

US EPA ARCHIVE DOCUMENT

## Releases of Hazardous Constituents Associated With Derived-From and Mixture Wastes October 14, 1999

The mixture and derived-from rules are a part of the RCRA regulations that define which wastes are considered to be hazardous and therefore subject to RCRA Subtitle C regulations. The mixture rule refers specifically to 40 CFR 261.3(a)(2)(iii) and (iv). Under the mixture rule, a solid waste becomes regulated as a hazardous waste if it is mixed with one or more listed hazardous wastes. The derived-from rule discussed refers specifically to 40 CFR 261.3(c)(2)(i). Under the derived-from rule, any solid waste generated from the treatment, storage, or disposal of a hazardous waste remains regulated as a hazardous waste. These derived-from wastes include wastes such as sludges, spill residues, ash, emission control dust, and leachate.

The Agency has identified many damage cases associated with derived-from and mixture wastes. For example, in an appendix in the preamble to the January 4, 1985 final rule on the definition of solid waste, EPA identified 67 damage incidents resulting from the recycling of hazardous wastes. Although the summaries provided by EPA do not specifically identify derived-from and mixture wastes, many of the damage incidents involve the handling and recycling of listed hazardous wastes. Accordingly, the resulting contamination and hazards posed at these sites can be attributable to derived-from and mixture wastes, e.g., residues from the recycling of listed hazardous wastes. (50 Fed. Reg. 614, 658). However, in many cases it is difficult to determine at what point in time the environmental damage occurs on a site.

In addition, the Agency has also identified sites in Table 1 that are likely the result of derived-from and mixture wastes since 1985. These case studies also indicate that derived-from and mixture waste are associated with RCRA corrective actions and closures in which a significant number of facilities show high concentrations of hazardous constituents in soils and groundwater in the vicinity of units that contained a listed waste. This problem is more pervasive in areas where the hazardous waste management site is located upstream of the source of water. Similarly, the mixture rule is applicable in cases where significant contamination has occurred from a mixture of leachates and it is difficult to segregate the source of a leachate (when facilities manage both solid waste and hazardous wastes). Soils can also be contaminated by direct contact with hazardous wastes or by indirect contact like spills, "tracked-out" by machinery or personnel that work within the site boundaries, and wind dispersion. (See, e.g., Lorentz Barrel & Drum Co., CA and Raymark Industries, Inc., CT). Finally, several examples have been cited where surface impoundments containing a mixture of solid and hazardous wastes have been the source of soils and groundwater contamination (e.g., Contract Plating Co., CT; IT Vine Hill Complex, CA). A more detailed summary of the sites listed in the Table below are provided in an appendix to this document.

Table 1. Releases of Hazardous Constituents Associated With Derived-From and Mixture Wastes

Site	Waste	Description
Kerr McGee Chemical Corp, ID	Derived-From	Superfund National Priority List (NPL) site that utilizes the by-product from ferrous-phosphate solids. Groundwater contaminated with vanadium, arsenic, copper, and silver. 8/30/90
Lorentz Barrel & Drum Co., CA	Mixture, Derived-From,	Superfund site with contaminated ground water resulting from incinerator ash, residual liquids and sludges. Contamination includes metals, organics, and polychlorinated biphenyls (PCBs). 10/4/89
Marine Shale Processors, LA	Mixture, Derived-From	Incineration of hazardous wastes resulting in a hazardous residual. Aggregate sold found to leach high concentrations of heavy metals. Ash piles and surrounding area contaminated with toluene, benzene, cadmium and lead. 4/18/96
General Electric Co., Bridgeport Facility, CT	Derived-From	Closure Plan for sludge drying beds presents evidence of release. Soils contaminated with oil and grease, polychlorinated biphenyls (PCBs), volatile organic compounds, cadmium, chromium; groundwater contaminated with lead. 2/88
Raymark Industries, Stratford, CT	Mixture, Derived-From	Corrective action at hazardous waste management facility. Groundwater contaminated above health based standards for cadmium, chromium, lead, cyanide, barium, copper and high concentrations of organics. 3/22/91
Contract plating Co., CT	Derived-From, Mixture	Closure plan for hazardous waste areas presents evidence of high levels of cyanide and metals in soils from waste treatment and waste piles. 12/1/88
IT Vine Hill Complex, CA	Derived-From	Sludges disposed in impoundments resulting in release of organics into soil and groundwater. 1/21/91
Tennessee Eastman, TN	Derived-From	Facility has on-site hazardous waste landfill that accepts incinerator ash resulting in groundwater contamination. 1/91
International Paper, TX	Derived-From, Mixture	Soil contaminated with constituents from K001 waste; polynuclear aromatic hydrocarbons (PAHs) range from 100 – 10,000 parts per million. 1/15/92

The damage incidents cited above are indicative of why the derived-from and mixture rules are necessary to regulate hazardous wastes in a way that protects human health and the environment. Many hazardous wastes continue to be toxic after they have been mixed with other waste or have been treated. Without the derived-from and mixture rules, such wastes could escape coverage of

RCRA Subtitle C regulations, while nevertheless posing risks to human health and the environment, and EPA would have fewer options to address the potential hazards posed by derived-from and mixture wastes.

## APPENDIX

### Case Studies on Releases of Hazardous Constituents Associated with Derived-from and Mixture Wastes

Site name - Kerr McGee Chemical Corp. (KMCC), ID

Wastes – The derived-from waste in ponds and the groundwater indicated the presence of arsenic, cadmium, chromium, lead and vanadium as well as three organic compounds.

Waste code(s) - P120 - Vanadium

Description- The 332 acre site owned by KMCC, includes a vanadium production plant on 80 acres of land. Ferrophosphorous (FeP) ore and limestone were the principal raw materials used. Production process by-products and waste materials were stored in three unlined surface impoundments: the solvent extraction pond, scrubber pond, and the calcine tailings pond. Roaster (used for producing water soluble sodium vanadine) reject materials stored above ground and the migration of windblown calcine tailings to surrounding land were cause for potential human exposure concerns. Industrial wastewater generated by the production process was stored in unlined ponds in various locations at the site. A maximum of 210 gallons per minute of excess water was discharged to an unlined scrubber pond, which accumulated an estimated 300 tons per year of scrubber residuals. After leaching, the solids were sluiced to a calcine tailings pond, where approximately 55,000 tons of leached calcine tailings were stored per year. However, two ponds on the property were reported to have holes in the bottom, resulting in the loss of 650,000 gallons of raffinate from the settling pond into the groundwater and 2.5 million gallons from the S-X pond.

This site was listed on the Superfund National Priorities List (NPL) on October 4, 1989 after a site investigation was conducted in April 1988.

Source - Kerr-McGee Chemical Corp. (Soda Springs), Record of Decision Abstract.

<http://www.epa.gov/superfund/sites/rodsites/1000190.htm>

Site name - Lorentz Barrel & Drum Co.(LB&D), CA

Waste - Groundwater contamination with volatile organic compounds (VOCs) resulting from incinerator ash, sludge and residual liquids (Derived-from waste). Soil contains polychlorinated biphenyl (PCBs), heavy metals including arsenic and lead, pesticides and VOCs (Mixture waste).

Waste code(s) - F001 - Tetrachloroethylene; F002 - Trichloroethane; F024 - 1,1,  
Dichloroethylene

Description – The LB&D site, a drum recycling facility was located directly above a major source of potable ground water in the South San Francisco Bay area with three public water supply well fields within 1 mile of the site. The drum recycling process used various methods involving caustic and acid washes, incineration, blasting with steel shot, steam cleaning, phenolic epoxy resins and rust inhibitors. Between 1950 and 1978, a drainage ditch from the processing facility was utilized to drain wastes to a large sump, which in turn discharged into a storm water drainage system and from 1968 to 1971, the discharge was diverted to a sanitary sewer which stopped in 1984.

Thereafter, liquid wastes were evaporated, drummed and disposed off as hazardous waste along with incinerator ash, residual liquids and sludge. Surface runoff was collected and recycled in hot

caustic wash cycle. The treatment residues from the recycling operations contaminated soil, structures, and shallow ground water. The plant was closed in 1987.

The facility has been listed in the Superfund NPL since October 9, 1989. This site is being addressed in three stages: immediate actions and two long-term remedial phases focusing on cleanup of the entire site and groundwater

Source- Lorentz Barrel & Drum Co. (LB&D), CA, Record of Decision (ROD) Abstracts  
<http://www.epa.gov/superfund/sites/rodsites/0901287.htm>

Site name- Raymark Industries, Inc., CT

Waste – The derived-from and mixed wastes generated and stored at this facility caused soil and groundwater contamination with hazardous substances, above health-based standards, like asbestos, cadmium, chromium, lead, cyanide, barium, copper, arsenic, PCBs and high concentrations of organic compounds.

Waste code(s) - U052 - Cresol; U122 - Formaldehyde; U188 - Phenol; U220 - Toluene; K062 - Spent pickle liquor from steel finishing; F001 - Tetrachloroethylene; F005 - Spent halogenated solvents

Description – The Raymark Inc. site manufactured automotive and heavy vehicle friction parts as well as adhesives and resins from 1919 to 1989. In addition to generating asbestos, metals and phenol-formaldehyde from its production process, this facility was also a registered treatment, storage and disposal facility.

The manufacturing wastes, like waste lead and asbestos dust, were disposed of in several unlined lagoons located on the property. From time to time, the lagoons were dredged for fill-material used on site and in other parts of the city. Of the several spills that occurred at the site, the largest was the leakage of an unknown amount of toluene from a 10,000 gallon underground tank in 1984. In the same year, 6,000 gallons of 1,1,1-trichloroethane spilled from an above ground tank. In addition, the facility handled hazardous wastes like cresol, formaldehyde, phenol, toluene, ignitable wastes, and corrosive wastes. The soils were contaminated with asbestos, lead, copper, PCBs, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) and others, as a result of mixture with the materials used. Analyses performed by Raymark indicated that the material in the lagoons contained as much as 75% asbestos and was hazardous for lead leachability (greater than 5 PPM - lead). The groundwater analysis found metals contamination at levels higher than prescribed health standards for cadmium, copper, chromium, lead, cyanide and barium. In addition there was potential for inhalation exposures to airborne asbestos and/or VOCs.

The manufacturing plant was closed in 1989, corrective actions suggested by EPA Region I officials on March 22, 1991 and the site thereafter listed in the Superfund NPL on April 25, 1995.

Source – (1) Raymark Industries, Inc., Record of Decision (ROD) Abstracts

<http://www.epa.gov/superfund/sites/rodsites/0100094.htm>; (2) Julie Belaga. March 22, 1991.

“Determination of Release of Hazardous Waste into the Environment from a RCRA Facility”, United States EPA Region I.

Site name – Marine Shale Processors, LA

Wastes – The treatment residuals were contaminated with toluene, benzene, cadmium and lead (derived-from wastes). Also surrounding air and soil contaminated.



Waste code(s) - K035 - Wastewater treatment sludges generated in the production of creosote  
Description - Marine Shale Processors (MSP), recycled hazardous wastes by using a rotary kiln. The company filed a permit application to run as a kiln and produce a commercial aggregate (or rock-like ash) which could be used as roadbed and construction fill. The company was recycling the hazardous waste by burning it at high temperatures (sometimes in excess of 2000 degrees Fahrenheit) in a rotary kiln using oxidizers and slag boxes, and producing ash (also called aggregate). The process generated substantial quantities of smoke, flue gases and air particles which incorporated carcinogenic heavy metals. Moreover, the aggregate sold was found to leach high levels of lead and calcium. The EPA required the ash or aggregate be put into a hazardous waste landfill instead of being accumulated on site. As a result of the treatment process, the residual ash piles and surrounding area were contaminated with toluene, benzene, cadmium, and lead.

Contamination at the site was discovered in October 1989 and a preliminary assessment was completed by January 1990. The facility was shut down in July 1996, but was not placed on the Superfund NPL. EPA filed an enforcement case against MSP and an out-of-court settlement was reached at in 1997.

Source- (1) Fed. Officials says Marine Shale, EPA closing in on deal. September 10, 1997. [http://www.leanweb.org/Marine\\_Shale,\\_EPA\\_Closing\\_.html](http://www.leanweb.org/Marine_Shale,_EPA_Closing_.html). (2) United States of America, et.al. vs. Marine Shale Processors, in the United States Court of Appeals for the 5<sup>th</sup> Circuit, no. 94-30664. <http://www.ca5.uscourts.gov/opinions/pub/94/94-30664-cv0.htm>. (3) U.S. Department of Health and Human Services, Public Health Service Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Atlanta, Georgia  
Petitioned Public Health Assessment Marine Shale Processors [http://atsdr1.atsdr.cdc.gov/HAC/PHA/marinesp/msp\\_p1.html#\\_1\\_4](http://atsdr1.atsdr.cdc.gov/HAC/PHA/marinesp/msp_p1.html#_1_4)

Site name - Contract Plating Co., Stratford, CT

Waste – High levels of cyanide and metals discovered in soils from waste treatment sludge and waste storage piles.

Waste code(s) - F006 - Wastewater treatment sludges from electroplating operations  
Description – This Company stored their waste in four old sludge drying beds and sludge piles. The unlined sludge drying beds included under drainpipes, 1 foot each of gravel and sand, and sludge on top. The under drains returned to the wastewater treatment building adjacent to the drying beds. The sludge drying beds were cleaned by removing the sludge layer and the top one foot of sand layer which were then sent off to a facility in Canada. The sludge drying beds have not been in use since 1985. In spite of the removal, visible pockets and veins of sludge material were seen in the soil where the sludge waste pile had been. An EPA investigation in September 1988, found samples of derived-from sludge waste to be contaminated with high levels of cyanide and total metals. The cyanide levels ranged from 1.2 PPM to 672 PPM and metals up to 6 percent for zinc and 2 percent for nickel. Other metals discovered at harmful levels include cadmium, chromium, copper and lead. Though cyanide concentrations of 1 PPM were found in clean sand just 3 foot into the ground, the sludge had also migrated into the more porous veins of soil indicating deeper cyanide contamination.

EPA suggested that additional steps need to be taken by Contract Plating as part of the closing of these hazardous waste areas to reduce contamination to background levels for metals

and cyanide. EPA Superfund program completed the site Removal Assessment in February 1995 and determined that the site will not be on the NPL.

Source – (1) Memorandum by Daniel S. Granz, United States Environmental Protection Agency, Region I, Lexington, Massachusetts. December 1, 1988. (2) Archive NFRAP Sites, <http://www.epa.gov/superfund/sites/arcsites/reg01/a0102775.htm>

Site Name- IT Vine Hill Complex, CA

Waste – Both sections of the Complex managed primarily derived-from sludge waste and released organics into soil and groundwater.

Waste code(s) - K151 - Wastewater treatment sludges generated during the treatment of wastewaters from the production of alpha-chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides and compounds with mixtures of these functional groups

Description – The IT Vine Hill Complex has 2 sections – Vine Hill and Baker. The Vine Hill section of the site received wastes from off-site which were then treated in either a permitted tank system or frequently reconfigured surface impoundments. The surface impoundments have been inactive since 1988 and the 286,300 cubic yards of sludge has been drying. The tank system was also dismantled. The Baker section of the site received wastes derived from treatment processes at the Vine Hill section by pipeline. This section also contained surface impoundments containing 200,700 cubic yards of sludge. According to information available in 1991, the sludge was expected to fail the TC test. The facility also reportedly released organics into soil and groundwater.

According to archive information, the site was first identified as a potential Superfund site on November 1, 1979, preliminary investigation and first site assessment was completed on December 1, 1986 and final site inspection completed on June 24, 1992. The EPA, thereafter, decided not to add the site to the Superfund NPL.

Source – (1) Appendix MDIF 50004.K to Memo by Matthew Hale, January 21, 1991. “Data on Mixture and Derived-from Wastes from Closures and Corrective Actions at Hazardous Waste Management Facilities.” United States EPA, Office of Solid Waste and Emergency Response, Washington DC. (2) Archive NFRAP Sites, <http://www.epa.gov/superfund/sites/arcsites/reg09/a0900905.htm>

Site name - Tennessee Eastman, TN

Wastes – Derived-from wastes - incinerator ash and fly ash and incinerator scrubber waste, sewage and sludge.

Waste code(s) - F002 - Spent halogenated solvents (Trichloroethylene, Tetrachloroethylene)

Description – This facility has three incinerators treating wastes from four Eastman Company locations. A very large wastewater treatment system treated significant quantities of incinerator scrubber waste and sewage, and generated between 500-600 tons of derived-from sludge per day. 3-4 large surface impoundments were used for treating the scrubber water. These units also managed only derived-from wastes. Groundwater contamination by the impoundments had been documented. The sludge from the incinerator waste treatment were burned in 8 BIF units which were suspected of not meeting the BIF standards besides managing primarily derived-from wastes. The facility also had an on-site hazardous waste landfill, which accepted derived from wastes like incinerator ash and fly ash. Neither the wastewater nor the sludge was suspected of exhibiting the hazardous toxicity characteristic.



Source – Appendix MDIF 50004.K to Memo by Matthew Hale, January 21, 1991. “Data on Mixture and Derived-from Wastes from Closures and Corrective Actions at Hazardous Waste Management Facilities.” United States EPA, Office of Solid Waste and Emergency Response, Washington DC.

Site name – General Electric Company, Bridgeport Facility, CT

Wastes – Derived-from wastes of treatment processes containing hazardous wastes like PCBs, VOCs, cadmium, chromium; Soils contaminated with oil and grease, PCBs, VOCs, cadmium, copper, nickel, zinc, etc; Groundwater contaminated with lead and VOCs.

Waste code(s) - F006 - Wastewater treatment sludges from electroplating operations

Description – This was a hazardous waste management facility. Drums containing unknown materials were stored in an area located at the north end of the property and southeast of the landfill belonging to this Company. Large cable reels and spools were also maintained and stored in this area. Aerial photographs from 1949-1985 show walled-pits with light and dark toned materials, which indicated the presence of such drums. Soils have shown contamination of oil and grease, PCBs and VOCs. Soil samples also indicated presence of high levels of cadmium, copper, nickel, lead and zinc. Groundwater samples collected from wells at the unit also indicated the presence of VOCs. PCB concentration range from 0.55 to 8.7 PPM in soil samples collected from the surface and at 5ft. below the surface. The same sample detected VOC presence at a range of 0.010 – 89 PPM.

In addition, the closure plan for sludge drying beds presented evidence of releases of hazardous waste from several other sites on this Company’s property, such as an industrial solid waste landfill; the Stillman’s Pond which received discharges from the wastewater treatment plant, drainage from sludge drying beds, contact cooling waters from wire and extrusion processes, NPDES discharges periodically exceeding permitted levels, and fuel oil possibly containing waste oil. This pond was dredged in 1938 and the sediment deposited in the landfill area.

This site was identified as a hazardous waste site in 1981 and a preliminary assessment was conducted on March 1, 1983.

Source – (1) “Closure Plan, Sludge Drying Beds” prepared by General Electric Company, Bridgeport Facility, February 1988 submitted as Appendix MDIF 50004.U to Memo by Matthew Hale, January 21, 1991. “Data on Mixture and Derived-from Wastes from Closures and Corrective Actions at Hazardous Waste Management Facilities.” United States EPA, Office of Solid Waste and Emergency Response, Washington DC. (2) CERCLIS Hazardous Waste Sites, <http://www.epa.gov/superfund/sites/cursites/c3ct/a0100009.htm>.

Site name – International Paper Company, TX

Wastes – Derived-from sludge wastes from treatment of wood treatment wastewaters.

Waste code(s) - K001 - Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol

Description – This facility used six closed surface impoundments situated on-site to manage derived-from sludge wastes generated from wood treatment processes. This waste was the bottom sediment sludge from the treatment of wastewater from wood preserving processes which used creosote and/or pentachlorophenol. Soil in the facility was contaminated with constituents from K001 waste and polynuclear aromatic hydrocarbons (PAHs) ranged from 100-10,000 PPM.

The plant was closed in 1983. EPA inspected the site on December 1, 1984 and conducted a preliminary assessment on July 1, 1985. However, the site was not listed on the Superfund NPL. Source – (1) “Fact Sheet for Issuance of RCRA Permit”, International Paper Company submitted as Appendix MDIF 50004.G. to Memo by Matthew Hale, January 21, 1991. “Data on Mixture and Derived-from Wastes from Closures and Corrective Actions at Hazardous Waste Management Facilities.” United States EPA, Office of Solid Waste and Emergency Response, Washington DC. (2) Archive NFRAP Sites, <http://www.epa.gov/superfund/sites/arcsites/reg06/a0602056.htm>