

**Case Inventory Document  
Garfield Avenue Group of Sites  
Remedial Investigation Report - Soil**

I. Area(s) of Concern, Receptor and Emergency Response Tracking	Impacted Media	Contaminants of Concern	Exposure Route <sup>1</sup>	Receptors		Current Status/Outcome
				Existing	Potential	
Site 114	Soil	Hexavalent chromium, TAL Metals, VOCs, SVOCs, and PCBs	Inhalation and Direct Contact (if soils are excavated)	Groundwater	Site is vacant. IRMs prevent contact and/or inhalation of soil and dust. Potential receptors include construction and remediation workers.	<p>Site 114 was used for the processing of chromate ore from 1911 into the mid 1960s. The fill material used to raise the Site above an organic meadow mat layer included Chromium Chemical Processing Waste ("CCPW"). Soil investigation activities at Site 114 began in 1982, although enforcement actions and remedial measures were not implemented until 1985. Site 114 has been extensively investigated as documented in the 2003 Remedial Investigation Work Plan (RIWP), the 2006 Remedial Investigation Report (RIR), the 2006 RIWP, the September 2006 RIWP, the March 2011 RIWP, and the November 2011 Draft RIR.</p> <p>PPG signed an Administrative Consent Order with NJDEP in 1990 and a Judicial Consent Order ("JCO") in 2009 agreeing to conduct Remedial Investigation ("RI") and Remedial Actions ("RA") at the Site. A series of Interim Remedial Measures ("IRMs") were implemented to prevent direct contact with on-site soils and to prevent groundwater from seeping from the Site onto nearby Garfield Avenue.</p> <p>The most widespread contaminant observed in soil and groundwater was hexavalent chromium (Cr<sup>+6</sup>). Other compounds were reported at concentrations exceeding regulatory limits, but their areal extent is generally less than Cr<sup>+6</sup>. Hexavalent chromium was reported in the fill material above the meadow mat at concentrations above the interim NJDEP Chromium Soil Cleanup Criteria ("CrSCC") throughout most of Site 114, with higher concentrations observed in the northwest quadrant of the Site. Concentrations were much lower at the perimeter of Site 114, especially along the eastern and western property boundaries. Concentrations of Cr<sup>+6</sup> in soils decrease with depth. The meadow mat and a silt layer beneath it appear to impede the downward migration of Cr<sup>+6</sup> into deeper soils. The Cr<sup>+6</sup> reported in soils below the meadow mat is due to Cr<sup>+6</sup> leaching downward from the source material in the fill.</p> <p>Target Analyte List (TAL) metals other than Cr<sup>+6</sup> and Cr were reported in soils throughout the Site and are found within the same areas as Cr<sup>+6</sup> impacts. PCBs were reported in 3 on-site locations with the highest concentrations located in the north-central Site area. VOCs related to former PSE&amp;G MGP operations were reported in the eastern half of Site 114. Isolated chlorinated solvent exceedances, specifically PCE, were reported in a few northern Site areas. SVOCs were detected above the soil cleanup criteria in shallow and deeper soils, mainly due to former PSE&amp;G MGP operations on the eastern portion of the Site.</p> <p>Contaminants of concern ("COCs") are well characterized on and adjacent to Site 114. However, additional delineation is required in a few areas adjacent to the Site 114 border to refine the delineation of Cr<sup>+6</sup> and TAL Metals.</p>
	Groundwater	Hexavalent chromium, TAL Metals, VOCs, and SVOCs	Direct Contact (during groundwater sampling activities)	Surface Water if Combined Sewer System Overflows	Groundwater sampling crews. Groundwater is not used for potable purposes.	<p>Based on the 2003 and 2005 RIs, groundwater COCs have migrated downward from buried CCPW through discontinuities in the meadow mat. RI results indicate that Cr<sup>+6</sup> was mainly found throughout Site 114 but did not migrate very far off-site. The highest concentrations of Cr<sup>+6</sup> were found in the shallow and intermediate groundwater zones. The shallow Cr<sup>+6</sup> plume appears to originate in the former chromate ore processing area and beneath the former waste stockpiles. Hexavalent chromium in the intermediate groundwater zone appears similar to the shallow zone with the highest concentrations found in areas where the meadow mat is suspected of being absent or discontinuous. Hexavalent chromium concentrations in the deep groundwater zone were much lower than in the intermediate and shallow zones. Lenses of lower permeability soils appear to retard downward migration of COCs in the groundwater.</p> <p>COCs other than Cr<sup>+6</sup> and Cr were reported less frequently than Cr<sup>+6</sup> and Cr at concentrations exceeding the NJDEP Groundwater Quality Standards ("GWQS"). These COCs include: TAL Metals (Al, Sb, As, Be, Cd, Co, Fe, Pb, Mn, Hg, Ni, Na, Tl, and Zn), VOCs (benzene, chlorobenzene, cis-1,2-DCE, 1,1-DCE, ethylbenzene, styrene, PCE, toluene, TCE, xylenes, and vinyl chloride).</p> <p>In general, TAL Metals were found in groundwater at various locations across Site 114. For most of these metals, lower concentrations were reported in the eastern portion of Site 114 than in the western portion, possibly due to the gravel and geosynthetic liner present on the eastern portion of the site that may be mitigating leaching.</p> <p>Petroleum compounds were generally found in the shallower groundwater zones. The presence of these compounds in groundwater predominantly on the eastern side of Site 114 is attributed to the former PSE&amp;G MGP activities. SVOCs were only detected sporadically in groundwater across Site 114. Most SVOCs appear related to former MGP operations or result from historic fill materials.</p> <p>In June 2011, monitoring wells were sampled for Cr<sup>+6</sup> and CCPW metals for the preparation of a Groundwater RIWP. Additional groundwater evaluation will be conducted upon completion of the Soil RI.</p>

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Site 132	Soil	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Inhalation and Direct Contact (if soils are excavated)	Groundwater	Parcel is abandoned with vacant warehouse. IRMs prevent contact and/or inhalation of soil and dust. Potential receptors include construction and remediation workers.	<p>On October 26, 1989, the NJDEP collected four surface soil samples and one wall scraping sample for total chromium analysis. Elevated levels of total chromium were detected in all five soil samples. In May 1990, PPG collected 26 surface and three subsurface soil samples for total Cr and Cr<sup>+6</sup> analysis.</p> <p>On October 9, 1990 CCPW was reportedly observed on the ground surface at Site 132 during a NJDEP inspection. PPG collected one interior soil sample and two chip samples in November 1990 for total Cr and Cr<sup>+6</sup> analysis. Total Cr was reported at 8.6 mg/kg in the soil sample but Cr<sup>+6</sup> was not detected at or above the method detection limit ("MDL"). No elevated Cr levels were reported in the chip samples. PPG prepared an IRM Workplan on May 13, 1991. Exterior IRM work consisting of grading and paving, began on October 29, 1991. On December 2, 1991, PPG installed fencing at the north yard area. Fencing was completed during the week of June 1, 1992.</p> <p>Approximately 12 soil borings were advanced on Site 132 in January through March 2007. Analytical results showed Cr<sup>+6</sup> and TAL Metal exceedances greater than the May 1999 NJDEP NRDC SCC.</p> <p>Borings advanced during the 2011 Soil RI completed the delineation of COCs on Site 132.</p>
	Groundwater	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Direct Contact (during groundwater sampling activities)	None, groundwater is not potable in Jersey City	Groundwater sampling crews.	<p>In March 2007, two groundwater monitoring wells were installed and subsequently sampled in May 2007. Analytical results reported Cr<sup>+6</sup> and TAL Metal exceedances greater than the GWQS. In June 2011, monitoring wells were sampled for Cr<sup>+6</sup> and CCPW metals. Analytical results were below the GWQS. Additional groundwater investigation will be conducted during an upcoming groundwater RI.</p>
Site 133	Soil	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Inhalation and Direct Contact (if soils are excavated)	Soil	Construction and remediation workers. Building employees; however, IRMs are in place to prevent contact and/or inhalation of soil and dust and/or wall surfaces.	<p>RI activities conducted at Site 133 (22 Halladay Street) include soil borings, analytical soil sampling, and visual inspection for CCPW material. In November of 1989, 13 samples from the building walls and soil samples at the base of the walls were collected by the Hudson Regional Health Commission (HRHC). Yellow crystals were observed on the wall. NJDEP also collected 3 wall samples at the same time. Hach® Kits were used to provide screening results that reported the presence of soluble chromium. HRHC returned and collected additional wall samples in Bldg # 7 during August of 1990.</p> <p>PPG initiated IRM activities in April 1990 at Site 133. In 1991, during the ongoing IRM installation, 12 shallow soil samples were collected at the exterior northern end of 22 Halladay Street and analyzed for Cr<sup>+6</sup>. Hexavalent chromium was not detected in these samples. IRM activities which included Interior/Exterior wall and soil surface coverings began on July 10, 1991, and continued intermittently until they were completed on September 27, 1991. Chromium blooms were observed at three general locations at 22 Halladay Street including: on interior walls and the rear exterior wall in Building 2; on the interior wall that separates Building 3 and 4; and on the interior wall that separates Buildings 6 and 7. CCPW was reported in an excavation during closure of a UST located adjacent to Building 2, and CCPW was reported in monitoring well boring MW-1, also adjacent to Building 2 (Vectre Corporation, 1992).</p> <p>Approximately 30 soil borings were advanced on Site 133 between December 2006 and April 2007. Analytical results showed TAL Metal exceedances were detected at concentrations greater than the SCC.</p> <p>Borings advanced during the 2011 RI indicated that additional delineation is required westward from the 15 Halladay Street portion of Site 133 for Cr<sup>+6</sup> and CCPW metals.</p>
	Groundwater	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Direct Contact (during groundwater sampling activities)	Groundwater	Groundwater sampling crews. Groundwater is not used for potable purposes.	<p>Six groundwater monitoring wells were installed on Site 133 in April and May 2007 and subsequently sampled in May 2007. Groundwater analytical results indicated that TAL Metals exceeded the GWQS in several samples. In June 2011, the monitoring wells were sampled for Cr<sup>+6</sup> and CCPW metals. Analytical results indicated one total Cr exceedance of the GWQS. Additional groundwater investigation will be conducted during an upcoming Groundwater RI.</p>

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Site 135	Soil	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Inhalation and Direct Contact (if soils are excavated)	Groundwater	Building employees; however, IRMs are in place to prevent contact and/or inhalation of soil and dust.	<p>Past investigation activities at this site includes interior sampling of the walls and floors and exterior sampling of the soils in the surrounding area. Site investigation activities conducted at Site 135 in particular, had been limited to minor soil sampling. During IRM activities at this site, 12 shallow soil samples were collected between 0 and 6 inches depth at the exterior northern end of Site 135 and analyzed for Cr<sup>+6</sup>. Hexavalent chromium was undetected in most of these samples.</p> <p>Between December 2006 and March 2007, approximately 15 soil borings were advanced on Site 135. Analytical results showed TAL Metal exceedances greater than the SCC.</p> <p>Borings advanced during the 2011 Soil RI indicate that Site 135 is fully delineated, with the exception of one location on the eastern border of the site for CCPW metal impacts.</p>
	Groundwater	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Direct Contact (during groundwater sampling activities)	None, groundwater is not potable in Jersey City	Groundwater sampling crews.	<p>In March and April 2007, 5 monitoring wells were installed and subsequently sampled in May 2007. Analytical results indicated TAL Metals at concentrations exceeding the GWQS. In June 2011, monitoring wells were sampled for Cr<sup>+6</sup> and CCPW metals. Analytical results indicated that there were no exceedances of the GWQS. Additional groundwater investigation will be conducted during an upcoming groundwater RI.</p>
Site 137	Soil	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Inhalation and Direct Contact (if soils are excavated)	Groundwater	Building employees; however, IRMs are in place to prevent contact and/or inhalation of soil and dust.	<p>Historically, Site 137 was associated with the operation of the former chromite ore processing facility located on Site 114. No chromate ore processing was conducted on Site 137. However, Site 137 was historically utilized for stockpiling CCPW that was generated from the operations on Site 114.</p> <p>A number of preliminary environmental investigations were conducted at Site 137 since 1984. These investigations have included interior sampling from the shelves, walls and floors of the Rudolf Bass building at 45 Halladay Street, and exterior sampling of the on-site soils. Results reported from these investigations show elevated total Cr and Cr<sup>+6</sup> concentrations on interior building surfaces and in shallow soils outside of the building. Based upon these findings, IRMs were implemented as described in a December 1991 IRM Workplan.</p> <p>Exterior IRM activities included asphalt pavement or gravel covers in areas with visible CCPW and areas where elevated chromium and/or Cr<sup>+6</sup> were reported. A sump was installed at the east loading dock area to collect and transfer impacted storm water and the loading dock area was paved. Sixteen truckloads of Cr-impacted soil were removed from the rear fenced lot area of Site 137 and the area was regraded to direct storm water drainage away from the building.</p> <p>IRM activities within the Site 137 building included covering Cr-impacted interior walls with 6-mil polyethylene and plywood. The interior IRM was implemented on November 26, 1991 in accordance with the Final IRM Work Plan. Wall coverings were installed along the east and west interior walls and a sump on the interior building floor was backfilled, abandoned and sealed. Final IRM activities at the site included covering the exterior wall of the below grade loading dock at the east side of the building with 30-mil PVC liner and plywood. The interior IRM activity was completed on August 28, 1992.</p> <p>Previous investigations focused on surface soils at the Rudolf Bass property of Site 137. Elevated total Cr and Cr<sup>+6</sup> concentrations were reported along the south and southeast portions of the building and in the northwestern corner of the property. Elevated levels of total Cr and Cr<sup>+6</sup> in surface soils were also reported along the eastern wall of the building. However, no sub-floor soil samples were collected during these investigations. Twenty additional soil borings were advanced in November 2006 for horizontal and vertical delineation along the northern, western and eastern portions of the building and at the outer limits of the property. Analytical results showed TAL Metal exceedances greater than the SCC.</p> <p>Borings advanced during the 2011 RI indicate that additional delineation is required at the southwest corner of Site 137 for Cr+6 and CCPW metals.</p>
	Groundwater	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Direct Contact (during groundwater sampling activities)	None, groundwater is not potable in Jersey City	Groundwater sampling crews. Groundwater is not used for potable purposes.	<p>Eight groundwater monitoring wells were installed in February and March 2007 and subsequently sampled in May 2007. Analytical results indicated TAL Metals were detected at concentrations exceeding the GWQS. Groundwater samples collected in June 2011 for Cr<sup>+6</sup> and CCPW metals indicate detections above the GWQS. Additional groundwater investigation will be conducted during an upcoming groundwater RI.</p>

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Site 143	Soil	Hexavalent chromium, antimony, chromium, nickel, thallium, and vanadium	Inhalation and Direct Contact (if soils are excavated)	Groundwater	Building employees, construction and remediation workers.	<p>The NJDOH observed visual evidence of COPR outside the facility during a preliminary site survey on November 15, 1989. Yellow crystals were noted in the surface soil and in an area that had been recently excavated to install sewer lines. Yellow water was observed in puddles on Carteret Avenue adjacent to the Site. NJDEP collected two surface soil samples for total chromium analysis on January 24, 1990. Total Cr concentrations of 818 mg/kg and 1,214 mg/kg were reported for these samples.</p> <p>CCPW was reportedly observed at the ground surface at Site 143 during an NJDEP inspection on October 9, 1990. IRMs could not be implemented at that time because the Site was almost completely occupied by salvaged vehicles.</p> <p>Soil samples were collected from nine borings on Site 143 in January 2007. Analytical results showed TAL Metal exceedances were detected at concentrations greater than the SCC.</p> <p>Borings advanced during the 2011 RI indicate that additional delineation is required at the southwest corner of Site 143 for Cr<sup>+6</sup> and CCPW metals.</p>
	Groundwater	None	None	None	None	<p>To date, groundwater has not been investigated at Site 143. However, two monitoring wells associated with Site 114 are located at the northwest corner of Site 143. These two monitoring wells were installed in November 2006 and subsequently sampled in February and May 2007. Analytical results indicated TAL Metals were detected at concentrations exceeding the GWQS.</p> <p>In June 2011, groundwater samples were collected from the two monitoring wells north of Site 143 and analyzed for Cr<sup>+6</sup> and CCPW metals. Analytical results indicate total Cr and Cr<sup>+6</sup> above the GWQS at well 114-MW22B. Additional groundwater investigation will be conducted during an upcoming Groundwater RI.</p>
Site 186	Soil	Antimony, nickel, and vanadium	Inhalation and Direct Contact (if soils are excavated)	None	Construction and/or remediation workers if soil is excavated	<p>NJDEP conducted soil testing in 1995 following a report of potential chromium impacts observed surface soils at the Site. A single Cr<sup>+6</sup> exceedance of the 20 mg/kg CrSCC was identified in a surface soil sample and the Site was deemed Hudson County Chrome Site 186 in 1996. In 1996 the NJDEP implemented an IRM consisting of a Permalon® liner covered with gravel and asphalt pavement covering the entire Site.</p> <p>A Preliminary Site Investigation was conducted in 2000 and a Remedial Investigation and Remedial Alternatives Selection conducted in 2003. No other Cr<sup>+6</sup> or Cr exceedances of the CrSCC were detected at Site 186. Antimony and vanadium were detected at concentrations exceeding the SRS in a few of the on-site soil borings during these investigation. These were generally identified in shallow soils in the southeastern portion of the Site. Additional delineation of nickel exceeding the default IGW SSL was conducted south of the Site boundary during the 2011 Soil RI. Additional Soil RI work will be conducted at Site 186 to verify and more precisely delineate the Cr<sup>+6</sup> exceedance identified by NJDEP in 1995.</p>
	Groundwater	Aluminum, lead, manganese, and sodium	Direct Contact (during groundwater sampling activities)	None, groundwater is not potable in Jersey City	Groundwater sampling crews. Groundwater is not used for potable purposes.	<p>Two shallow groundwater monitoring wells were installed on Site 186 during a Preliminary Site Investigation conducted in 2000. Groundwater samples were collected from these wells and analyzed. Chromium, Cr<sup>+6</sup>, and the CCPW metals were not detected at concentrations exceeding the GWQS in any of the collected from these wells during the Preliminary Site Investigation.</p> <p>Groundwater samples were collected from the two Site 186 monitoring wells in June 2011 and analyzed for Cr<sup>+6</sup> and CCPW Metals. Total chromium was detected above the GWQS in one well on Site 186. No other COCs exceedce the GWQS. Additional groundwater sampling will be conducted during an upcoming groundwater RI.</p>

**Note:**

1 - Any CCPW and/or CCPW-impacted material remaining on the site is buried and only accessible during intrusive field work or excavation.

The New Jersey Soil Remediation Standards (SRS), promulgated on June 2, 2008, adopted on November 4, 2009, and last amended on October 3, 2011 pursuant to the Remediation Standards (N.J.A.C. 7:26D et. seq.), were utilized for soil delineation purposes for non-chromium compounds. The May 1999 New Jersey Soil Cleanup Criteria were used for soil comparison prior to the adoption of the SRS.

The most stringent (non-residential) chromium soil cleanup criteria (CrSCC) of 20 mg/kg for hexavalent chromium, and the most stringent (residential) soil cleanup criteria of 120,000 mg/kg for trivalent chromium, were utilized for soil delineation purposes pursuant to the *Chromium Soil Cleanup Criteria* (NJDEP, September 2008).

Groundwater results were compared to the *Ground Water Quality Standards* (N.J.A.C. 7:9C), promulgated June 2, 2008 and last revised July 22, 2010.