

APPENDIX Q
Summary of Investigative Areas by Areas of Concern

IA-1

Investigative Area No. 1 (IA-1) is located in the northwestern portion of the Roche Nutley Facility and is bounded to the west by the Norfolk Southern Railroad, to the south by IA-6, to the east by IA-4 and IA-2, and to the north by IA-12. A total of 33 AOCs were identified in IA-1. No Further Action (NFA) was either proposed or issued for fifteen of these. Eighteen AOCs (AOC 11, AOC 32, AOC 33, AOC 34, AOC 35, AOC 36, AOC 37, AOC 65, AOC 75, AOC 95, AOC 97, AOC 126, AOC 127, AOC 130, AOC 136W, AOC 140, AOC 141, and AOC 144) required further environmental investigation for soils during the recent remedial investigation (RI).

Following the review of data related to soil and groundwater sampling, it was determined that twelve AOCs were reported with impacted soil and four with impacted ground water. Only one AOC (AOC 75 Building 52 Transformers) appears to have an impact on ground water from soils related to the AOC. The main contaminants of concern (COCs) for soil and ground water in the area of AOC 75 are arsenic and PCBs.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-1		
AOC	Soil COCs	GW COCs
11	none	PAHs - B(a)P, B(a)A, B(b)F, I(1,2,3-cd)P
32	PAHs (historic fill)	none
33	PAHs (historic fill)	none
35	PAHs (historic fill)	none
36	PAHs (historic fill)	none
37	PAHs (historic fill)	none
65	PAHs (historic fill)	none
75	PCBs, Arsenic	Arsenic, PCBs
95	Toluene, PAHs, PCBs (historic fill)	none
97	none	Arsenic, Thallium (attributed to natural background)
127	none	PAHs

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AOC	Soil COCs	GW COCs
136W	PCE, PAHs (historic fill)	none
140	EPHs, VOCs, PAHs (historic fill)	none
141	PCBs, Hg, Ni (historic fill)	none
144	PAHs, Cu (historic fill)	none

IA-2

IA-2 is located in the central portion of the Roche Nutley Facility and includes the facility's former tank farm and other structures that were operated in support of tank farm operations that were centered on former Building 35. Originally, fifteen AOCs were identified within IA-2. Nine AOCs (AOC 85, AOC 86, AOC 87, AOC 88, AOC 89, AOC 128, AOC 135, AOC 136E, and AOC 145) were determined to require additional environmental investigation during the recent RI. The remaining AOCs either received NFA determinations or proposals.

The primary COCs in soil within the IA-2 boundary are VOCs (i.e., benzene and chloroform). Other COCs in soil include PAHs and PCBs. Two isolated exceedances of lead and hexavalent chromium were also detected. The COCs for ground water are benzene, chloroform, aluminum, arsenic, beryllium, chromium, iron, lead, manganese, mercury, and sodium, which were detected above their respective GWQS. Also detected were PCE, 1,1-dichloroethylene (1,1-DCE), vinyl chloride, bromodichloromethane, dibromochloromethane, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, pentachlorophenol and SVOC TICs. The relatively broad extent and "low-levels" of the PAHs contamination appears to be associated with the fill material observed throughout IA-2.

Following the review of data related to soil and groundwater sampling, it was determined that eight AOCs were reported with impacted soil and four with ground water impact. Two AOCs (AOC 85 and AOC 145) appear to have an impact on ground water from soils related to the AOC (see table below).

AOC 85 includes Former USTs 4, 7 and 10 which contained chloroform toluene/toluol, acetone, and methyl carbitol. Former USTs 1-3, 5, 6, 8, 9, 36-39, 45 and 51 contained organic liquids such as acetone, methyl ethyl ketone (MEK), ethanol, benzene, and xylene.

AOC 85 also included 8 former ASTs that contained liquids such as isopropyl alcohol; 2B alcohol, dry acetone, glacial acetic acid, methanol, and TMP. The ASTs were located on paved areas with secondary containment dikes, and were demolished between May 1986 and 2003.

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The benzene and chloroform reported in both the soil and groundwater are believed to be directly attributable to the tank farm. The primary COCs in soil are benzene and chloroform. PAHs, PCBs and methylene chloride were also detected above the RDCSRS and NRDCSRS. No constituents were detected above their respective IGWSRS.

Based on the analytical results, the ground water contamination associated with AOC 85 appears to have migrated into the bedrock aquifer. However, a vertical concentration gradient was demonstrated (e.g., overall contaminant concentrations have significantly decreased with depth).

AOC 145 consists of the former Building 30 basement area which extends to approximately 10 to 11 feet below surface. During 2005, the building was razed and the basement was filled in with concrete debris/slabs from the building itself, soils from on-site areas that were previously excavated, and imported fill.

AOC 145 impact to groundwater is believed to be related to the fill material used in area surrounding the Building 30 footings.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-2		
AOC	Soil COCs	GW COCs
85	Benzene, Chloroform	Toluene, Benzene, Chloroform, Methylene Chloride, PAHs, Bis (2-ethylhexyl)phthalate, Methanol, Xylenes, Hexane, VOC & SVOC
86	none	Benzene (likely associated with AOC 85)
87	B(a)P, PCBs	No GW collected due to insufficient ground water
88	B(a)P, Heptachlor and Gamma-chlordane (pesticides), Mercury	No GW collected due to insufficient ground water
89	B(a)P, B(a)A, B(b)F, D(a,h)A, I(1,2,3-cd)P	No GW collected due to insufficient ground water
111	Acetone	none
128	B(a)P, PCBs	Benzene, Chlorobenzene (likely associated with AOC 85)
135	B(a)P, B(a)A, B(b)F, D(a,h)A	No GW collected due to insufficient ground water

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AOC	Soil COCs	GW COCs
145	B(a)P, B(a)A, B(b)F, D(a,h)A, I(1,2,3-cd)P, PCBs	B(a)P, B(a)A, B(b)F, Aluminum, Arsenic, Beryllium, Chromium, Iron, Lead, Manganese, Mercury, Sodium, PCE, 1,1-DCE, Vinyl Chloride, Bromodichloromethane, Dibromochloromethane, Pentachlorophenol, and SVOC TICs

IA-3

IA-3 is located in the central/eastern portion of the Roche Nutley facility and is bounded to the north by the Jersey City Water Company right-of-way, and beyond this easement, IA-12; to the east by residential properties; to the south by IA-7; and, to the west by IA-4 and IA-9.

IA-3 contains 18 AOCs. NFAs were granted or proposed for eleven of these AOCs with eight requiring additional investigation (AOCs 1, 129, 160, 169 (a, b, c), 176, and 178). Only one area of concern (AOC 1) reported an impact (methylene chloride) in both soil and groundwater.

AOC 1 was the location of the former Building No. 68 UST farm and consisted of 13 USTs that were used to store feed stock solvents (Vitamin A intermediates and spent mother liquors) generated in the manufacturing of Vitamin A in Building 68. The investigation of this area was to address foundation backfill.

The contaminants detected in AOC 1 are primarily PAHs and metals typically associated with historic fill material. No other source or discharge related to these contaminants has been identified. Soil samples collected from the backfill material only exhibited slight exceedances of the DIGWSSL for methylene chloride.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-3		
AOC	Soil COCs	GW COCs
1	B(a)P, Metals, Methylene Chloride (historic fill)	Benzene, Toluene, Pyridine, 4-methyl phenol, Methylene Chloride, Ethane, Butane, Pentane, Cyclopentane, and Cyclohexane TICs

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IA-3		
AOC	Soil COCs	GW COCs
129	B(a)P, Toluene	Benzene, TCE, Ethyl Ether, and TICs
160	PCBs, PAHs, Mercury, VOCs (historic fill)	Arsenic
169a	B(a)P	PCE, Arsenic
169b	none	PCE, Arsenic
169c	none	PCE, Arsenic
170	none	VOCs
176	Metals	none

IA-4

IA-4 is located in the north central portion of the Roche Nutley Facility. AOCs requiring environmental investigation within IA-4 during the recent RI are AOC 8a, AOC 9, AOC 38, AOC 39, AOC 92, AOC 105, AOC 128, AOC 137, AOC 142, and AOC 143). NFAs have been issued or proposed for AOCs (AOCs 8b, AOC 39, AOC 41, AOC 51, AOC 52, AOC 128, and AOC 143).

The primary COCs in soil within the IA-4 boundary are VOCs (i.e., benzene, methylene chloride, and vinyl chloride) and metals (lead, mercury, arsenic, and beryllium). The primary COCs in ground water are trichloroethene (TCE) and PCE.

Five AOCs (AOC 9, AOC 38, AOC 92, AOC 105, and AOC 142) reported an impact to both soil and groundwater.

AOC 9 consists of a former 1,500-gallon No. 2 Fuel Oil UST installed in 1963 and removed in 1985. The tank was utilized as a feed tank for a Building 43 incinerator. No tank closure information or post-excavation soil and/or ground water sampling data were available for evaluation. Arsenic and Dieldrin were reported in soil and arsenic in the ground water in the vicinity of AOC 9. The arsenic appears to be attributed to natural background.

AOC 38 consists of two process waste water “dumpster” tanks located in a former 90-day Outdoor Hazardous Waste Dumpster Storage Area west of former Building 44. The pavement in this area sloped to a concrete containment trench/sump, lined with impermeable materials, and was connected to Roche’s process sewer system. Records indicate that releases of alcohol/water

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mixture and toluene occurred from this former storage area onto pavement and/or into secondary containment structures. Methylene chloride was reported in both the soil and groundwater associated with this AOC but not associated with the material releases.

AOC 92 consists of twelve former ASTs removed from an AST farm located east of former Building 44 sometime between 1993 and 1999. Two previous spills are reported in this area including a 100-gallon release of sodium bisulfite, and a spill of methanol, acetone, methylene chloride, and water occurred when a glass line (elbow) that exits the former building ruptured, releasing material into the containment dike. Methylene chloride was reported in both the soil and groundwater associated with this AOC and therefore may be related to the material releases.

AOC 105 consists of the area around the Building 61 Pump House and appurtenant piping in the northern portion of the Site. The building was used to pump fire suppression waters in the north portion IA-4 at the Roche Site. The No. 6 fuel oil supply line from the former 640,000 gal No. 6 fuel oil AST in IA-1 lies beneath Building 61 and extended east to Building 39.

An unknown quantity of No. 6 fuel oil was discovered in a storm water catch basin (1989) and was determined to be the result of a leak in an underground fuel oil supply line near the pump house. The oil release from the supply line migrated into the subsurface area beneath and around Building 61 and the east side of Building 50. Fuel oil-impacted material was excavated and the underground piping was removed in this area, where accessible. Benzene and methylene chloride were reported in both the soil and groundwater associated with this AOC and may be related to the fuel oil releases in this area.

AOC 142 consists of the former Building No. 44 footprint where subsurface piping formerly conveyed process waste water from production areas to the process sewer system. Building 44 was constructed in 1947 and demolished in 1999. A series of process sewers and manholes/pits surround former Building 44. Additionally, a series of below ground storm water catch basins, manholes exist around former Building 44. Benzene, methylene chloride, and arsenic were reported in both soil and groundwater associated with this AOC.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-4		
AOC	Soil COCs	GW COCs
8a	PAHs	PCE, TCE, Arsenic, Chromium, Lead
9	Arsenic, Dieldrin	Arsenic (natural background), Sodium

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IA-4		
AOC	Soil COCs	GW COCs
38	Methylene Chloride	Methylene Chloride, Benzene, SVOC TICs (including 1,4-dioxane), Sodium
39	none	Benzene, SVOC TICs (including 1,4-dioxane), Sodium
92	Methylene Chloride	Methylene Chloride, Arsenic, Benzene, VOC TICs, SVOC TICs, Sodium
105	No. 6 Fuel Oil (remediated), Benzene, Toluene, Methylene Chloride, EPH	Benzene, VOC TICs, SVOC TICs, petroleum sheen, Methylene Chloride, Sodium
137	Methylene Chloride, PAHs	1,4-dioxane, Sodium
142	PAHs, PCBs, Dieldrin, Hexavalent Chromium, various VOCs (including Benzene, Chlorobenzene, Chloroform, MEK, Methyl Acetate, Methylene Chloride, PCE, styrene), Arsenic, Antimony, Cadmium, Lead, Nickel, Selenium, EPH	Benzene, Methylene Chloride, Arsenic, VOC TICs, SVOC TICs, 1,4-dioxane, Sodium
143	Benzene, Methylene Chloride, PCE, PAHs, Bis-(2-ethyl hexyl)phthalate, Lead, Mercury	none

IA-5

IA-5 (located within IA-1) consists of one AOC (AOC 109 known previously as MOA AOC-5) to address a mercury release area located within an underground utility tunnel between Buildings 56 and 44. Building 56 formerly extended over the section of the tunnel that includes AOC 109. Roche site personnel indicated that mercury was used as part of electrolysis operations in the southern portion of the building. The release was discovered by a contractor performing repairs in the tunnel on July 29, 1992. Approximately 1 to 2 ounces of liquid mercury were observed within or in the immediate vicinity of a sump pit in the floor of the tunnel. The material was

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cleaned up by Roche personnel; however, it was suspected at that time that additional mercury was present in soils near the tunnel.

The lateral and vertical extent of impacts was assessed through a mercury vapor survey, but mercury vapors were not detected. Test pits were attempted in the area of the reported release, but were not completed due to extensive subgrade utilities within the tunnel, and/or the presence of shallow bedrock. No mercury was found to leak from lateral borings in the tunnel wall; however, no confirmation samples were collected or analyzed. No COC reported in this AOC were related to the mercury release and there appears to be no associated impact between the soil and ground water.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-5		
AOC	Soil COCs	GW COCs
109	Benzo(a)pyrene, PCBs	Benzo(a)anthracene, Lead, Sodium

IA-6

IA-6 is located in the southern portion of the Roche Nutley facility and bound to the north by Parking Area 86 North (the location of former Buildings No. 10 and No. 4), to the east by Building No. 1, and to the south and west by the Norfolk Southern Railroad tracks that run through the site. IA-6 is currently occupied by Building No. 80, asphalt-paved parking areas, and landscaped areas.

Thirty AOCs have been identified within IA-6. Some have been fully investigated and remediated and/or are currently being remediated through Interim Remedial Measures (IRMs). NFA determinations were issued or pending for eighteen AOCs. The remaining AOCs (AOC 79, AOC 132, AOC 133, AOC 147, AOC 149, AOC 150, AOC 151, AOC 152, AOC 155, AOC 156, AOC 157, AOC 158, and AOC 180) required additional investigation during the recent RI.

Previous ground water results indicated VOC impacts above NJDEP GWQS in overburden and bedrock ground water in IA-6, with chlorobenzene being the compound detected at the highest concentrations and frequency.

A pump and treat ground water remediation system was installed in IA-6 in 2004 as an IRM and continues to operate, providing a level of hydraulic control and preventing contamination from migrating off-site. Approximately 4,000 tons of PAH impacted soil were removed for off-site disposal in 2007 under a Remedial Action Workplan (RAWP) submitted in 2006.

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COCs for soil in this AOC include PAHs and VOCs (tetrahydrofuran, chlorobenzene, TCE, PCE). COCs for ground water include metals and VOCs. Seven AOC has soil impacts and all AOCs had ground water impacts. Only one AOC (AOC 155) had COCs in the soil that may have impacted the ground water.

AOC 155 consists of the former Building No. 15 footprint. Building No. 15 was constructed in 1939 and was used in the early 1980s for solvent recovery for Taractan, Tigan, and cycloamine products and historically used for Vitamin B1 manufacturing. The building was demolished in 1992 and the area is currently paved and used for parking. Portions of the foundation footings and walls remain in place. Chlorobenzene and PCE, reported in the soil may have impacted the ground water in this area.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-6		
AOC	Soil COCs	GW COCs
79	none	Arsenic, Cadmium, Cobalt, Nickel, Iron, Manganese, Sodium
132	TPH, Methylene Chloride, Acetone	TCE, VC, 1,1-DCE, Chlorobenzene, 1,4-dioxane
133	none	Arsenic, Iron, Manganese, Sodium
147	Manganese, Sodium	EPHs, Metals
149	Chlorobenzene, 1,1,2,2-TCA, TCE, Xylenes	Aluminum, Arsenic, Iron, Manganese, Sodium, Benzene
150	none	Thallium, Aluminum, Iron, Manganese, Sodium, PCE, TCE, Vinyl Chloride
151	none	Manganese, Sodium
152	PAHs	Iron, Manganese, Sodium, PCE, TCE, 1,1-DCE, Chlorobenzene
155	Chlorobenzene, PCE, PAHs	PCE, Chlorobenzene, Benzene, Cadmium, Zinc, Thallium

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IA-6		
AOC	Soil COCs	GW COCs
156	none	BHC-Lindane, Arsenic, Thallium, Lead, Zinc, Cadmium
157	PAHs	Iron, Manganese, Sodium, Aluminum, Arsenic, Thallium,
158	none	Cobalt, Nickel, T SVOCs, Benzene
180	PCBs, Dieldrin	Dieldrin

IA-7

IA-7 is located in the central/eastern portion of the Roche Nutley facility and bounded to the north by IA-3, including Building 115 and parking lots, to the east by residential properties, to the south by residential properties and IA-11; and to the west by IA-9.

IA-7 contains 33 AOCs, twenty-eight of which NFAs have been issued, pending or proposed. The remaining five AOCs (AOC 4/175, AOC 15, AOC 62, AOC 121, and AOC 166) required additional investigation according to the recent RI.

Soil and ground water are relatively minimally impacted by past Roche operations. There were no actionable concentrations of COCs detected in several AOCs investigated during the investigation area (IA) specific RI. Based on the RI sampling results, several limited areas of PAH contamination in fill material were detected in IA-7. Additionally, smaller areas of exceedances of VOCs, PAHs, EPH, arsenic, lead, and mercury contamination were detected in soils above action levels. Delineation of these areas was achieved; and the remedial investigation of soil in IA-7 is deemed complete. With the exception of VOC-contaminated soil, the other COCs appear to be associated with contaminated historic fill material; no other specific source(s) were identified for the types of contaminants detected.

Based on the analytical results from the IA specific RI, a dissolved chlorinated VOC plume exists at the western margin of IA-7. This chlorinated VOC plume consists of the products of PCE degradation. PCE was detected at elevated concentrations in the past and currently, TCE is the predominant COC in this plume. Elevated concentrations of arsenic and sodium were also detected in several shallow wells across IA-7.

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No significant sources of the VOCs, arsenic and sodium in ground water were identified in IA-7. A separate, ongoing technical evaluation indicates that the source of the chlorinated VOCs is likely related to releases from the Valley Drain and the historic Clifton Sanitary Sewer (now removed).

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-7		
AOC	Soil COCs	GW COCs
15	none	BEHP, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Nickel, and Sodium
62	Toluene	none
166	B(a)P, mercury	none

IA-8

IA-8 is located throughout the subgrade of the Roche Nutley facility and consists of the sub-grade process and the storm pipes and catch basins/manholes and chemical transfer lines within two subgrade trenches (AOCs 67, 116, and 117). Approximately 6 miles of piping investigated and over 1500 locations were sampled and evaluated. The primary focus of previous sampling events was for soil. There were exceedances of NRDCSRS, all were PAHs except for one PCE exceedance and four samples exceeding for lead. The primary exceedance of RDCSRS was PAHs. VOC exceedances consisted of PCE and chloroform and metals: lead, mercury, and silver. The majority of exceedances of DIGWSSLs included mostly PAHs. PCE was the predominant VOC exceedance and mercury was the predominant metal exceedance.

Ground water samples were collected from 87 locations throughout the sub-grade piping and associated infrastructure. Vinyl chloride was the primary contaminant detected above the GWQS. Benzene and chlorinated aliphatic compounds were also found above the GWQS.

Soil COCs consist of VOCs, PAHs, and metals, which are widespread across the site. The GW COCs vary by area, with chlorinated aliphatics most prevalent across site. For ground water, chlorinated aliphatics exceeding the GWQS are the main issue.

IA-8 Sub-Area G. A large portion of Area G is located within the western and northern portions of IA-3, following the western and northern perimeter of the footprint of Former Building 59. Much of the subgrade Area G piping along the western boundary of IA-3 and parallel to First Avenue was within the saturated zone at the time of the SI.

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2006 Historical soil sample results for reported PAHs, lead and mercury were the most frequently detected COCs; however, there was only one lead and one PAH exceedance in Area G in excess of remediation standards. PAHs and metals are common historic fill material contaminants and the areas where the exceedances were detected exhibited fill material in the subsurface. No other specific source or discharge related to these contaminants has been identified.

VOCs were also detected at three isolated locations in Area G. The highest concentration was detected at 10 ft. bgs, near the water table. These soil borings are located close to the location of the former Clifton sanitary sewer line. Two other smaller hotspots with single soil sample VOC exceedances of benzene, chlorobenzene, and toluene.

Contaminant hotspots detected in Area G have been sufficiently delineated for the purpose of completing the IA-3 RI. These exceedances are contained within the boundaries of the Roche site.

There is sufficient information to define the nature and extent of the historic fill material and COCs (benzene, chlorobenzene, PCE and toluene) and to determine an appropriate remedy to address this contamination. No further investigation of soil is proposed.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-8		
AOC	Soil COCs	GW COCs
67	EPHs, PAHs, PCE (IA-11) (historic fill), Chlorobenzene	Benzene, metals (Temp wells)
116	VOCs, PAHs, Cr, Hg, Pb, Ag	PCE, PAHs, Chromium, Hg, Pb, Ag
117	VOCs, PAHs, Cu, Pb, Zn	PCE, PAHs, Hg, Pb, Ag

IA-9

IA-9 is located in the south-central portion of the Roche Facility to the east of IA-2 and IA-6; west of IA-7; and south of IA-4 and includes 11 AOCs comprised of two former building footprints (Buildings 73 and 9), six former underground storage tanks (USTs), two former drum storage areas, two former dumpster storage areas, a former spill area and a portion of the historic chemical transfer network. Further investigation of eight of the AOCs (AOCs 7, 30B, 49, 50, 134, 146, 159, and a portion of 106) was required in the recent RI. Four AOCs (30a, 30b, 48, and 110) located in IA-9 have received NFA determinations.

AOC 49 consists of former 90-day outdoor hazardous waste dumpster storage areas along the north side of former Building 73. The Building 73 dumpsters were used to retain and store

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process waste waters. Prior to building demolitions and repaving in the area, the storage area was located on pavement and was demarcated with a yellow paint boundary. The pavement was sloped to a concrete containment trench, which was lined with impermeable materials. The trench was regularly inspected as part of Roche's periodic preventive maintenance program. The trench was connected to the on-site process sewer system. In 1990, Roche upgraded the dumpster storage area as part of the preventive maintenance program. Building 73 was demolished starting in the late 2004 through mid-2005. The area was paved and is currently being used as a parking lot. Releases/spills of methyl-ethyl ketone (MEK), methyl alcohol, Apomorphan and toluene (1989), and trimethylhydroquinone (TMHQ) and waste solvents (1990) were reported in area of the AOC (prior to building demolition).

Benzene, TCE, PCE, cis-1,2-DCE, vinyl chloride were detected in both soil and groundwater in the vicinity of AOC 49 but do not appear to be impacts from spills or releases in the area.

AOC 146 consists of the Building 73 footprint containing sub-slab trenches with piping that conveyed process waste water from production areas to the process sewer system.

The demolition of Building 73 was completed by June 2005 and the basement area was backfilled; however, the basement floor and associated foundation walls currently remain in place. Based on discussions with Roche employees, the basement was backfilled with concrete debris/slabs from the building itself, soils from on-site areas that were previously excavated and imported fill.

Benzene, PCE, and 1,1-DCE were detected in both soil and groundwater in the vicinity of AOC 146.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-9		
AOC	Soil COCs	GW COCs
7	Benzo(a)anthracene, Beryllium	none
49	Benzene, TCE, PCE, cis-1,2-DCE, Vinyl Chloride, Methylene Chloride, mercury	Benzene, PCE, TCE, Cis 1,2-DCE, Vinyl Chloride, Toluene, trans-1,2-DCE, 1,1-DCE, As, Cr, Ni, T SVOC
50	B(a)A, B(a)P, Mercury, Beryllium	none
106	VOCs, BNAs, inorganics, acids, bases, alcohols	Benzene, metals, chlorinated VOCs, toluene

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AOC	Soil COCs	GW COCs
134	B(a)A, B(a)P, Mercury, Nickel, Beryllium	none
146	B(a)A, B(a)P, B(b)F, D(a,h)A, I(123-cd)P, PCBs, Mercury, Beryllium, PCE, 1,1-DCE, Benzene	Benzene, PCE, 1,1-DCE, Toluene, TCE, Cis & trans-1,2-DCE, Vinyl Chloride, Arsenic, Chromium, Lead, Nickel, PCP
159	B(a)A, B(a)P, B(b)F, Methylene Chloride, Beryllium	none

IA-10

IA-10 is located in the western portion of the Roche facility. There are 24 AOCs, six of which (2a, 2b, 100, 112, 172 & 182) have NFAs issued or proposed. The eighteen remaining AOCs (AOCs 22, 23, 25, 26, 27, 53, 54a, 54b, 66, 118, 131, 138, 139, 174, 179, 186, 187, and 190) were determined to require additional investigation. Of these AOC fifteen were reported with impacts to soil and seventeen with impacts to groundwater. Five AOCs (AOC 53, AOC 66, AOC 186, AOC 187, and AOC 190) reported a similar impact to both soil and groundwater. These AOC are summarized below.

AOC 53 is the location of Building 106 (Former Raw Materials Storage Area). Based on the results from sampling, the soil is impacted primarily with PCBs, PAHs and lead; however, the source of these contaminants is most likely the landfill materials from AOC 66 (Former City of Clifton Dump) and not the former raw materials storage area.

A review of the boring logs note the presence of landfill materials (paper, wood, glass and rubber, etc.), and historic aerial photos, document the former landfill extends further south (under Building 103) and west (under Building 106) and north and west beyond the Roche property boundary. Therefore, no further delineation of these contaminants is necessary.

Sporadic exceedances of antimony, arsenic and mercury and the pesticides alpha-BHC, gamma-BHC and Dieldrin were delineated.

Ground water sampling results from two sampling events do not indicate contamination attributable to the former raw materials storage area. Ground water in AOC 53 is impacted with VOCs that are likely associated with adjacent properties to the west, and not related to the former raw materials storage area.

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Metals concentrations in ground water are also not related to the raw materials storage area. The aluminum, iron, and manganese are believed to be naturally occurring and are not considered a concern at this time.

AOC 66 is the location of the former City of Clifton dumping area. Based on the results of the soil sampling conducted in AOC 66, the landfill perimeter borings were successful in delineating the eastern extent of the landfill. However, the landfill extends south under Building 103 and west under Building 106 and extends off the Roche property both to the north and west.

Concentrations of PCBs, pesticides, metals, VOCs, and/or SVOCs were detected above applicable criteria in most of the soil samples collected from the interior of the landfill; the majority of the exceedances were vertically delineated to at least the NRDCSRS.

Ground water results from two sampling events indicate contamination (lead, chromium and arsenic) potentially attributable to buried waste in the landfill. In addition, Dieldrin and bis(2-ethylhexyl)phthalate were detected marginally above the GWQS; PCBs were detected marginally above the GWQS in one sample.

AOC 186 is the former Haberland Morningstar-Paisley rail spur. Based on the results of the soil sampling conducted in AOC 186, the limited PAH, PCB and/or metals contamination attributable to the former rail spurs has been horizontally and vertically delineated and an appropriate remedial strategy will be developed. The extent of VOCs detected in former Building 104 borings has been delineated.

Ground water results from two sampling events do not indicate contamination attributable to the former rail spurs, with the exception of arsenic. The arsenic concentrations detected above the GWQS in ground water may be attributable to the presence of fill material and/or coal as evidenced by the other locations in IA-10 where arsenic was detected above the GWQS during the RI (i.e., AOC 23, AOC 53, AOC 66, AOC 131, AOC 138, AOC 186 and AOC 190).

Based on the AOC 186 soil results and site history, the VOCs detected in ground water are most likely associated with historical chlorinated solvent releases at the site and/or adjacent properties to the west, and not related to the former rail spurs comprising AOC 186. The VOC exceedances will be addressed as part of the Site-Wide Ground Water RI.

AOC 187 is the location of the former Broadbent Coal Rail Spur. Based on the results of the soil sampling conducted in AOC 187, the limited benzo(a)pyrene and arsenic impacts detected along the former rail spurs have been horizontally and vertically delineated and an appropriate remedial strategy will be developed.

Ground water results from two sampling events do not indicate contamination attributable to the former rail spur, with the exception of arsenic, which may be attributable to the former rail spur or fill material and will be addressed as part of the RAWP.

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AOC 190 represents the former Broadbent Coal Storage Pile. Based on the results of the soil sampling conducted in AOC 190, the limited benzo(a)pyrene, arsenic and/or selenium impacts detected in the vicinity of the former coal pile in borings have been horizontally and vertically delineated and an appropriate remedial strategy will be developed.

The slight benzene exceedance of the IGWSRS, as well as other petroleum related impacts in this area, will be further investigated in association with AOC 100.

Ground water results from two sampling events do not indicate contamination attributable to the former coal pile, with the exception of arsenic which may be attributable to historical coal storage.

No further investigation is warranted for AOC 190 soil. The RI is complete and an appropriate remedial strategy will be developed. The exceedances detected in AOC 190 ground water samples not related to AOC 190 may warrant additional consideration as part of the RAWP.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-10		
AOC	Soil COCs	GW COCs
22	PAHs	Benzene, 1,1 DCE, PCE, TCE
23	PAHs	PCE, TCE, Sodium, 1,4-dioxane
25	none	Metals
26	none	Sodium
27	none	TPHC, VOCs
53	PAHs, PCBs, Dieldrin, Aluminum, Antimony, Barium, Beryllium, Cadmium, Lead, Manganese, Mercury, Nickel, Silver, Zinc (historic fill)	Lead, and possibly Arsenic, PCE, TCE, Benzene, Aluminum, Iron, Manganese, Sodium, and Thallium
54a	PAHs, PCBs, Lead, Aluminum, Beryllium, Manganese, and Mercury	none
54b	PCBs, Lead (fill), Aluminum, Beryllium, Manganese, Mercury, Silver	none
66	Benzene, Toluene, Xylene, B(a)A, B(a)P, B(b)F, B(k)P, Carbazole, Chrysene, D(ah)A, 2-	PCE, TCE, 11-DCE, Bis(2-ethylhexyl)phthalate, Dieldrin, Lead, Chromium, Arsenic,

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IA-10		
AOC	Soil COCs	GW COCs
	Methylnaphthalene, I(123-cd)P, Naphthalene, N-NitroDPA, T. EPHs, PCBs, Alpha BHC, Dieldrin, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Zinc (landfill)	Benzene, Toluene, Xylene, B(a)A, B(a)P, B(b)F, B(k)P, Carbazole, Chrysene, D(ah)A, 2-Methylnaphthalene, I(123-cd)P, Naphthalene, N-NitroDPA, T. EPHs, PCBs, Alpha BHC, Aluminum, Antimony, Barium, Beryllium, Cadmium, Copper, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Zinc
100	PCBs, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Lead, Manganese, Mercury, Nickel, Silver, Zinc, PAHs, N-Nitrosodiphenylamine, EPH (C9-C40), Pesticides (historic fill)	PCE, TCE, Benzene, Aluminum, Arsenic, Iron, Lead, Manganese, Sodium and Thallium
112	PAH, PCBs, Lead (fill)	PCE, TCE, Arsenic, Benzene, 1,4-Dioxane
118	PCBs	PCE, TCE, Arsenic, Benz
131	PCBs, Lead, Mercury (fill)	PCE, TCE, 1,1-DCE, VC, Lead, Arsenic, Iron, Manganese, Sodium, Dieldrin
138	Methylene Chloride, PAHs, Nickel, Mercury (attributed to AOC 23)	PCE, TCE, Aluminum, Arsenic, Iron, Manganese, Sodium (not related to former Drum Storage Area)
174	PAHs, Metals (historic fill)	PCE, TCE
179	none	PCE, TCE, 1,4-dioxane
186	PCBs, PAHs, PCE, TCE, vinyl chloride, metals, Dieldrin	Metals, PCE, TCE, PAH, PCBs, Dieldrin
187	Benzene, Aluminum, Ethylbenzene, Manganese	Arsenic (may be related to coal), PCE, TCE, 1,1-DCE, VC, Benzene, Metals

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IA-10		
AOC	Soil COCs	GW COCs
190	Benzene, benzo(a)pyrene, Aluminum, Arsenic, Manganese, Nickel, Beryllium, Mercury, Selenium	Arsenic (may be related to coal), PCE, TCE, VC, PAHs, Aluminum, Arsenic, Iron, Manganese, Sodium, Chromium, Nickel, Lead

IA-11

IA-11 is located in the southeastern portion of the Roche Nutley facility and is bounded to the north by IA-7, to the east by IA-6, to the northwest by residential properties, to the southwest by IA-13, and to the south by Kingsland Street. IA-11 currently encompasses one parking lot (PL903), Building Nos. 47, 47A, 66A, 66B, 66C, a soil pile, and a drainage swale.

NFA were submitted or proposed for AOCs (AOC 10a, AOC 10b, AOC 28, AOC 58, AOC 164, and AOC 173). As discussed in the IA-11 RIWP seven AOCs (AOC 59, AOC 67, AOC 116, AOC 165, AOC 181, AOC 188, and the Stockpiled Soil Area (no AOC designation) required further environmental investigation.

Based on the RI, five AOCs indicated soil impacts and five ground water impacts. Of these only one (AOC 59) reported similar VOC impacts to both soil and groundwater. The vertical and horizontal extent of PCE and TCE has been delineated to RDCSRS. PCE and TCE were not detected above GWQS. Since 1,1-DCE is formed during biodegradation of TCE, it appears that soil conditions associated with AOC 59 may be impacting ground water conditions.

EISB is being implemented and further evaluation of soil quality and impact to ground water at this location is being deferred until completion of the monitoring/PDI activities.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-11		
AOC	Soil COCs	GW COCs
59	PCE, TCE, 1-1, DCE	1,1-DCE, PCE, TCE
165	B(a)P, Beryllium (historic fill)	1,1-DCE
173	none	PCE, TCE
181	PAHs, Lead, Beryllium, Cadmium,	PCE, TCE, CIS 1,2-DCE, Vinyl

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	Mercury, Nickel (historic fill)	Chloride, 1,1 DCE, Chlorobenzene
188	Benzo(a)pyrene, Beryllium, Lead, Mercury, and Nickel (historic fill)	none
Stockpile Soil Area	PAHs, PCBs (anomaly), Mercury, Beryllium, and Lead	PCE

IA-12

IA-12 is located in the northern portion of the Roche facility and is bordered to the west by the Norfolk Southern Railroad tracks, to the east by a residential neighborhood, to the south by the Roche Campus, and to the north by State Highway Route 3. The majority of the IA-12 surface area is covered by asphalt pavement and a small number of permanent structures consisting of the Route 3 Guard Shack (known as Building 54) and Buildings 108 and 108A, which are the pump houses for the potable water mains that enter the site. Former Building 41, which was a warehouse, was located around Building 108.

No AOCs have been identified wholly within the IA-12 boundary. However, the following areas were addressed in IA-12 during the recent RI: a portion of AOC 116 (Storm Sewer East); VOC contamination in ground water detected primarily within the vicinity of monitoring wells MW-60 and MW-80; reported fill placement; a former sample from the Stone Yard area, and geophysical anomalies.

Based on the RI sampling results, no significant soil contamination was detected in IA-12. Two minor detections of metals and PAHs were found in on-site soils above action levels; however, delineation was achieved. CVOCs were not detected in on-site soils, with the exception of the soil samples collected beneath the Clifton Sanitary Sewer line, indicating that CVOCs, specifically PCE and TCE may have discharged into this line from an off-site, upgradient location and leaked into the surrounding environment.

The portion of AOC 116 within IA-12 consists of approximately 1,360 linear feet of sub-grade storm sewer pipes, of which approximately 880 feet were previously investigated during the 2004 IA-8 site investigation. The remaining lengths of sub-surface piping were addressed during this RI. In addition, approximately 270 feet of storm sewer piping located adjacent to eastbound Route 3, in the New Jersey Department of Transportation (NJDOT) right-of-way, were addressed during this RI.

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Overall, soil concentrations in on-site soil samples were below the soil remediation standards with the exception of exceedances of arsenic and manganese in one sample and PAHs in one sample.

Based on the results of the soil sampling conducted along the storm sewer lines, the limited contamination detected in several IA-12 borings has been horizontally and vertically delineated and an appropriate remedial strategy will be developed.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-12		
AOC	Soil COCs	GW COCs
Clifton Sanitary Sewer	none	Benzene, PCE, TCE and cis-1,2-DCE
Fill Material	PAHs, Metals	none
Stone Yard	VOCs, Lead, Arsenic	Not accessible to sampling
Subsurface Geophysical Anomalies	PAH, Arsenic, Manganese	None
Portions of AOC 116 (Storm Sewer East)	VOCs, PAHs, Cr, Hg, Pb, Ag	PCE, PAHs, Chromium, Hg, Pb, Ag
VOCs in GW	Not applicable	PCE, TCE

IA-13

IA-13 is located in the southeastern portion of the Roche facility and is bordered to the south by Kingsland Street, residential homes to the northeast, and the Roche Campus to the north and west. IA-13 consists of an unoccupied 10,600 square foot two-story building (Building 77), a parking lot (Lot 904, 57 spaces), landscaped areas, macadam hardscaping/walkways and an additional six parking spaces just east of Building 77. Only one AOC (AOC 16) was initially identified on the IA-13 parcel. Historic fill was also reported in this IA. No soil impacts were noted which were not related to the historic fill and no ground water investigation is warranted. No production, engineering, or distribution activities took place in IA-13.

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AOC 16 (Former UST NE of Building 77) was investigated and remediated and no further action is warranted for this AOC. However, due to the presence of historic fill material on the Site a Remedial Action Work Plan, likely consisting of institutional and engineering controls for soil and a Classification Exception Area for ground water, will be submitted.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-13		
AOC	Soil COCs	GW COCs
16	PAHs (historic fill)	PCE (not associated with IA-13)
Building 77 Historic Fill	Metals, PAHs	PCE (not associated with IA-13)

IA-14

IA-14 is located in the southeastern portion of the Roche Nutley facility across Kingsland Street from the main campus of the Roche facility and consists of five AOCs (numbered 24, 184B, 184, 185, 189). An NFA has been issued for AOC 24.

IA-14 currently consists of two large parking lots (Lot 906 and Contractor Parking) and the former Buildings 105 and 121 footprints, with the remainder consisting of landscaped areas and mature trees. The concrete slabs and foundation walls/footings within the former building footprints remain in place. The parking lots in IA-14 are largely surrounded by a chain link fence. Kingsland Street and a couple of residential properties border IA-14 to the north, residential homes to the east and southeast, St. Paul's Brook and commercial establishments to the south, and a Conrail railroad line to the west. The southwestern boundary of IA-14 is a proposed subdivision property line separating IA-14 from IA-15. The proposed boundary line parallels the Conrail rail line.

The IA-14 area was used for industrial purposes prior to Roche purchasing the property through a series of individual parcel purchases beginning in 1968. George La Monte & Son used the premises to manufacture safety paper for financial documents (e.g., checks) from when the original buildings were constructed in 1905 to sometime prior to 1968. Roche's use of the parcel was largely limited to office/administrative services and limited storage until the demolition of Buildings 105 and 121 in 2011.

Based on the April 2013 RI submitted to the NJDEP for this IA, no AOCs indicated soil impacts other than those related to historic fill. AOCs 184b requires further ecological evaluation to

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address the potential for erosion of historic fill material along the banks in the riparian buffer of St. Paul’s Brook.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-14		
AOC	Soil COCs	GW COCs
184B	PAHs (historic fill)	PCE (not associated with IA-14)
184	Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver; Naphthalene, PAHs (historic fill)	PCE, Arsenic, Nickel
185	PAHs (historic fill)	PCE
189	B(a)P, Beryllium, Mercury	PCE (not associated with IA-14)

IA-15

IA-15 is located across Kingsland Street from the main campus of the Roche facility and adjacent to IA-14. IA-15 is bordered by Kingsland Street to the north/northwest, IA-14 to the east/northeast, St. Paul’s Brook and commercial establishments to the south, and a Conrail railroad line to the west/southwest. There are a total of eight AOCs located in this IA (AOC 29, AOC 103, AOC 119, AOC 177, Historic Dye House, AOC 183, and portions of AOC 184, AOC 185, and AOC 189). Five NFAs were either approved or proposed for AOC 29, AOC 103, AOC 119, AOC 177 and AOC 183.

The area encompassing IA-15 was used for industrial purposes prior to Roche purchasing the property through a series of individual parcel purchases beginning in 1968. George La Monte & Son (La Monte) used the premises to manufacture safety paper for financial documents (e.g., checks) from when the original buildings were constructed prior to 1906 to sometime prior to 1968. Based on a review of available Sanborn maps of this area (1906, 1938, 1950 and 1963), buildings associated with the La Monte safety paper manufacturing company were present in this area dating back to at least 1906. In 1979, the La Monte buildings were demolished in preparation for construction of Roche Building 116 and the associated Environmental Control Facility (ECF, waste water treatment facility) infrastructure that largely resides within IA-15.

With the exception of the ECF, Roche’s use of the parcel was largely limited to office/administrative services and limited storage until the demolition of Building 121 (and adjacent Building 105 located on adjoining IA-14) in 2011.

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Only one AOCs (AOC 189b) and has similar and possibly associated soil/ground water impacts.

COCs impacting soil and/or ground water for each of the affected AOCs are provided below.

IA-15		
AOC	Soil COCs	GW COCs
Portion of 67(IA-8)	EPHs, PAHs, PCE (IA-11) (historic fill), Chlorobenzene	none
Historic Dye House	SVOCs & Metals (historic fill)	PCE, TCE
Portion of 184c	PAHs, lead, mercury (historic fill)	PCE
Portion of 185b	PAHs, lead, mercury (historic fill)	PCE
Portion of 189b	PCE, PAHs, arsenic, lead, nickel, vanadium, beryllium, Dieldrin (historic fill)	PCE
Historic Fill	PAHs, Metals	PAHs and Metals, associated with elevated sample turbidity for S1/S2 wells screening artificial fill