LETTER REPORT

OFF-SITE PHASE III REMEDIAL INVESTIGATION WORK ASSIGNMENT C007540-4.1

FORMER KLINK COSMO CLEANERS SITE
GREENPOINT/EAST WILLIAMSBURG INDUSTRIAL AREA

SITE NO. 224130
KINGS (C), NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, Albany, New York

Joseph Martens, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION
REMEDIAL BUREAU B

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Final
September 2014

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OFF-SITE PHASE III REMEDIAL INVESTIGATION
FOR THE
FORMER KLINK COSMO CLEANERS SITE
GREENPOINT/EAST WILLIAMSBURG INDUSTRIAL AREA
SITE ID NO. 224130
BROOKLYN, KINGS COUNTY, NEW YORK

PREPARED FOR:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
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WORK ASSIGNMENT NUMBER C007540-4.1

PREPARED BY:

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BUFFALO, NEW YORK 14202-2657

FINAL
SEPTEMBER 2014

September 5, 2014

Mr. David K. Harrington, P.E.
Senior Environmental Engineer
Remedial Bureau B
Division of Environmental Remediation
NYS Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233-7016

Re: NYSDEC Standby Contract, Work Assignment No. C007540-4.1
Former Klink Cosmo Cleaners, Greenpoint/East Williamsburg Industrial Area,
Site ID No. 224130
Final Letter Report – Off-Site Phase III Remedial Investigation

Dear Mr. Harrington:

URS Corporation - New York (URS) has prepared this Letter Report to summarize the field activities and analytical results associated with the Off-Site Phase III Remedial Investigation (RI) conducted in December 2013 and between January and March 2014 at the Former Klink Cosmo Cleaners (Klink Cosmo) Site [New York State Department of Environmental Conservation (NYSDEC) Site (Site Number 224130)], which is located in the Greenpoint/East Williamsburg Industrial Area section of Brooklyn, New York (Figure 1). The work associated with the Phase III RI was completed under NYSDEC Work Assignment No. C007540-4.1.

1.0 INTRODUCTION

The Off-Site Phase III RI field investigation was conducted to evaluate the downgradient extent of the dissolved-phase chlorinated volatile organic compound (CVOC) groundwater plume at the top of the Raritan Formation originating from the Klink Cosmo Site, and to assess the potential impact of the nearby former JR Cooperage facility on the dissolved-phase CVOC groundwater plume. The following soil vapor, soil boring, and monitoring wells were included for sampling:

Soil Vapor Implant Locations		*Well Boring Locations*	
SG-195	*SG-199*	*DEC-111D*	*DEC-111*
SG-196	*SG-200*	*DEC-006TC*	
SG-197			

NYSDEC Monitoring Well Locations

DEC-006TC

DEC-111

DEC-111D

Activities associated with the Off-Site Phase III RI field investigation consisted of:

- Utility clearance was performed by a geophysical contractor (i.e., Radar Solutions, International) at all soil vapor locations, soil boring, and monitoring well locations on December 9, 2013 and January 21, 2014.
- Five of a proposed six soil vapor implants were installed by Zebra Environmental, Inc. to a maximum depth of 8 feet below ground surface (bgs) on February 7, 2014 (Figure 2). Six soil vapor implants were planned; however, soil vapor point SG-198 was not installed. SG-198 was planned at a location adjacent to a residence at Division and Vandervoort Avenue. The resident at that location did not want the soil vapor point installed. Soil vapor implants were completed with flush-mount protective casings.
- Soil vapor samples were collected on February 12, 2014 from the five new soil vapor implants. Quality control (QC) samples were collected in accordance with soil vapor implant sampling procedures. All soil vapor samples plus quality assurance/quality control (QA/QC) samples were analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory (i.e., Pace Analytical Services, Inc.) for volatile organic compounds (VOCs) plus tentatively identified compounds (TICs). Each sample was collected in a 6-liter Summa canister equipped with a 1-hour flow controller. Helium tracer gas was used to verify the integrity of each soil vapor implant seal.
- Three well borings and corresponding monitoring wells were advanced, sampled, and installed at the site using both conventional mud-rotary and sonic drilling methods up to approximately 124 feet bgs. DEC-006TC was advanced using mud-rotary methods between December 9 and 23, 2013 by Associated Environmental Services Ltd. (Associated), and DEC-111 and DEC-111D were advanced and sampled at the site with sonic drilling methods up to approximately 80 feet bgs using a low clearance sonic drill rig by Glacier Drilling LLC (Glacier) between February 10 and 13, 2014. All boring locations were cleared to 5 feet bgs by Vac-Tron© prior to drilling.
- One soil sample was collected from well boring DEC-111D for environmental characterization. One soil sample was also collected from each of the soil vapor implant locations. All soil samples plus QA/QC samples were analyzed by a NYSDOH ELAP certified laboratory (i.e., Spectrum Analytical, Inc.) for TCL VOCs plus TICs.
- At DEC-006TC, two grab samples from the upper glacial sand and the silty sand material above the Raritan Formation clay, and one Shelby tube sample from the top of the Raritan Formation clay were collected for geotechnical analysis by 3rd Rock LLC.
- Monitoring wells were developed a minimum of 24 hours after their completion. Between 110 and 200 gallons of development water was removed from the newly installed wells.
- Groundwater samples were collected from the 3 newly installed monitoring wells. A complete synoptic round of water levels in the Klink Cosmo Site area was collected prior to the start of groundwater sampling.

- Groundwater samples were collected in accordance with low-flow groundwater sampling procedures. All groundwater samples were analyzed by a NYSDOH ELAP certified laboratory (i.e., Spectrum Analytical, Inc.) for TCL VOCs plus TICs.
- All investigation derived waste (IDW) (e.g., soil cuttings, development, purge and decontamination water) were drummed for disposal. Drums were removed from the site on a daily basis for proper disposal by AARCO Environmental Services Corporation (AARCO).
- A 100-foot scale topographic survey was completed, which includes the location of existing streets, curbs, sidewalks, fencing and other site features, along with soil boring, monitoring well and soil vapor implant locations by B. Thayer & Associates. The survey was tied into the existing site survey.
- Restoration of three sidewalk flags in kind by AARCO (i.e., DEC-006TC, DEC-111, and DEC-111D).
- Soil vapor implants and monitoring wells were inspected by URS personnel and the information recorded on the appropriate inspection records.

2.0 PREVIOUS INVESTIGATIONS

URS has previously conducted two phases of RI/FS investigation field work at the Klink Cosmo Site. The results for the previous phases have been reported in the Phase II Remedial Investigation Report (URS, 2012). A brief summary is presented below.

Based on the results of all soil vapor, soil, and groundwater data collected to date, the former Klink Cosmo Cleaners is the origin of tetrachloroethene (PCE) and trichloroethene (TCE) contamination which has migrated to the east, north, and northeast of the building that formerly housed the dry cleaning operations. The exact location of the PCE source has yet to be determined and most likely lies beneath the building. Additional intrusive and non-intrusive methods of investigation inside the building that housed the former Klink Cosmo Cleaners are planned as part of the On-Site Phase III RI to determine the location(s) and size(s) of the PCE source(s) material(s).

Based upon the RI Phase II groundwater sampling event, a dissolved chlorinated solvent plume originates at the Klink Cosmo Site. The horizontal extent of the chlorinated solvents has been mostly delineated. RI Phase II PCE concentrations were marginally lower as compared to RI Phase I concentrations except in the area of DEC-015D, DEC-007D, and DEC-006DD, which were higher. It appears that the chlorinated solvent plume in the shallow and deep overburden has higher concentrations of PCE immediately north and east of the Klink Cosmo site. The extent of PCE has a larger footprint in the shallow groundwater compared to the deep groundwater and appears to be moving with regional deep groundwater flow towards the northeast and comingles with the dissolved chlorinated solvent plume originating within the nearby ACME Steel Areas. The vertical extent of PCE and TCE impacted groundwater was determined to extend down to the top of the Raritan Formation. The horizontal extent of PCE impacted groundwater in the deep overburden near the top of the Raritan Formation has not fully been delineated. The impacted groundwater appears to be migrating to the northeast and extends into the ACME Steel Areas in the vicinity the intersection of Porter Avenue and Lombardy Street. The vertical extent of PCE and TCE impacted groundwater is not expected to migrate below the top of the Raritan Formation due to its vast areal extent and low permeability.

Soil vapor in the Klink Cosmo area has been adversely impacted by the presence of PCE, TCE and their daughter products. The elevated soil vapor concentrations were generally present to the west, north, and the eastern perimeter of the former Klink Cosmo Cleaners building and immediately downgradient toward the east and northeast. A second area of elevated soil vapor concentration was found north/ northwest of the site. The approximate size of the soil vapor PCE and TCE plumes from RI Phases are similar in size and appear to also mimic the extent of the dissolved phase shallow PCE and TCE groundwater plume. The exception to this is the concentrations that exist along the west side of the former Klink Cosmo Cleaners building and north/ northwest of the site.

Recommendations for additional off-site field investigations included:

- One top of clay monitoring well should be installed to an approximate depth of 125 feet at DEC-006TC. The rationale for the top of clay well location was to assess the extent of CVOCs at the top of the Raritan Formation between the Klink Cosmo Site and the ACME Steel Sites. The top of clay well should be a hybrid well consisting of a 10-foot screen of 2-inch ID, Type 304 stainless steel 0.010-inch continuous wrap screen with a 2-foot long sump, and, 2-inch ID, Schedule 40 PVC riser string to the surface. A 00 or 00N size sand pack should be installed from the bottom of the well up to 2 feet above the top of the well screen. A bentonite slurry should then be installed around the riser to an elevation of 1-foot below grade via tremie pipe. An 8-inch diameter, flush-mount protective casing should complete the well.
- One monitoring well pair (i.e., DEC-111 and DEC-111D) should be installed near the former JR Cooperage that was situated just north of the Klink Cosmo Site along the west side of Vandervoort Avenue. The shallow well should be installed with a 2-inch ID, 15-foot length of 0.010 slot Schedule 40 PVC screen, and 2-inch ID Schedule 40 PVC riser string to the surface. A 00 or 00N size sand pack should be installed from the bottom of the well up to 2 feet above the top of the well screen. A bentonite slurry should then be installed around the riser to an elevation of 1-foot below grade via tremie pipe. An 8-inch diameter, flush-mount protective casing should complete the well. The deep well should be installed with a 2-inch ID, 10-foot length of 0.010 slot Schedule 40 PVC screen, and 2-inch ID Schedule 40 PVC riser string to the surface. A 00 or 00N size sand pack should be installed from the bottom of the well up to 2 feet above the top of the well screen. A bentonite slurry should then be installed around the riser to an elevation of 1-foot below grade via tremie pipe. An 8-inch diameter, flush-mount protective casing should complete the well.
- Six soil vapor implant locations should be installed to assess and evaluate the elevated soil vapor concentrations found north/northwest of the site.

3.0 FIELD ACTIVITIES

Off-Site Phase III field activities associated with the soil gas, soil, and groundwater sampling event were performed between December 9 and 23, 2013 and between January 21, 2014 and March 7, 2014. Field notes are provided in Attachment 1 and site photographs are provided in Attachment 2.

3.1 Utility Clearance

Prior to site work, each subcontractor arranged for all appropriate utility clearance mark-outs. This included (but was not limited to) contacting the New York City (NYC) Departments of Environmental Protection and Transportation, the Transit Authority, Consolidated Edison Company of New York (Con Edison), Keyspan, and Verizon, in addition to using the Dig-Safely number for

New York City – 811 or (800) 272-4480. On December 11, 2014, Con Edison jacketed the overhead wires along the west side of Vandervoort Avenue north of Richardson Street because monitoring well locations DEC-111 and DEC-111D were situated under/adjacent to the overhead wires.

3.2 Geophysical Survey

On December 9, 2013, and again on January 21, 2014, Radar Solutions International of Waltham, MA (RSI) mobilized a one person crew with ground penetrating radar (GPR) and electromagnetic (EM) induction equipment to the site. The purpose of the geophysical survey was to screen for and identify the presence/location of underground utilities in areas where monitoring wells (i.e., December 9, 2013), soil borings, and soil vapor implant locations (i.e., January 21, 2014) were proposed.

A 10-foot square reference grid was established around each soil vapor implant, soil boring, and monitoring well location prior to collecting the geophysical data. A GSSI SIR-2000 digital radar system was used to perform the GPR survey. GPR data were acquired along lines spaced 1.0 to 2.5 feet apart. The EM induction equipment used to determine the location of buried utilities was a Ditch Witch 950 RT locating system and a McLaughlin's Verifier G2 digital locator.

RSI marked utilities and anomalies by spray-painting the outline on the pavement as soon as they were located. A URS geologist supervised and assisted RSI. RSI's report is provided in Attachment 3.

3.3 Soil Vapor Implant Installation

Prior to any intrusive activities, the subcontractor obtained all necessary permits (i.e., NYCDOT sidewalk permits) for conducting intrusive activities. During Off-Site Phase III RI field activities, five permanent soil vapor implants (SG-195, SG-196, SG-197, SG-199, and SG-200) were installed on February 7, 2014 by Zebra Environmental Corporation of Lynbrook, NY (Zebra), under the direction of a URS geologist. The five soil vapor implants were installed to a maximum depth of 8 feet bgs. Soil vapor implants were completed with flush-mount protective casings. URS did not install a soil vapor implant at proposed location SG-198 at the request of the property owner. Locations of the soil vapor implants are shown on Figure 2. All locations were installed through sidewalks. Rotary concrete drill bits were used to drill through the concrete sidewalk. A track-mounted Geoprobe® 6620 DT hydraulic push unit was utilized to advance a 2-inch outside diameter (OD) by 5-foot long acetate-lined Macrocore sampler to a maximum depth of 8 feet bgs.

Each sample core was screened with a photoionization detector (PID). One soil sample was collected from each boring from the interval exhibiting odors, staining, or the highest PID reading. If no odors, staining, or elevated PID readings were encountered, then a sample from the bottom of the boring was collected.

A 6-inch long double-woven stainless steel Geoprobe® vapor sampling implant was connected to an anchor and positioned above the silty clay layer (if present) or at the bottom of the probe hole. The implants were constructed to a minimum depth of 2.0 feet bgs. Polyethylene tubing ($^{3}/_{8}$-inch OD) was connected to the implant and cut above the ground surface. The annular space around the implant (screen) was backfilled with #1 silica sand to a minimum of 6 inches above the implant. A bentonite slurry was placed immediately above the sand for the seal, and extended to the ground surface. The implants were completed with 5-inch diameter aluminum flush-mount protective casings, set in approximately 1 foot of concrete. All downhole equipment was decontaminated between each soil vapor implant location with a non-phosphate detergent and potable water. Soil vapor implant construction details are provided in Attachment 4.

For the soil samples collected during installation of the soil vapor implants, a chain-of-custody (COC) form was maintained and accompanied the soil sample containers to Spectrum Analytical, Inc., of Melville, New York, (Spectrum) a NYSDOH ELAP accredited laboratory. The soil samples were analyzed for TCL VOCs plus TICs, following United States Environmental Protection Agency (USEPA) SW846 Method 8260B.

All IDW generated from the soil vapor implant installation was containerized in Department of Transportation (DOT) approved 55-gallon drums and picked up by AARCO Environmental Services Corporation of Lindenhurst, New York (AARCO), on a daily basis for off-site disposal at a permitted facility.

3.4 Soil Vapor Sampling

Five soil vapor samples (including one field duplicate) and 1 outdoor air sample were collected on February 12, 2014 in accordance with the procedures outlined in the Field Activities Plan (FAP) (URS, April 2010) using laboratory evacuated 6-liter Summa® canisters with 1-hour flow regulators provided by Pace Analytical Services, Inc. of Melville, New York (Pace). Per the New York State Department of Health's (NYSDOH's) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, October 2006), a helium tracer gas was utilized during the sampling of each soil vapor implant. The tracer gas was used to verify that the infiltration of outdoor (ambient) air was not occurring during sample collection. A one-quart enclosure or 5-gallon bucket lid was placed over the well head. The well tubing was run through an outlet and a silicone gasket was used to seal the interface between the tubing and the enclosure or lid. The enclosure or lid was then sealed at the ground surface with a polyurethane foam gasket. A tank containing ultra-high purity helium (99.999%) was connected to the side port of the enclosure or lid and enough helium was released to displace any ambient air and to maintain a positive pressure within the enclosure or lid. Following the application of the tracer gas, one to three volumes were purged from the soil vapor implant using a Gilian GilAir-3 air sample pump.

A Dielectric MGD-2002 helium detector was used to check for the presence of the tracer gas in the purged soil vapor; if less than 10% of the tracer gas was detected, a sample was collected. Following the collection of the soil vapor sample, the helium detector was re-connected to the tubing to check for the presence of the tracer gas in the soil vapor; if less than 10% of the tracer gas was detected, the sample was acceptable for analyses.

One outdoor (ambient) air sample was collected from a location upwind of the sample locations. The outdoor ambient air sample was collected by opening a summa canister fitted with a 1-hour flow controller and drawing in the ambient air. Field duplicate samples were collected using stainless steel 'T' fittings. The Summa Canister Sampling Field Data Sheets documenting the sampling event are presented in Attachment 5.

All samples were transported under chain-of custody (COC) via laboratory courier to Pace. The samples were analyzed for TCL VOCs plus TICs, following USEPA Compendium Method TO-15.

3.5 Monitoring Well Installation

3.5.1 Pre-Boring Clearing and Monitoring Well Construction

Prior to any intrusive activities, the subcontractor obtained all necessary permits (i.e., NYC DOT street opening permits) for conducting intrusive activities. Three well borings were advanced and sampled at the site using both conventional mud-rotary and sonic drilling methods up to

approximately 124 feet bgs. DEC-006TC was advanced by Associated Environmental Services Ltd. of Hauppauge, New York (Associated) using mud-rotary methods and DEC-111 and DEC-111D were advanced and sampled with sonic drilling methods up to approximately 80 feet bgs by Glacier Drilling LLC of Durham, Connecticut (Glacier) using a low clearance sonic drill rig. All boring locations were cleared to 5 feet bgs by Vac-Tron© prior to drilling. Soil boring logs and well construction diagrams are provided in Attachment 6.

3.5.1.1 DEC-006TC Monitoring Well Construction

On December 9, 2013 Associated mobilized one Vac-Tron® unit to perform location specific utility clearance at DEC-006TC as depicted in Figure 3. DEC-006TC was cleared on December 9, 2013. An approximately two-foot by two-foot square area of the sidewalk was cut. An approximately one-foot diameter by five-foot deep hole was excavated using post-hole diggers, pry bars, and an air knife along with the Vac-Tron® unit. After the location was cleared for drilling, the borehole was advanced by Associated with a truck-mount Diedrich D-120 drill rig between December 9 and 23, 2013. The soil boring was advanced using 6-inch ID drive and wash with mud-rotary drilling methods. Split spoon samples and/or Macrocore samples were collected continuously using standard penetration techniques (ASTM D1586-84) unless an obstruction was encountered that required the advancement of the drill string past the obstruction. Soil samples for subsurface characterization were screened with a photoionization detector (PID). No odors, staining, or elevated PID readings were encountered. All IDW generated from the monitoring well installation was containerized in DOT approved 55-gallon drums and picked up by AARCO on a daily basis for off-site disposal at a permitted facility.

Select soil samples were analyzed by 3rd Rock LLC of East Aurora, New York (3rd Rock) for the following geotechnical analyses including: grain size distribution (ASTM D422); Atterberg Limits (ASTM D4318); USCS classification, and falling head permeability (ASTM D5084). Soil samples collected for geotechnical analysis include those from 34-35', 113-115', and 119-121' bgs. Geotechnical results are provided in Attachment 7.

DEC-006TC was constructed as a hybrid well was installed with a 10-foot long, 2-inch inside diameter (ID), Type 304 stainless steel 0.010-inch continuous wrap screen and 2-foot long stainless steel sump. The Type 304 stainless steel screen and sump was flush threaded to 2-inch ID, Schedule 40 polyvinyl chloride (PVC) riser up to the ground surface. A #0 Filpro size sand pack was installed from the bottom of the well up to 6 feet above the top of the well screen. A bentonite slurry was then installed around the riser to an elevation of 1-foot below grade via tremie pipe. DEC-006TC was finished with a locking well cap, a 2-foot square concrete apron, and a flush-mounted curb box. Security bolts were installed in the well cover to minimize the potential for unauthorized well access. The concrete apron for the well pad was approximately 6 inches thick. A monitoring well construction log is included in Attachment 6.

3.5.1.2 DEC-111 and DEC 111D Monitoring Well Construction

On January 28, 2014 Glacier mobilized one Vac-Tron® unit to perform location specific utility clearance at each of the proposed monitoring well locations. Two monitoring well locations were cleared on January 28, 2014. At each location, an approximately two-foot by two-foot square area of the sidewalk was cut. An approximately one-foot diameter by five-foot deep hole was excavated using post-hole diggers, pry bars, and an air knife along with the Vac-Tron® unit. After the location was cleared for drilling, the hole was backfilled flush with the sidewalk using the excavated spoils

(rocks and debris were removed and not re-used as backfill) and if necessary, temporarily patched with blacktop patch or concrete.

Between February 10, 2014 and February 13, 2014, Glacier utilized a track-mounted Geoprobe® 8140LS Roto Sonic drill rig for the installation of the DEC-111 monitoring well pair located on Figure 3.

The soil borings at the shallow and deep well location was advanced using a 4-inch outside diameter (OD) inner sampler and a 6-inch OD outer casing with sonic drilling methods. Soil samples were collected continuously from the ground surface to the terminus of DEC-111D. The procedure for the advancement of the borehole was to advance the inner sampler the appropriate interval (5 or 10 feet) and then advance the outer casing over the inner sampler to the desired depth. After the outer casing was advanced, the inner sampler was retrieved and the sample core collected was placed in a polyethylene sample tube. The process was repeated until the desired depth was reached. At the DEC-111 monitoring well pair, only the deep monitoring well location was sampled and logged. Following the installation of the deep monitoring well, the corresponding shallow monitoring well was advanced to a pre-determined depth and installed without the collection of any soil samples.

Each sample core was screened with a PID. On February 6, 2014, one soil sample was collected for environmental characterization from well boring location DEC-111D between 34 and 35 feet bgs. No odors, staining, or elevated PID readings were encountered. Soil boring logs are provided in Attachment 6. A COC form was maintained and accompanied the soil sample containers to Spectrum. The soil sample was analyzed for TCL VOCs plus TICs following USEPA SW846 Method 8260B. All IDW generated from monitoring well installation was containerized in DOT approved 55-gallon drums and picked up by AARCO on a daily basis for off-site disposal at a permitted facility.

DEC-111 was constructed with 15 feet of 2-inch ID, Schedule 40 PVC 0.010-inch slot screen and riser. A #1 size silica sand pack was installed from the bottom of the well up to 4 feet above the top of the well screen. The screen was nominally set between 5 feet above and 10 feet below the water table. Bentonite chips were then installed around the riser to an elevation of 2 feet below grade.

DEC-111D was constructed with 10 feet of 2-inch ID, Schedule 40 PVC 0.010-inch slot screen and Schedule 40 PVC riser. A #1 size sand pack was installed from the bottom of the well up to 2 feet above the top of the well screen. A bentonite slurry was then installed around the riser to an elevation of 2-feet below grade via tremie pipe.

Each monitoring well was finished with a locking well cap, an approximately 2-foot square concrete apron, and a flush-mounted curb box. Security bolts were installed in the well covers to minimize the potential for unauthorized well access. The concrete apron for each well pad was approximately 6 inches thick. Monitoring well construction logs are included in Attachment 6.

3.5.2 Monitoring Well Development

At least 24 hours after the monitoring wells were installed the wells were developed by URS personnel with the pump and surge development method using a Waterra Inertial Hydrolift pump equipped with dedicated/disposable high density polyethylene (HDPE) tubing and dedicated/disposable HDPE check valves. Prior to well development, a 200-foot long Solinst oil/water interface probe was used to check for the presence/thickness of any free product. During well development, water quality parameters (pH, specific conductivity, temperature, turbidity) were measured using a Hanna 991301 Multiparameter Meter and a Lamotte 2020 turbidimeter and

recorded. A monitoring well was considered developed when a minimum of 100 gallons was removed and the water quality parameters had stabilized.

Well development water was collected in DOT approved 55-gallon drums and picked up daily by AARCO for off-site disposal at a permitted facility. Well development forms are included in Attachment 8.

3.6 Monitoring Well and Soil Vapor Implant Inspections and Maintenance

Monitoring well and soil vapor implant inspections and maintenance was performed on all DEC soil vapor points and monitoring wells that were entered during the Off-Site Phase III RI field investigation. If maintenance was necessary and performed, it is noted on the form. Maintenance includes: tapping out bolt holes, replacement of security bolts, addition of an anti-seize paste to security bolts, and location ID stenciling adjacent to the locations. Completed inspection forms are provided in Attachment 9.

3.7 Groundwater Level Measurements

On March 6-7, 2014, a complete synoptic round of water levels in the Klink Cosmo Site area were collected prior to the start of groundwater sampling. Monitoring wells were checked for depth to groundwater and thickness of accumulated light non-aqueous phase liquid (LNAPL), if any. Water levels were measured using a 200-foot long Solinst oil/water interface probe. Table 1 presents groundwater level measurements and the presence/absence of LNAPL in monitoring wells. Groundwater elevations were adjusted if LNAPL was present, based upon the (laboratory) measured specific gravity of the product present in monitoring wells at the site. No LNAPL was present in any of the newly installed monitoring wells.

3.8 Non-Aqueous Phase Liquid Gauging

During the Off-Site Phase III RI field investigation, LNAPL was detected in DEC-048 at a thickness of 0.20 feet.

3.9 Groundwater Sampling

On March 6-7, 2014, URS personnel collected groundwater samples from the 3 monitoring wells shown on Figure 3. Prior to sample collection at DEC-006TC and DEC-111D, standing water was purged with a Grundfos Pump. At DEC-111, standing water was purged with a bladder pump using dedicated/disposable HDPE tubing. The wells were purged at a rate of 1-liter per minute or less and the purge rate was adjusted to minimize draw down. During the purging of the well, water quality parameters (pH, specific conductivity, temperature, dissolved oxygen, turbidity) were measured using a Horiba U-52 Multi-parameter Instrument with a flow-through cell and documented on a purge log. Samples were collected after the water quality parameters stabilized. All IDW including purge water, bailers and HDPE tubing, was collected and placed into Department of Transportation (DOT) approved 55-gallon drums. Well purge logs are provided in Attachment 8.

All samples were transported under COC via laboratory courier to Spectrum. The samples were analyzed for TCL VOCs, plus TICs following USEPA SW846 Method 8260C.

3.10 Concrete Flag Replacement

AARCO was contracted for the replacement of sidewalk flags where monitoring wells were installed during current site activities. AARCO replaced 3 sidewalk flags on May 6, 2014 at monitoring well locations DEC-006TC, DEC-111, and DEC-111D, in accordance with applicable standards. Prior to removal of the damaged flags, AARCO saw cut the perimeter of each flag to be replaced using a

water-cooled pavement saw to reduce fugitive dust. The flags were demolished, removed and disposed of by AARCO. New flags were replaced in kind to the surrounding flags. The daily construction report detailing the flag replacement activities is provided in Attachment 10.

3.11 Investigation Derived Waste Disposal

AARCO was contracted for the daily pick-up and disposal of all drummed IDW at a permitted disposal facility. Copies of the non-hazardous bills of lading and hazardous waste manifests are provided in Attachment 11.

3.12 Site Survey

B. Thayer Associates of Woodbury, New York (i.e., B. Thayer), was contracted to survey additional monitoring well, soil vapor, and soil boring locations in May 2014. The survey provides 100-scale mapping and does not include elevated roadways and expressways (i.e., BQE). The survey was tied into the existing site survey. All surveying was performed under the supervision of a New York State licensed land surveyor. All vertical control points were referenced to the North American Vertical Datum 1988 (NAVD 1988). Horizontal datum was referenced to the North American Datum of 1983 (NAD 83), New York State Plane Coordinate System, Long Island Zone.

4.0 STUDY AREA GEOLOGY

This section discusses the physical characteristics of the study area including: geology, hydrogeology, and SCGs.

4.1 Regional Geology

The Klink Cosmo Site is located within the Atlantic Coastal Plain physiographic province of New York State (Broughton, et al. 1966). The Atlantic Coastal Plain is characterized by low relief with elevations ranging from sea level to almost 400 feet amsl. The lithology of Brooklyn and Queens consists of Cretaceous and Pleistocene age unconsolidated deposits underlain by Precambrian crystalline bedrock. The unconsolidated deposits pinch out in northwestern Queens where bedrock outcrops, but reach a thickness of more than 1,000 feet in southeastern Queens. The unconsolidated deposits form six distinct hydrogeologic units consisting of four aquifers and two confining layers that generally dip to the south-southeast. The units in ascending order are the Lloyd aquifer (0-300 feet thick), the Raritan confining unit (0-200 feet thick), the Magothy aquifer (0-500 feet thick), the Jameco aquifer (0-200 feet thick), the Gardiners clay (0-150 feet thick), and the upper glacial aquifer (0-300 feet thick) (USGS, 1999a and b). The units pinch out to the north-northeast and may not all be found at any one location.

Based on borings performed near the site for unrelated work, the site is underlain from the surface down by upper glacial aquifer, the Raritan Formation, and crystalline bedrock. The upper glacial aquifer is of Wisconsin age and consists of a terminal moraine, a ground moraine, and glacial outwash deposits whose area is characterized as an unsorted and unstratified mixture of clay, sand, gravel and boulders. The Raritan Formation is recognized as a confining unit which has been described as light to dark gray, brown-red, pink, red and gray-white clay, silty clay and clayey to silty fine sand. Disseminated lignite and pyrite are common and calcareous concretions may be found. Prior to the Site Characterization (SC) Phase VI fieldwork, the Raritan Formation had previously been encountered in three borings performed near the site by the USGS: one boring near Morgan Avenue and Meeker Avenue (-47 feet amsl); one boring under the BQE near the west bank of Newtown Creek (-48 feet amsl); and one boring near Meeker Avenue between Stewart Avenue and Gardner Avenue (-71 feet amsl). The boring near Morgan Avenue and Meeker Avenue

penetrated the Raritan Formation into the underlying crystalline bedrock at an elevation of -163 feet amsl.

During the Meeker Avenue Site Characterization Plume Trackdown (SC) and Klink Cosmo RI fieldwork phases, the Raritan Formation was positively encountered in ten top of clay well locations at depths between 108.5 and 138.0 feet bgs (elevations of -56.95 to -121.19 feet amsl) and was described as gray with white banding, brown, brownish gray, greenish gray, dark gray to greenish brown, fine sand and silt, clays with carbonized plant fragments, clays with varying amounts of sand to silts with varying amounts of sand and clay. In the Klink Cosmo area, the top of Raritan Formation was identified at 4 well locations (DEC-006TC, DEC-028TC, DEC-029TC, and DEC-031TC) at depths between109 feet and 118 feet bgs.

During this RI phase, the top of Raritan Formation was encountered at a depth of 118 feet bgs in DEC-006TC.

4.2 Site Geology and Hydrogeology

Figure 4 presents the locations of the monitoring wells and cross sections developed during the RI. Cross sections A-A', B-B' and C-C' are shown on Figures 5, 6, and 7, respectively. Based upon subsurface data obtained during this and previous investigations, the upper glacial aquifer has been penetrated and the top of the Raritan Formation has been encountered at the top of clay locations. The following textural units have been found in the upper glacial aquifer in most borings, from the surface downward: a fill unit; a sand unit or a discontinuous glacial till unit; a sand unit if the discontinuous glacial till unit was encountered at the surface; a discontinuous clayey silt unit within the sand unit; sand and gravel unit; and the Raritan Formation. Due to the heterogeneous nature of the geology, some but not all of the units may or may not be present at each boring. The thickness of the upper glacial aquifer in the Klink Cosmo area is approximately 108.5 to more than 113.0 feet thick. The Raritan Formation was encountered between -68.83 and -74.05 feet amsl. An isopleth of the top of Raritan Formation is shown on Figure 8.

A fill unit is present, varying in thickness from approximately 0 to 11 feet, and consists of a heterogeneous mixture of sand, silt, clay and varying amounts of construction and demolition debris (i.e., bricks, concrete, coal, slag, etc.). Potentially former MGP related fill material (i.e., cinder and/or trace slag) was found to be present across Vandervoort Avenue in the vicinity of a former MGP facility in DEC-014D (5-7 feet bgs), DEC-043 (1-11 feet bgs), SG-079 (1-2 feet bgs), and SG-086 (at 1 foot bgs).

A glacial till unit was noted at the surface in some borings and consists of a heterogeneous mixture of sand, silt, and clay and varying amounts of gravel, cobbles and boulders.

A sand unit is present at all the boring locations and is represented by stratified sands of varying textures containing some to no fines.

A lacustrine clayey silt/silt unit has been observed as an inclusive unit within the sand unit. The thickness of the clayey silt/silt unit, where present, varies from 0.5 to over 10 feet thick.

A sand and gravel unit has been found to overlie the Raritan Formation at DEC-006TC, DEC-028TC, DEC-029TC, and DEC-031TC. The Raritan Formation consisted of gray or dark gray, silt with some clay and fine sand stringers; clay with some sand; clay and silt; or fine sand and silt.

Geotechnical results are presented in Attachment 7 and presented below.

A grab sample was collected from the glacial till within the upper glacial aquifer sand at DEC-006TC (34-35 feet bgs). The USCS classification of this sample is SC. Soil was identified as slightly plastic.

A grab sample was collected from the silty sand material above the top of the Raritan Formation clay (DEC-006TC 113-115 feet bgs). It contained 2% gravel, 87.5% sand, 8.3% silt and 2.2% clay which would be classified as a SW.

A Shelby tube sample was collected from the top of the Raritan Formation at DEC-006TC (119-121 feet bgs). The USCS classification of this sample from the Raritan Formation was CL. Soil was identified as slightly to medium plastic. The measured permeability value was 3.6 x 10^{-8} J:\Projects\11176390\WORD\DRAFT\Klink Cosmo On-Site Phase III Letter Report\Klink Cosmo Off-Site Phase III RI - Letter Report September 2014 - Final.docxcm/sec for the clay.

4.3 Groundwater Levels

During the Off-Site Phase III RI field activities, a round of synoptic groundwater levels was obtained from monitoring wells in the Klink Cosmo area prior to the start of the groundwater sampling. These were used to develop groundwater contour elevation maps during the RI so that groundwater flow direction could be determined.

A potentiometric surface map based on the water level measurements from the shallow overburden wells, using 0.1-foot contour interval, is provided in Figure 9. The groundwater flow direction was to the east with northeast and southeast components and is consistent with prior rounds.

A potentiometric surface map based on the water level measurements from the deep overburden wells, using 0.1-foot contour interval, is provided in Figure 10. The groundwater flow direction was to the east with northeast and southeast components and is consistent with prior rounds.

A potentiometric surface map based on the water level measurements from the Top of Raritan Formation wells, using 0.1-foot contour interval, is provided in Figure 11. The groundwater flow direction was generally to the east with east-northeast and southeast components.

The water table surface is found between approximately 25 to 43 feet bgs in the shallow overburden groundwater. The potentiometric surface in the deep overburden groundwater is between 25 and 50 feet bgs. The potentiometric surface in the deep overburden groundwater at the top of Raritan Formation is between 32 and 47 feet bgs. Groundwater levels in the shallow and deep overburden groundwater were approximately a foot lower than those measured in June 2011, and approximately a half foot lower than those measured in March 2012. The groundwater flow direction in all three units is generally to the east (including to the northeast and southeast). A groundwater depression is observed in the shallow overburden groundwater in the vicinity of DEC-028 which is consistent with prior rounds.

4.4 Standards, Guidance, and Criteria

Soil

Three sources of soil SCGs are considered appropriate for this site: site-specific background soil samples, NYSDEC Part 375, and NYSDEC CP-51. Site-specific background soil sample results were detailed in the Spic and Span RI (URS, September 2012). Soil samples during this Off-Site Phase III RI were only analyzed for VOCs, and since no VOCs were detected in soil background samples, soil background is not included on the analytical tables and figures presented in Section 5.

Part 375 criteria are considered as SCGs for soil samples in conjunction with CP-51 criteria. CP-51 supplements Part 375 by providing criteria for contaminants previously included under TAGM 4046 where values were not included in Part 375. Hereafter, mention of Part 375 includes incorporation of CP-51 criteria values. Part 375 Unrestricted Use criteria are considered to assist in the development of a remedial alternative capable of achieving unrestricted future use, as required by DER-10 Section 4.4 (b) 3 ii. In addition, criteria for the Protection of Groundwater are considered as SCGs for contaminants which exceed groundwater SCGs. Soil SCGs also considered appropriate for the site are Residential criteria. Part 375 Residential and Restricted Residential Use soil cleanup criteria for the soil samples are used on the soil analytical data tables in Section 5.

Groundwater

The SCGs for groundwater are the Class GA standards and guidance values presented in NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998 (including subsequent revisions). These groundwater SCGs are included on the groundwater analytical tables presented in Section 5.

Soil Vapor

There are no criteria for soil vapor analytical data.

5.0 ANALYTICAL RESULTS

Full deliverable data packages [i.e., NYSDEC Analytical Service Protocol (ASP) Category B] were provided by the laboratories, and included all reporting forms and raw data necessary to fully evaluate and verify the reported analytical results.

Data Usability Summary Reports (DUSR) were prepared following the guidelines provided NYSDEC Division of Environmental Remediation Draft *DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B - Guidance for the Development of Data Usability Summary Reports,* May 2010. The data packages were reviewed for compliance with analytical method requirements and the following USEPA Region II guidelines:

- *Validating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry SW-846 Method 8260B*, SOP HW-24, Revision 2, August 2008; and
- *Validating Volatile Organic Analyses of Ambient Air in Canister by Method TO-15*, SOP HW-31, Revision 4, October 2006.

The type and quality of analytical results that are needed to answer specific environmental questions and support proper environmental decisions met the project quality objectives (PQOs) for this sampling event, except where noted in the DUSRs.

Summaries of the detected TCL VOCs in the soil vapor, soil and groundwater samples are provided in Tables 2, 4A, 4B, and 6, respectively. Results exceeding their respective SCGs are indicated with a circle. As noted above, there are no criteria for soil vapor analytical data.

The complete validated analytical results for the soil vapor, soil and groundwater samples are presented in the DUSRs in Attachment 12, on a CD. Data summary tables, Form Is and Form I-TICs are provided in the DUSRs and include the reporting limit for each non-detected compound.

5.1 Outdoor Air and Soil Vapor

Table 2 presents the outdoor air and soil vapor sample results and depicted on Figure 12. Table 3 provides a statistical summary of the detected parameters for the soil vapor samples as follows: the

number of detections; the minimum, maximum and average values; and the location of the maximum value.

PCE was detected in the outdoor air sample associated with the soil vapor samples. The location of the outdoor air sample was on Richardson Street. In addition, the following VOCs were also detected in the outdoor air sample: 1,2,4-trimethylbenzene, 1,4-dichlorobenzene, acetone, benzene, carbon disulfide, chloromethane, dichlorodifluoromethane, 2-butanone, methylene chloride, toluene, trichlorofluoromethane, vinyl acetate, and xylenes.

5.1.1 Soil Vapor PCE Detections

PCE was detected in 4 of the 5 soil vapor samples collected. Concentrations ranged from 0.81 µg/m^3 to 62.6 µg/m^3. The highest concentration of PCE was detected at SG-195 (62.6 µg/m^3), followed by SG-196 (8.61 µg/m^3), SG-197 (2.51 µg/m^3), and SG-199 (0.81 µg/m^3).

PCE concentrations in the soil vapor samples are shown on Figure 13. Since all detections are less than 100 µg/m^3 no isoconcentration contours are shown.

5.1.2 Soil Vapor TCE Detections

TCE was detected in 2 of the 5 soil vapor samples collected. Concentrations ranged from 1.02 µg/m^3 to 9.03 µg/m^3. The highest concentration of PCE was detected at SG-195 (9.03 µg/m^3), followed by SG-199 (1.02 µg/m^3).

TCE concentrations in the soil vapor samples are shown on Figure 14. Since all detections are less than 100 µg/m^3 no isoconcentration contours are shown.

5.1.3 Soil Vapor PCE and TCE Degradation Product Detections

The presence of PCE and TCE degradation products have also been detected in this soil vapor sampling event. Cis-1,2-dichloroethene (cis-1,2-DCE) and trans-1,2-dichloroethene (trans-1,2-DCE) were detected in 1 of the 5 soil vapor samples collected (SG-195), as listed in Table 3. The concentration of cis-1,2-DCE was 5.63 µg/m^3, while the concentration of trans-1,2-DCE was 0.44 µg/m^3.

5.2 Soil

Tables 4A and 4B present the soil analytical results. Methylene chloride was the only VOC detected in the soil samples, which is below SCG criteria at all locations. PCE, TCE, and subsequent degradation products were not detected in any of the 6 soil samples. Table 5 provides a statistical summary of the detected parameters for the soil samples as follows: the number of detections; the minimum, maximum and average values; and the location of the maximum value.

5.3 Soil PCE, TCE and Degradation Product Detections

PCE, TCE, and subsequent degradation products were not detected in any of the 6 soil samples collected.

5.4 Groundwater

Table 6 presents the groundwater analytical results. Figure 15 presents the analytical results for the groundwater samples. Table 7 provides a statistical summary of the detected parameters for the groundwater samples as follows: the number of detections; the minimum, maximum and average values; and the location of the maximum value.

5.4.1 Groundwater PCE Detections

PCE was detected in all 3 groundwater samples collected, with each location exceeding groundwater criteria. Concentrations exceeding groundwater criteria ranged from 18 µg/L to 4,900 µg/L. The highest concentration of PCE was detected at DEC-006TC (4,900 µg/L), followed by DEC-111 (1,300 µg/L), and DEC-111D (18 µg/L).

Concentrations of PCE in the groundwater samples are shown on Figure 16.

5.4.2 Groundwater TCE Detections

TCE was detected in all 3 groundwater samples collected, with each location exceeding groundwater criteria. Concentrations exceeding groundwater criteria ranged from 8.4 µg/L to 380 µg/L (Figure 15). The highest concentration found at DEC-006TC (380 µg/L), followed by DEC-111D (220 µg/L), and DEC-111 (8.4 µg/L).

Concentrations of TCE in the groundwater samples are shown on Figure 17.

5.4.3 Groundwater PCE and TCE Degradation Product Detections

The presence of PCE and TCE degradation products have also been detected in this groundwater sampling event at concentrations exceeding groundwater criteria (Figure 15).

Cis-1,2-DCE was detected in all 3 groundwater samples collected, with only 1 location exceeding groundwater criteria, as listed in Table 7. The range of cis-1,2-DCE varied from 2.4 µg/L to 11 µg/L, with the highest concentration detected at DEC-111D.

Additional VOCs were detected above SCGs and include: 1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, and 1,2-dichloroethane.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based upon the results of the Off-Site Phase III RI field investigation, the following conclusions are provided.

6.1.1 Geology

- The 3 monitoring wells installed during the RI Phase III are located in the upper glacial aquifer and the Top of Raritan Formation. Well DEC-006TC is mostly screened in stratified sands of varying textures containing some silt and fines and reached the Top of Raritan Formation at a depth of 118 feet (elevation -68.83 amsl). DEC-111 and DEC-111D are screened through fine to coarse sand and gravel.
- Shallow overburden groundwater flow in the vicinity of the Klink Cosmo Site is to the east with northeast and southeast components.
- Deep overburden groundwater flow in the vicinity of the Klink Cosmo Site is to the east with northeast and southeast components.
- Deep overburden groundwater flow near the top of Raritan Formation in the vicinity of the Klink Cosmo Site is generally to the east with east-northeast and southeast components.
- There is a slight upward vertical hydraulic gradient at monitoring well pair DEC-111 and between DEC-006 and DEC-006TC.

6.1.2 Soil

- There were no VOCs detected above SCGs during the Off-Site Phase III RI.

6.1.3 Groundwater Analytical Results

- PCE and its degradation products were detected at concentrations exceeding groundwater criteria in shallow and deep groundwater monitoring wells (DEC-111 and DEC-111D, respectively) which are located immediately downgradient of the Klink Cosmo Site, adjacent to the former JR Cooperage facility.
- PCE and TCE have also been detected in groundwater sample DEC-006TC at concentrations exceeding groundwater criteria. The sample was collected immediately above the top of the Raritan Formation at approximately 115 feet bgs. The PCE concentration at DEC-006TC (i.e., 4,900 µg/L) is similar to the concentration detected at DEC-029TC (i.e., 4,500 µg/L) during the RI Phase II sampling event. DEC-029TC is located upgradient of DEC-006TC at the top of the Raritan Formation. This indicates the PCE contamination maybe continuing to migrate to the northeast in the direction of groundwater flow in the deep groundwater zone above the top of the Raritan Formation from the Klink Cosmo Site area. However, since DEC-006TC is within the zone of potential impact from the nearby ACME Steel Sites, the PCE contamination could be attributed to the ACME Steel Sites, or a combination of the ACME Steel Sites and Klink Cosmo Site.

6.1.4 Soil Vapor

- PCE was detected in 4 of the 5 soil vapor samples collected. Concentrations ranged from 0.81 µg/m^3 to 62.6 µg/m^3. The highest concentration of PCE was detected at SG-195 (62.6 µg/m^3), followed by SG-196 (8.61 µg/m^3), SG-197 (2.51 µg/m^3), and SG-199 (0.81 µg/m^3).
- TCE was detected in 2 of the 5 soil vapor samples collected. Concentrations ranged from 1.02 µg/m^3 to 9.03 µg/m^3. The highest concentration of PCE was detected at SG-195 (9.03 µg/m^3), followed by SG-199 (1.02 µg/m^3).
- Cis-1,2-DCE and trans-1,2-DCE were detected in 1 of the 5 soil vapor samples collected (SG-195), as listed in Table 3. The concentration of cis-1,2-DCE was 5.63 µg/m^3, while the concentration of trans-1,2-DCE was 0.44 µg/m^3.

6.2 Recommendations

The following recommendations are offered for consideration by the Department.

- Carbon specific isotope analysis (CSIA) should be analyzed at locations immediately downgradient of the Klink Cosmo Site (i.e., DEC-111 and DEC-111D) and at DEC-006TC to determine if concentrations of PCE and TCE are attributable to the Klink Cosmo Site and/or the former JR Cooperage facility (i.e., DEC-111 and DEC-111D), and/or the nearby ACME Steel Sites (i.e., DEC-006TC), or a combination of these areas.
- A complete round of groundwater samples should be collected from all Klink Cosmo monitoring wells, including the newly installed monitoring wells. All groundwater samples should be analyzed for TCL VOCs plus TICs. Prior to the start of groundwater sampling, a synoptic round of water levels/ LNAPL gauging should be collected from all

monitoring wells proposed for sampling. This event should be conducted after the source area On-Site Phase III RI Phase is completed.

- An additional round of soil vapor sampling is recommended to confirm the results.

7.0 REFERENCES

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8.0 TABLES, FIGURES, AND ATTACHMENTS

The following tables, figures, and attachments are included as part of this letter report:

Tables (following Text)

Figures (following Tables)

Attachments (following Figures)

Attachment 9 Monitoring Well Inspection Forms and Soil Vapor Implant Inspection Forms
Attachment 10 Daily Construction Report for Flag Replacement
Attachment 11 Investigation Derived Waste (IDW) Disposal Documentation
Attachment 12 Data Usability Summary Reports (on CD)

Closing

Please contact me at 716-856-5636 if you have any questions or comments. We appreciate serving the Department with this interesting and challenging project.

Sincerely, and with kind regards,

URS Corporation

Michael Gutmann
Project Manager

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