). PAHs indicative of a pyrogenic (ash) origin include (benzo(a)anthracene, benzo(a) pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene). PAHs indicative of a petrogenic (petroleum) origin include naphthalene, 2-methylnaphthalene, phenanthrene, and acenaphthene. Soil containing chlorinated hydrocarbons, polychlorinated biphenyls (PCBs), pesticides, herbicides, and visible asbestos debris is not Historic Fill.

Table 1 lists chemicals which are considered consistent with natural background as well as the 90<sup>th</sup> percentile value for soils containing wood or coal ash. Many metals found in coal ash are documented in EPA publications and Electric Power Research Institute (EPRI) reports.

### **Site History**

A thorough site history is critical to rule out on-site sources of contamination and to be able to support a Historic Fill determination. Sufficient evidence must be provided that the area was filled prior to 1983, that the fill contained the OHM at the time of placement; that it was not filled with a chemical production or manufacturing waste, and that it is not a municipal solid waste disposal location. An ineligible waste disposal location includes Mass-DEP approved landfills (post 1971),

a historic municipal landfill/dump, a burn dump or an illegal landfill. Sufficient due diligence based upon the specific site location and area history is necessary to support the determination of Historic Fill. Commercial and industrialized areas require a higher level of effort to rule out on-property sources of contamination.

Aerial photos and topographic maps should be reviewed to document changes in topography which would indicate a filling history. These maps are readily available on various web sites and should be included in an appendix to the Permanent Solution Statement where a Permanent Solution relies on a Historic Fill determination. Available topographic maps date from 1893 to 1987 and aerial photos go back to 1938 for some areas although the quality varies. Topographic changes such as wetland to upland, the shapes of water bodies, the elimination or culverting of streams, and elevation changes should be identified. Low-lying and wetland coastal areas were subject to filling historically. Areas may also have been filled to create roadways, railways or other transportation corridors. Town offices often have historical information regarding property development including the planning department and conservation commissions if there are wetland or water resources nearby. Chapter 91 licenses date back to 1866 and were required for filling tidelands and ponds greater than 10 acres in area. The licenses are maintained by the MassDEP Waterways program but were also recorded at the Registry of Deeds for the impacted property. An additional source of information in the Boston area filling is contained in "Gaining Ground: A History of Landmaking in Boston" (N. Seasholes, 2003).

The disposal site history requirements of a Phase I are applicable and relevant to a Historic Fill determination, including: owner/operator history, release and OHM storage and use history, manufacturing operations and waste management history, environmental permits and compliance history (see 310 CMR 40.0483(1)(c)).

Some available resources to research the property history and to rule out or rule in potential sources of contamination include:

- ❖ Local Government offices - Town offices (Planning Dept., Conservation Commission), city directories;
- ❖ Mapping Resources - Sanborn Insurance maps, topographic maps, and aerial photos
- ❖ MassDEP - 21E files of sites/releases, Facility and Hazardous Waste Generator history, Chapter 91 licenses.

### **Subsurface Investigations**

The areas believed to contain Historic Fill must be field verified using a sufficient number of test pits, soil borings, and/or trenches, to adequately identify and locate the Historic Fill within the boundaries of the disposal site. Delineation of the nature and extent of the disposal site would include those areas considered to be Historic Fill. Excavations/borings should be extended at least two feet into presumed native soils or until bedrock/refusal is met. Depending upon the depth of the Fill layer, continuous split spoon samples may be advised. Geophysical methods, particularly electrical conductivity (EC) can be used to quickly define Historic Fill boundaries, as a heterogeneous Fill has an obvious and unique EC signature. Visual observations are also important in confirming the presence of Historic Fill. Various Fill horizons should be noted including the coloring, texture, composition (construction debris, ash, asphalt pavement /grindings), relative amounts or percentages and depth of the Fill. Consideration of information and data from adjacent parcels with a common filling history may also be used as a line of evidence. A minimum number of borings/test pits recommended for a typical urban location (1/4 acre) is 4-6, with more required for larger or more complicated parcels.

The areas asserted to be Historic Fill must be identified, characterized and verified through quantitative laboratory analysis. Again, the site history plays an important role in determining the location, number and chemical analysis of the samples. A site with a long history of industrial use would require a higher level of investigation to distinguish between releases from historic operations vs. Historic Fill emplacement. At a minimum, the MCP 14 metals and PAH analysis

should be conducted on each sample as well as those parameters necessary to define the nature and extent of other releases on the site. Depending upon visual and headspace screening results, EPH, VPH and VOCs may be warranted. A representative number of soil samples must be collected including at least one from each discrete horizon/Fill zone identified. The boundary between Historic Fill zones and native soil may be obvious based upon visual observations, but in some cases the distinction will not be clear and may require chemical analysis to assist in the determination of the boundary. Composite sampling (5 discrete sub-samples) in similar zones or horizons is acceptable to provide broader coverage of the Historic Fill area. Incremental sampling methodology (ISM) can also be used to obtain representative concentrations in the fill. A minimum of one soil sample per boring/test pit/excavation is recommended. XRF can also be used as a field screening tool to determine the areas of elevated metals concentrations in the Historic Fill and aid decisions about quantitative laboratory analysis.

Forensic analysis is a useful tool to support Historic Fill determinations in identifying ash and other components of the soil matrix which would provide a line of evidence for the origin of the OHM. Laboratories can use microscopy to identify particles in the soil matrix and to selectively analyze samples. Typical ash analysis includes Polarized Light Microscopy (PLM), Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS). Fly ash and bottom ash have different shape characteristics and metal composition. This distinction can be used to determine if the metals concentrations are due to the ash or another source. EDS is also used to determine if paint chips contain lead since EDS provides an elemental analysis of a particle. Alkylated PAH analysis and ratio plots can be used to provide information regarding the origin of the PAHs to support a Historic Fill determination.

### **Data Compilation**

Data should be compiled in tables with ranges, maximum and minimum, average or median in a format which can be compared to Table 1, which contains the 90<sup>th</sup> percentile data tabulation. Table 1- 90th percentile values are considered a maximum, "not to exceed concentration". If contaminant concentrations in the Fill fall outside of those values, a higher level of effort, including additional data, would be warranted in order to provide a statistically valid data set. Additional justification necessary to support a Historic Fill determination may include information from sites/projects in the area, peer reviewed publications, and/or government studies. Potential or known releases at a site with the same contaminants as those typically found in Historic Fill would require a much higher level of effort to support a Historic Fill determination than a release where the contaminants are clearly distinct from OHM typically found in Historic Fill.

### **Conceptual Site Model**

a discussion of the OHM origins including possible on-site sources, Anthropogenic Background and the Historic Fill determination should be included in the CSM, including site history, the fill location in relationship to the disposal site, and the fill composition both descriptive and analytic.

### **Risk Characterization**

Per 310 CMR 40.0902(3) if the concentration(s) of OHM is at or below Natural or Anthropogenic Background levels, then that OHM does not need to be included in the Risk Characterization.

### **Site Closure**

Sites at which OHM have been eliminated from the risk characterization because they have been determined to be Anthropogenic Background (including Historic Fill) are eligible for a Permanent Solution with Conditions.

A Permanent Solution with Conditions and an Activity and Use Limitation applies at sites where the risk characterization, excluding the OHM exclusively associated with Anthropogenic Background, also includes limitations on site use and potential exposure in order to document a condition of No Significant

## Risk.

A Permanent Solution with Conditions but No AUL (310 CMR 40.1013) applies at sites where the risk characterization, excluding the OHM exclusively associated with Anthropogenic Background, documents a condition of No Significant Risk for unrestricted use of the site.

Response actions must include at a minimum an Initial Site Investigation, where work is completed within a year of notification. Otherwise, the site must be Tier Classified with a Phase I report and continue with phased response actions.

Historic Fill Delineation - Per 310 CMR 40.1056(2) (a) and (j) (2), a Permanent Solution must contain a clear and accurate description of the disposal site including the location of the areas characterized as Background relative to the disposal site boundaries. A simple way to achieve this requirement is to provide a plan to scale which shows the disposal site boundaries along with locations/landmarks, and the approximate/extrapolated vertical and horizontal Historic Fill boundaries relative to the disposal site/areas of contamination included in the risk characterization. Such a plan is considered the best approach for conveying information about the location of Historic Fill to MassDEP, current and future property owners and others who may reviewing the Permanent Solution Statement, as well as ensuring that Historic Fill is identified and properly managed as part of future site development. A detailed narrative description that identifies the known or implied vertical and horizontal extent of Historic Fill within the site boundaries along with locations/landmarks so that the area can be readily identified may also be provided in addition to a plan, but a description alone is not considered adequate.

Anthropogenic Background, and the subset Historic Fill, is itself a “condition” of the Permanent Solution. Pursuant to 310 CMR 40.1056(2)(j)(2), the documentation related to this condition must be included in the Permanent Solution Statement. *In this regard, it is recommended that the Permanent Solution Statement include information regarding the handling of this material should it be excavated or moved. An LSP may make recommendations in the form of Best Management Practices regarding future use include maintaining the Fill in place, excavation, construction, gardening, etc.* Anthropogenic Background/Historic Fill that is excavated must still be managed as a remediation waste if RCs are exceeded. Pursuant to 310 CMR 40.1067(5) applicable to remedial actions at disposal sites with a Permanent Solution with Conditions where an AUL is not required (i.e., in the case of a Permanent Solution with conditions limited to Historic Fill), which exceed the limited excavation threshold, i.e. 100 yds<sup>3</sup> oil and 20 yds<sup>3</sup> hazardous material, must be conducted under a Release Abatement Measure.

## Attachments:

Table 1: Technical Update entitled “Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil”, 2002.

Table 2: Historic Fill Evaluation Criteria

Notification Exemption Summary

**References:**

- Characterization of Coal Combustion Residues from Electric Utilities – Leaching and Characterization Data, EPA-600/R-09/151 December 2009.
- Coal Combustion Residual Beneficial Use Evaluation, Fly Ash and FGD Gypsum Wallboard, USEPA. February 2014.
- EPRI, Coal Ash: Characteristics, Management and Environmental Issues, Technical Update, September 2009.
- EPRI, Mobilization and Attenuation of Trace Elements in an Artificially Weather Fly Ash, University of Alberta, EPRI EA-4747
- EPRI, Mixtures of Coal Combustion By-Product and Composted Yard Waste for Use as Soil Substitutes and Amendments, Ohio State University Research Foundation, EPRI TR 106682 August 1976.
- Identification of Historic Fill Using Readily Available Information Sources, LSPA Technical Online Journal, M. Zirbel, 4-16-10.
- Historic Fill Material Technical Guidance, NJ Dept. of Environmental Protection, Site Remediation Program, April 29, 2013.
- Gaining Ground: A History of Landmaking in Boston, (Nancy Seasholes, 2003).
- ITRC Incremental Sampling Methodology, [http://www.itrcweb.org/ism-1/Executive\\_Summary.html](http://www.itrcweb.org/ism-1/Executive_Summary.html)
- MassDEP Compendium of Quality Assurance and Quality Control Requirement and Performance Standards for Selected Analytical Methods Used in Support of Response action for the Massachusetts Contingency Plan (MC),WSC-02-320, July 1, 2010
- MassDEP Technical Update entitled “Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil”.
- Methods for Evaluating Application for the Coal Ash and Wood Ash exemption under the Massachusetts Contingency Plan, LSP Association White Paper, October 19, 1999.
- State of Wisconsin Division of Public Health, Correspondence Memorandum “Public Health Implications of Residual Lead and Arsenic in Orchard Soils”, dated March 28, 2000.
- Streamlined Site Cleanup in New York City, USEPA Brownfields and Land Revitalization Technology Support Center and NYC Mayor’s Office of Operations, August 2010
- USEPA. Guidance on Remedial Actions for Superfund Sites with PCB Contamination. Office of Emergency and Remedial Response. EPA/540/G-90/007. August 1990.

**Resources:**

- Historic Aerials and Topographic maps <http://www.historicaerials.com> search by address, town
- Historic USGS maps UNH government Information Dept.  
<http://docs.unh.edu/towns/MassachusettsTownList.htm>
- Sanborn Insurance Map Library – State Library of Massachusetts – Special Collections:  
<http://www.mass.gov/anf/research-and-tech/research-state-and-local-history/sanborn-maps.html>

Table 1.

**MassDEP Identified Background Levels in Soil**

<b>OIL OR HAZARDOUS MATERIAL</b>	<b>Concentration</b>	<b>Concentration</b>
	<b>in "Natural" Soil</b>	<b>in Soil Containing Coal Ash or Wood Ash Associated With Fill Material</b>
	<b>Mg/kg</b>	<b>mg/kg</b>
ACENAPHTHENE <sup>2</sup>	0.5	2
ACENAPHTHYLENE <sup>2</sup>	0.5	1
ANTHRACENE <sup>2</sup>	1	4
ALUMINUM <sup>1</sup>	10,000	10,000
ANTIMONY	1	7
ARSENIC	20	20
BARIUM <sup>1</sup>	50	50
BENZO(a)ANTHRACENE <sup>2</sup>	2	9
BENZO(a)PYRENE <sup>2</sup>	2	7
BENZO(b)FLUORANTHENE <sup>2</sup>	2	8
BENZO(g,h,i)PERYLENE <sup>2</sup>	1	3
BENZO(k)FLUORANTHENE <sup>2</sup>	1	4
BERYLLIUM	0.4	0.9
CADMIUM	2	3
CHROMIUM (TOTAL)	30	40
CHROMIUM(III)	30	40
CHROMIUM(VI)	30	40
CHRYSENE <sup>2</sup>	2	7
COBALT <sup>1</sup>	4	4
COPPER	40	200
DIBENZO(a,h)ANTHRACENE <sup>2</sup>	0.5	1
FLUORANTHENE <sup>2</sup>	4	10
FLUORENE <sup>2</sup>	1	2
INDENO(1,2,3-cd)PYRENE <sup>2</sup>	1	3
IRON <sup>1</sup>	20,000	20,000
LEAD	100	600
MAGNESIUM <sup>1</sup>	5,000	5,000
MANGANESE <sup>1</sup>	300	300
MERCURY	0.3	1
METHYLNAPHTHALENE, 2- <sup>2</sup>	0.5	1
NAPHTHALENE <sup>2</sup>	0.5	1
NICKEL	20	30
PHENANTHRENE <sup>2</sup>	3	20
PYRENE <sup>2</sup>	4	20
SELENIUM	0.5	1
SILVER	0.6	5
THALLIUM	0.6	5
VANADIUM <sup>1</sup>	30	30
ZINC	100	300

(Values rounded to one significant figure.)

<sup>1</sup> In the absence of Fill-specific data, the "natural" soil value has been adopted.

<sup>2</sup> In the absence of data specific to "natural" soil, a lower percentile value from the Fill data set has been adopted.

<b>Table 2 Historic Fill Evaluation Criteria*</b>		
<b>Criteria</b>	<b>Historic Fill?</b>	<b>Comments</b>
Fill from off-site source emplaced prior to 1983	Probably	Site history of filling documented, c.91, historic aerials, town records Boring test pits clearly indicate peat or native material beneath Fill layer
Fill is primarily soil	Probably	>50% of total contaminated mass must be soil-not predominately ash, dredge spoils, construction or demolition debris, no large discrete areas or layers composed of ineligible materials within the filled area
OHM from pervasive use	Probably	Common or typical of widespread use (i.e.: motor vehicle use, power plants, wood or coal burning stoves/furnaces) over an area and not a discrete area. Includes metals, hydrocarbons and/or PAHs.
Does not contain OHM from site operations	Probably	Site history demonstrates no on-site sources of OHM >RCs
Contains Hazardous Waste or chemical by-products	NO	Not eligible for Historic Fill with the exception of Oil, Waste Oil
Is a municipal or burn dump, waste lagoon	NO	Not eligible for Historic Fill
Asbestos	NO	Not eligible for Historic Fill
Herbicides/Pesticides	NO	Not eligible for Historic Fill but may be Anthropogenic Background
Volatile petroleum hydrocarbons (VPH)	NO	Small quantities released in a manner associated with pervasive use could be present but would be expected to be low if disposed prior to 1983. Such small quantities would either biodegrade, volatilize or be diluted to very low concentrations in soil.
EPH	Possibly	Heavier petroleum compounds (i.e.: EPH or TPH) could be found at low concentrations in the 200-500 mg/kg range, but probably not at a level of concern, i.e. > 1000 mg/kg total hydrocarbons.
Non-volatile PAHs (pervasive use)	Possibly	Indicative of a pyrogenic (ash) origin include (benzo(a)anthracene, benzo(a) pyrene, benzo(b)flouranthene, benzo(k)flouranthene, dibenzo(a,h)anthracene and indeno (1,2,3-cd)pyrene). PAHs indicative of a petrogenic (petroleum) origin include naphthalene, 2-methylnaphthalene,phenanthrene,and acenaphthene.
Metals (pervasive use)	Possibly	Arsenic (<100 mg/kg), barium (<1000mg/kg), beryllium (<90 mg/kg), cadmium (<70 mg/kg), chromium (<100 mg/kg), copper (200 mg/kg), lead (<1000 mg/kg), mercury(<20 mg/kg), zinc(<1000 mg/kg), Lead - historically used in paint (buildings, bridges and water towers), gasoline, pipes, and solder.
Lead	NO	Site history of industries which used lead such as paint, battery, glass, munitions herbicide/pesticide manufacturers, and foundries.
Lead	Possibly	A thorough site history rules out an on-site release. Forensic analysis supports the identification of lead in paint chips or presence in coal/wood ash.
Lead paint in soil	Possibly	If moved from original location (exempt if found at its original on-site location). History indicates lead is likely from paint used in buildings, or on infrastructure and forensic analysis supports assertion.
Polychlorinated biphenyls (PCBs)	NO	Used in a number of industrial and commercial products. Unlikely that PCBs would be present in "Historic Fill" at concentrations which consistently and/or significantly exceed 1 mg/kg. Background – PCBs between 0.1 and 1.0 mg/kg (USEPA -1990)

\* Fill material, based on the weight of evidence and consistent with the CSM. These are ONLY guidelines and may not be applicable in ALL cases. While staff shall not categorically dismiss assertions that soils containing these contaminants in excess of these guidelines meet the definition of Historic Fill, proponents must present a robust argument in this regard, including, as appropriate, literature citations and/or forensic analytical data.

## Reporting Exemption Summary

### Exemptions:

Conditions that are categorically exempted from the definition of release or disposal site under c. 21E and the MCP are “Anthropogenic Background” pursuant to clause (c) of the Anthropogenic Background definition which thereby negates the need to evaluate such OHM as part of a Historic Fill evaluation. These conditions also have reporting exemptions at 310 CMR 40.0317.

However, other conditions that have reporting exemptions are NOT exempt from regulation under c. 21E and the MCP. These “reporting only” exemptions may or may not meet the definition of Historic Fill (assuming, of course, that the site in question was otherwise reportable and therefore known to MassDEP).

The LSP in the Conceptual Site Model must evaluate all OHM to determine or make a reasonable case for how the OHM came to be present, whether it meets the definition of Anthropogenic Background or Historic Fill and therefore can be excluded from the Risk Characterization.

There are 3 types of “exempted” conditions germane to Anthropogenic Background and Historic Fill:

- Conditions that are *categorically* exempted from regulation under c. 21E and the MCP;
- Conditions that are *conditionally* exempted from regulation under c, 21E and the MCP;
- Conditions that are exempted from *reporting* under the MCP.

1. Conditions that are categorically (i.e., in all cases) exempted from regulation under c. 21E and the MCP (i.e. Anthropogenic Background) are OHMs that are attributable to:

- emissions from engine exhaust (lead and pyrogenic PAHs); and
- pesticides/herbicides at concentrations consistent with application/label instructions

Note that these exemptions apply even in cases where impacted soils were moved from their original locations. In general, impacts of this nature should be presumed for pre-1983 fills where:

- lead < 300 mg/kg (pesticide and lead emissions).
- pyrogenic PAHs < PAHs in MassDEP’s Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (2002) (“Table 1 attached).
- arsenic < 40 mg/kg AND there is a known site history of Lead Arsenate pesticide use.

2. Conditions that are conditionally (i.e., in some cases) exempted from regulation under c. 21E and the MCP consist of:

- lead-based paint at the point of original application

It is important to note that this exemption would NOT apply to soils that were moved from the point where the lead-based paint was originally applied (i.e., as will be the case in many Historic Fill situations). However, this point is largely moot, given that in most cases such conditions may otherwise meet the definition of Historic Fill as a ubiquitous area-wide contaminant, as discussed further below. Note also that contaminants associated with lead-based paints may include other heavy metals and even PCBs at low levels, though these require case-specific rationale and justification.

3. Lastly, conditions that are exempted from reporting under the MCP, but have been previously reported or are present at a disposal site with OHM that otherwise requires notification, include:

- coal, coal ash, or wood ash (excluding wood ash from preserved/pressure- treated lumber, which contains arsenic, copper, and chromium);,
- the asphaltic binder in bituminous pavement (hydrocarbons and petrogenic PAHs);
- piers, pilings, utility poles (hydrocarbons and petrogenic PAHs)

Conditions that are reported to MassDEP are subject to the review criteria discussed below. Table 1 provides a one-page summary of the Historic Fill criteria and approximate concentrations of OHM to be expected.